23rd – 25th October 2026

Organized by

ISF COLLEGE OF PHARMACY
(An Autonomous College)

GT Road, Ghal Kalan, Moga-142 001 (Punjab) India

Supported by

Pharmacy Council of India, New Delhi

FIRST TIME IN INDIA
MEGA EVENT

22nd INTERNATIONAL CYCLODEXTRIN SYMPOSIUM (ICS-22)

Moga, Punjab, India

"Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, **Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare**"

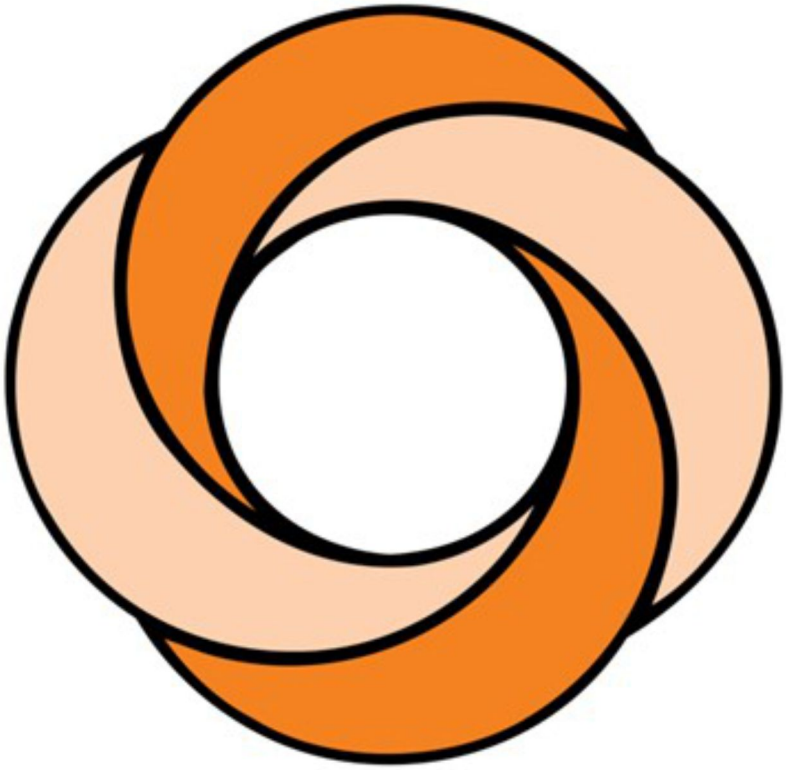


SOUVENIR
& BOOK OF ABSTRACTS

800 + Abstracts | **12** Scientific Categories | **432** Awards

www.ics22india.com | ics22india@isfcp.org
+91 8146562883 | +91 9878696688 | +91 8059889909

With Best Compliments from



SUN PHARMA

22nd International Cyclodextrin Symposium (ICS-22)

23rd – 25th October 2026 · ISF College of Pharmacy, Moga, Punjab

About the Conference

22ⁿ International Cyclodextrin Symposium (ICS-22)

The 22ⁿ International Cyclodextrin Symposium (ICS-22), themed "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare", is a premier global event dedicated to advancing Cyclodextrin applications in Pharmaceutical Sciences and Allied fields. Hosted by ISF College of Pharmacy, Moga, Punjab, India, ICS-22 aims to unite Researchers, Academicians, Industry Professionals, and Students worldwide to foster collaboration and share innovative advancements. Cyclodextrins, known for their versatility in forming inclusion complexes, enhancing drug solubility, and targeted delivery, have evolved from excipients to vital tools in pharmaceuticals, nanotechnology, food sciences, and environmental applications. ICS-22 highlights the integration of cyclodextrins with cutting-edge technologies, artificial intelligence, and sustainable practices to address modern healthcare challenges. The symposium features a comprehensive program covering topics like cyclodextrin-based drug delivery, nanotechnology, post-COVID-19 interventions, and AI applications in pharmaceutical research. Participants can present research across 12 categories, ranging from pharmacology and drug discovery to quality assurance and biotechnology, ensuring a multidisciplinary focus. Keynote speeches, plenary lectures, and networking sessions will provide insights into the latest trends and foster global partnerships. ISF College of Pharmacy, a leading institution in pharmaceutical education and research, ICS-22 emphasizes sustainability and innovation. This landmark event invites global experts and young researchers to explore cyclodextrins' transformative role in advancing healthcare, promoting eco-conscious practices, and shaping the future of pharmaceutical sciences and healthcare. Join us in Moga to drive impactful change in global healthcare.

Local Organizing Committee



Shri Parveen Garg
PATRON



Er. Janesh Garg
CO-PATRON



Prof. (Dr.) G. D. Gupta
CONVENER



Prof. (Dr.) R. K. Narang
FINANCE SECRETARY



Prof. (Dr.) Sidharth Mehan
ORGANIZING SECRETARY

COMMITTEES

VENUE & CULTURAL COMMITTEE



Dr. Sidharth Mehan*



Dr. Vedpal Singh*



Ms. Seema Brar*



Dr. Sanchi Gupta



Ms. Kirandeep Kaur



Ms. Janvi Verma



Ms. Mahima Devi



Ms. Nandini



Dr. Mohit Yadav



Ms. Kumari Kajal



Ms. Aman



Ms. Amandeep Kaur Verma

FINANCE COMMITTEE & SPONSORSHIP



Dr. R. K. Narang*



Dr. Balak Das Kurmi*



Ms. Sania Grover



Ms. Akshita



Ms. Anchal

REGISTRATION COMMITTEE


Dr. Vivek Asati*


Dr. Khadga Raj Aran*


Dr. Navjot Kaur Sandhu*


Dr. Shubham Singh


Mr. Pavittar Singh


Ms. Sanchi Jain


Mr. Abhilash Bhardwaj


Ms. Preety Kumari


Mr. Himanshu


Ms. Priyanshi Devi


Ms. Arushi Gupta

SCIENTIFIC COMMITTEE


Dr. Sant Kumar Verma*


Dr. Vema Kiran*


Dr. Preeti Patel


Dr. Shubham Thakur


Dr. Madhaw Dwiwedi


Dr. Nidhi Gupta


Ms. Komal


Mr. Nitin Singh


Mr. Nitin Gautam


Ms. Supriya Das


Ms. Romanpreet Kaur


Ms. Nandini


Mr. Muinur Rahman


Mr. Salesh Kumar


Ms. Shreya Sharma

HOPITALITY COMMITTEE


Dr. Shamsher Singh*


Dr. Shivam K Pandey


Ms. Amanpreet Kaur


Mr. Lovekesh Singh


Ms. Karishma Aggarwal


Ms. Anchal


Ms. Yukta Garg


Ms. Gayatri


Mr. Mohammad Azahruddin


Ms. Amandeep Kaur


Mr. Ashish Kumar

ACCOMMODATION


Dr. Amandeep Singh*


Mr. Lav Goyal


Mr. Amit Sharma


Mr. Rohan Bansal


Ms. Kanchan


Ms. Ayushreeya Banga

TRANSPORT


Er. Jaspreet Inder Singh*


Mr. Navjeet Singh*


Mr. Amit Sharma


Mr. Deepinder Singh Arora

EXHIBITION & SOUVENIR COMMITTEE


Dr. Balak Das Kurmi*


Mr. MD Mustahidul Islam


Mr. Aman Kumar


Mr. Abhishek Sharma


Ms. Shailza Sharma

PRESS-MEDIA


Dr. Sourbah Kosey*


Dr. Mohd. Haneef


Mr. Shubham Singh


Dr. Hamelahun Syndai


Mr. Vishal Goldar

PRINTING


Mr. Navneesh Kumar*


Mr. Taqdir Singh


Mr. Deepinder Singh Arora


Mr. Arun Kumar Sharma


Mr. Manjeet Kumar

IT & WEB COMMITTEE


Mr. Parneet Kumar*


Mr. Pramod Kumar


Ms. Navdeep


Ms. Kaynat

DISCIPLINE COMMITTEE


Dr. Amandeep Singh*


Er. Jaspreet Inder Singh*


Mr. Lovekesh Singh*


Mr. Navjeet Singh


Mr. Zuber Khan


Mr. Charanjit Singh


Ms. Rajveer Kaur


Mr. Pankaj Kumar Maurya


Mr. Rajat


Ms. Harpreet Kaur


Mr. Sankushdeep Singh


Ms. Amandeep Kaur

HELPDESK


Dr. G. S. Sarma*


Ms. Manjot Kaur


Ms. Ayushreeya Banga

WOMEN CELL


Dr. Jyoti Bala*


Ms. Nitika Sharma*


Ms. Jasleen Kaur

About the College

ISF College of Pharmacy (An Autonomous College) was established by Honorable Sh. Baldev Krishan Garg, Founder Secretary, ISF Educational Society, Moga. The society felt the need for sincere and honest efforts to meet the basic educational needs of underprivileged youth in remote areas of Punjab. The society established ISF College of Pharmacy in 1984 to impart education, research, innovation, training, and entrepreneurship in pharmaceutical sciences.

Presently, ISF College of Pharmacy is a unique center of excellence for all levels of Pharmaceutical Education and Research, offering all possible courses in Pharmacy, viz. D. Pharm., B. Pharm., M. Pharm. in nine branches, Pharm D., Pharm D. (PB.), B. Pharm. Practice and Doctorate of Pharmacy under the able leadership of Shri Parveen Garg.

ISF College of Pharmacy strives to educate and train students in the knowledge and practice of pharmaceutical sciences by providing inspirational learning, research, and a professional attitude to serve society without compromising ethics and quality. The college ensures a strong interaction between the faculty and students. To comply with regulatory guidelines, the college has constituted various committees to continuously protect students and strengthen their values. A proactive Women Cell ensures the safety and dignity of women employees and students. The college monitors student performance through comprehensive, continuous evaluation. Need-based remedial inputs are provided to improve the performance of weak students. Our students also excel in competitive exams at the national level, such as GPAT, GMAT, NET, IELTS, NIPER, etc. The college successfully runs an Industry Institute Partnership Cell (IIPC), which promotes interaction with pharmaceutical industries for training & placement, collaborative research projects, product development, technology transfers, consultancy, and clinical trials. The Research Advisory Board (RAB) and Research Advisory Council (RAC) promote and facilitate research activities and play an instrumental role in finalizing research projects. The college runs an in-house analytical lab (approved by NABL and CDSCO) and an animal house (approved by CCSEA), with breeding and trading facilities. The college organizes workshops/seminars for students on personality development, soft skill development, interview techniques, career guidance, etc., which helps boost students' confidence and performance. The training and placement cell organizes regular placement drives for passing-out students.

RECOGNITION & AWARDS

- NAAC Accredited “A” Grade College
- Recognized by the UGC under Section 2(f)
- NIRF-2025: ranked 25th in the Pharmacy category in India
- 'A' Grade in the newly established PCI-QCI National Ranking and Rating
- ARIIA-2021: Band Excellent in India
- AICTE–CII: Platinum Category (six consecutive years)
- Awarded “Best Pharmacy College in Punjab” by PTU, Jalandhar
- ISO 9001:2015 certified for Teaching and Research in Pharmacy
- Ranked 10th in Pharmacy by Career 360 Magazine
- “Most Innovative Pharmacy College in India” — SPER, 2019
- “Best Pharmacy Institute of the Year” — SPER, 2022

डॉ. मोंटू कुमार एम. पटेल
अध्यक्ष
DR. MONTU KUMAR M. PATEL
President

सत्यमेव जयते

भारतीय भेषजी परिषद्
Pharmacy Council of India
(Ministry of Health & Family Welfare, Govt. of India)

MESSAGE

It gives me immense pleasure to extend my warm greetings and best wishes on the occasion of the 22nd International Cyclodextrin Symposium (ICS-22), being organized at Moga, Punjab, India. It is particularly gratifying to witness an international scientific symposium of such significance being conducted for the first time in India, and uniquely in a rural area of Punjab. This is a remarkable achievement that demonstrates how excellence in pharmaceutical education and research can transcend geographical boundaries.

The theme, "Transforming Cyclodextrin Research with Emerging AI Enabled Technologies, Modeling, and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare," is highly relevant to the rapidly evolving landscape of pharmaceutical and biomedical sciences. The integration of Cyclodextrin research with Artificial Intelligence, advanced modelling, nanotechnology, Quality by Design, and innovative drug-delivery approaches offers tremendous opportunities for addressing contemporary healthcare challenges.

ICS-22 provides an exceptional platform for distinguished scientists, academicians, researchers, industry professionals, and young scholars from across the world to exchange knowledge, share pioneering research, and foster meaningful collaborations. The plenary lectures, scientific presentations, posters, and hands-on workshops will undoubtedly enrich participants and stimulate new ideas.

I congratulate the organizers and all associated institutions for this landmark initiative and wish ICS-22 every success in advancing global Cyclodextrin research and strengthening the future of pharmaceutical sciences.

Dr. Montu Kumar M. Patel
President
Pharmacy Council of India
New Delhi

आई-टावर, तीसरी मंजिल, वर्ल्ड ट्रेड सेंटर, नौरोजी नगर, नई दिल्ली-110029
I-Tower, Third Floor, World Trade Centre, Nauroji Nagar, New Delhi-110029
ई-मेल Email: president-pci@gov.in, Presidentpci2718@gmail.com | दूरभाष, Tel: 011-65218900-01

भारतीय भेषजी परिषद्
(स्वास्थ्य एवं परिवार कल्याण मंत्रालय के अंतर्गत सांविधिक निकाय)
भारत सरकार
आई-300, तीसरी मंजिल, टावर-1, वर्ल्ड ट्रेड सेंटर,
नौरोजी नगर, नई दिल्ली-110029
टेलीफोन नंबर 011-65218900-01
E-mail: registrar@pci.nic.in

कामये दु:खतप्तानाम् प्राणिनामार्तिनाशनम्

PHARMACY COUNCIL OF INDIA
(Statutory body under Ministry of Health & Family Welfare)
Government of India
I-300, 3rd floor, Tower-I, World Trade Centre,
Nauroji Nagar, New Delhi-110029
Telephone No. 011-65218900-01
E-mail: registrar@pci.nic.in



Message

It is a matter of great pleasure to extend my warm greetings to all the distinguished scientists, academicians, researchers, industry professionals, and students participating in the 22nd International Cyclodextrin Symposium (ICS-22), being organized at ISF College of Pharmacy, Moga, Punjab, India, from 23–25 October 2026. The symposium addresses the theme “Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare.”

The organization of ICS-22 in India marks an important occasion for the pharmaceutical and scientific community. The symposium provides a valuable platform for bringing together global experts and Indian researchers to exchange knowledge, present emerging research, and establish meaningful academic and industrial collaborations. Its multidisciplinary programme encompasses cyclodextrin-based drug delivery, nanotechnology, drug discovery, analytical sciences, biotechnology, pharmaceutical education and AI-integrated innovations.

I particularly appreciate the initiative to bring this prestigious international scientific gathering to Moga, a rural region of Punjab, demonstrating that advanced research, innovation, and global academic engagement can thrive beyond major metropolitan centres.

I congratulate the organizers for their efforts and extend my best wishes to all participants. May ICS-22 inspire new ideas, strengthen international collaboration and contribute meaningfully to the advancement of pharmaceutical sciences and next-generation healthcare.

Jashubhai Hirabhai Chaudhari

Vice-President,
Pharmacy Council of India (PCI)
New Delhi, India

ਪੰਜਾਬ ਫਾਰਮੇਸੀ ਕੌਂਸਲ
Punjab Pharmacy Council
(Statutory Body under Dept. of Medical Education & Research, Govt. of Punjab)
Address: Punjab Pharmacy Council, II Floor, Medical Education Bhawan, Sector-69, S.A.S. Nagar (Mohali) - 160062
Contact No.: 0172-5197563 | Helpline No.: 7717227717
Website - www.pbspc.in | Email - pspc.pb@gmail.com



Message

It is a matter of great pleasure and privilege to extend my warm greetings and best wishes to the organizers, distinguished speakers, delegates, researchers, academicians, industry professionals, and students participating in the 22nd International Cyclodextrin Symposium (ICS-22).

The theme, "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling, and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare," reflects the changing landscape of pharmaceutical and biomedical sciences. The integration of cyclodextrin research with Artificial Intelligence, computational modeling, nanotechnology, and Quality by Design (QbD) has immense potential to accelerate pharmaceutical innovation and address complex challenges in drug delivery, formulation development, and healthcare.

ICS-22 provides an outstanding platform for bringing together global experts and emerging researchers to exchange knowledge, share innovative findings, and explore new avenues of interdisciplinary collaboration. The diverse scientific programme comprising plenary lectures, oral and poster presentations, and hands-on workshops will undoubtedly enrich the learning and research experience of all participants.

I am confident that the deliberations and collaborations fostered during this symposium will contribute meaningfully to the advancement of pharmaceutical sciences and the development of innovative, safe, effective, and patient-centric healthcare solutions.

I congratulate the organizing committee for their commendable efforts and wish ICS-22 grand success and a scientifically enriching outcome.

(Sushil K. Bansal)
President
Punjab Pharmacy Council

ਵਿਕਾਸ ਪ੍ਰਤਾਪ, ਆਈ.ਏ.ਐਸ.
ਵਧੀਕ ਮੁੱਖ ਸਕੱਤਰ
Vikas Pratap, IAS
Additional Chief Secretary

D.O.No. PA/ACSTE/2026/1510

ਪੰਜਾਬ ਸਰਕਾਰ
Government of Punjab
ਤਕਨੀਕੀ ਸਿੱਖਿਆ ਅਤੇ ਉਦਯੋਗਿਕ ਸਿਖਲਾਈ, ਵਿਭਾਗ
Department of Technical Education & Industrial Training

Dated, Chandigarh. 28/09/2026

MESSAGE

It gives me immense pleasure to extend my warm greetings and best wishes to the organizers as well as scientists, academicians, Industry professionals, students and other delegates participating in the 22nd International Cyclodextrin Symposium (ICS-22).

2. Such International scientific platforms act as a catalyst for inter-disciplinary collaboration and Industry–Academia partnerships. The diverse programme of ICS-22, encompassing plenary lectures, presentations and workshops will provide participants with valuable exposure to emerging technologies and contemporary research in health care.

3. I am confident that the deliberations during this Symposium will encourage young researchers and professionals to pursue innovative approaches and contribute to the development of next-generation Healthcare technologies.

4. I congratulate the Organizing Committee for bringing together a distinguished global scientific community and wish ICS-22 a roaring success.

28/9/26

Vikas Pratap, IAS
Additional Chief Secretary,
Technical Education & Industrial Training,
Government of Punjab,
Chandigarh.

Telephone No. 0172-2742920, Mobile No. 9876633500, Email : steit@punjab.gov.in

ਡਾ. ਅਰਵਿੰਦ ਕੁਮਾਰ ਬਾਂਸਲ
ਉਪ - ਕੁਲਪਤੀ
Dr. Arvind Kumar Bansal
Vice-Chancellor

ਆਈ ਕੇ ਗੁਜਰਾਲ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ
ਜਲੰਧਰ- ਕਪੂਰਥਲਾ ਰਾਜਮਾਰਗ, ਕਪੂਰਥਲਾ - 144603
I. K. Gujral Punjab Technical University
Jalandhar-Kapurthala Highway, Kapurthala-144603
(A State Government University established by the State Legislature Act No. 1 of 1997)

Ref. No.IKGPTU/VC/_____ Dated.....

Message

It gives me immense pleasure to extend my warmest greetings to all International speakers, delegates, researchers and distinguished guests from abroad and pan India attending the **22nd International Cyclodextrin Symposium (ICS-22)**, hosted by ISF College of Pharmacy (An Autonomous College), Moga, Punjab, from **23rd to 25th October 2026**. This landmark occasion marks a historic milestone: for the first time in the 44-year history of the International Cyclodextrin Symposium, the conference is being hosted in India, in the vibrant rural heartland of Punjab at Moga.

The conference has a theme of "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modelling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare"

Cyclodextrin remain at the forefront of pharmaceutical innovation, driving breakthroughs in drug solubility, targeted delivery, nanotechnology, and environmental applications. By incorporating AI-driven technologies, Quality by Design (QbD), and predictive modelling into Cyclodextrin research, ICS-22 addresses the core tools shaping the future of medicine.

This symposium provides an invaluable space for global collaboration among academia, industry and emerging researchers.

I congratulate ISF College of Pharmacy and whole organising committee for organizing this significant scientific event and wish ICS-22 a inspiring and successful conference.

6/x/26

Prof. (Dr.) Arvind Kumar Bansal

Vice Chancellor

Prof. (Dr.) Rajinder Kumar Bansal
DM (Neurology)
Vice Chancellor

Baba Farid University Of Health Sciences,
Sadiq Road, Faridkot -151203 Punjab (India)
(A State University established under Act No.18 of 1998)
Phone No. +91-1639-256232, 256756 (O)
Email: officebfuhs@gmail.com
vcbfuhs@punjab.gov.in

Message

It gives me immense pleasure to know that the 22nd International Cyclodextrin Symposium (ICS-22) is going to be held at ISF College of Pharmacy, Moga on the theme **"Transforming Cyclodextrin Research with emerging AI technologies, Modeling and QbD"**from 23rd to 25th October, 2026. It is thrilling to note that the conference is being held for the first time in India and that too at Moga in Punjab. The conference is of global importance in the field of cyclodextrin research and will serve as an opportunity to provide a platform for the participants to exchange views, ideas, and experiences. It is also praiseworthy to know that this conference will also give an opportunity to young researchers to make presentation about their innovative ideas and learn from experiences of senior scientists. I am sure the galaxy of scientists gathering at Moga in Punjab will pave the way for bridging innovation and collaboration for next generation healthcare. I have been told that about 2000 delegates will participate in the conference and about equal number will join online from across the world.

I would like to use this opportunity to remind each one of that interdisciplinary and inter-sectorial research and team work is the need of the hour. I hope this conference will be an ideal platform to launch such a coordinated effort by all the major stakeholders.

I take this opportunity to warmly compliment the organizing committee and wish the conference a grand success.

Prof. (Dr.) Rajinder Kumar Bansal
Vice Chancellor

NIPER
RAEBARELI

शुभिनी अ सराफ
एम. फार्म, पीएचडी
निदेशक

Shubhini A Saraf
M. Pharm, PhD
Director

राष्ट्रीय औषधीय शिक्षा एवं अनुसंधान संस्थान, रायबरेली
(औषध विभाग, रसायन और उर्वरक मंत्रालय, भारत सरकार)
बिजनौर-सिसेंडी रोड, सीआरपीएफ बेस कैम्प के निकट, सरोजनी नगर,
पोस्ट ऑफिस : माती, लखनऊ–226002

National Institute of Pharmaceutical Education and Research, Raebareli
(Department of Pharmaceuticals, Ministry of Chemicals & Fertilizers, Govt. of India)
Bijnor-Sisendi Road, Near CRPF Base Camp, Sarojini Nagar,
Post Office : Mati, Lucknow (UP)- 226002

Message

It gives me immense pleasure to convey my warm greetings and best wishes to the organizers, academicians, industry professionals, and young researchers participating in the **22nd International Cyclodextrin Symposium (ICS-22)**, being organized by ISF College of Pharmacy, Moga, Punjab on the theme: "*Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare.*" To host an event of this stature, is a matter of pride.

Cyclodextrins (CDs) have evolved from starch-derived molecules into important pharmaceutical excipients and drug-delivery platforms. Discovered in the late 19th century and structurally characterized by Schardinger in the early 20th century, their pharmaceutical potential emerged from their ability to form **inclusion complexes** with poorly soluble drugs. Several marketed formulations demonstrate their value represents a paradigm shift, where a modified γ-CD itself acts as the active drug. In India, several companies have been associated with CD-based formulation research involving poorly soluble drugs, oral disintegrating tablets and nanocarriers. Indian academia-industry research has explored CDs for solubility enhancement, taste masking, ophthalmic delivery, nanoparticles and bioavailability improvement. The future lies in CD-based nanomedicine, biologics and targeted delivery systems.

I am confident that ICS-22 will foster meaningful exchange of ideas, cutting-edge research, and collaborations among academia, industry, and regulatory stakeholders. I congratulate ISF College of Pharmacy and the organizing committee for bringing together the global cyclodextrin community. May the symposium inspire innovation, strengthen partnerships, and advance pharmaceutical technologies for improved healthcare and societal benefit.

Wishing ICS-22 great success and fruitful scientific discussions.

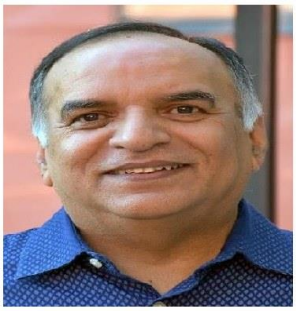
(Shubhini A Saraf)

दूरभाष / Phone : +91-9005551409 ईमेल / Email : director@niperrbl.ac.in, director@niperraebareli.edu.in वेबसाइट / Website : niperraebareli.edu.in

भारतीय प्रौद्योगिकी संस्थान रोपड़
INDIAN INSTITUTE OF TECHNOLOGY ROPAR
रूपनगर-140001, पंजाब, भारत
Rupnagar- 140001, Punjab, INDIA
दूरभाष/Tele : +91 - 1881- 231006
ई - मेल / E-mail : director@iitrpr.ac.in

प्रो. राजीव आहूजा
PROF. RAJEEV AHUJA
निदेशक
DIRECTOR

MESSAGE



It gives me immense pleasure to extend my warm greetings and best wishes on the occasion of the 22nd International Cyclodextrin Symposium (ICS-22), being organized at ISF College of Pharmacy, Moga, Punjab, India.

The theme of ICS-22, "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling, and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare," is highly relevant to the rapidly evolving landscape of pharmaceutical and healthcare research. The integration of cyclodextrin science with Artificial Intelligence, computational modelling, Quality by Design, and advanced drug delivery technologies offers exciting opportunities for innovation and translational research.

The symposium will provide an excellent international platform for scientists, academicians, researchers, industry professionals, healthcare experts, and students to share knowledge, present innovative research, exchange ideas, and establish meaningful collaborations.

I sincerely appreciate the efforts of the Organizing Committee, Scientific Committee, faculty, researchers, students, volunteers, and all stakeholders for their dedicated efforts in making this prestigious scientific event possible. I also extend my best wishes to all the distinguished speakers and delegates joining ICS-22 from India and abroad.

I am confident that ICS-22 will foster scientific excellence, interdisciplinary collaboration, and new opportunities in cyclodextrin research, while inspiring the next generation of researchers.

I wish the 22nd International Cyclodextrin Symposium great success and a memorable and enriching experience for all participants.

With best wishes for a successful ICS-22.

(RAJEEV AHUJA)

राष्ट्रीय आयुर्वेद संस्थान
मानद विश्वविद्यालय (डी-नोवो)
(आयुष मंत्रालय, भारत सरकार)
NATIONAL INSTITUTE OF AYURVEDA
Deemed to be University (de-novo)
(Ministry of Ayush, Govt. of India)



MESSAGE

It gives me immense pleasure to learn that **ISF College of Pharmacy, Moga (Punjab)** is organizing the **22nd International Cyclodextrin Symposium (ICS-22)** from **23–25 October 2026** on the theme:

"Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."

The integration of cyclodextrin research with advanced computational tools, Quality by Design (QbD), and artificial intelligence represents a pivotal leap toward precision formulations and next-generation drug delivery systems. Such interdisciplinary advancements hold profound potential not only for modern pharmaceutical sciences but also for enhancing the bioavailability, stability, and delivery of bioactive compounds in traditional and integrative healthcare systems.

Bringing together global researchers, academicians, and industry leaders onto a unified platform will undoubtedly stimulate high-impact scientific discourse, foster meaningful collaborations, and inspire innovative healthcare solutions.

I commend the leadership and organizing committee of ISF College of Pharmacy for hosting this prestigious international forum. I extend my best wishes for the grand success of the symposium and hope the souvenir serves as an enriching compilation of knowledge for the scientific community.

(Prof. Sanjeev Sharma)
Vice-Chancellor

The Indian Pharmaceutical Association (IPA)

(Society Regn No. Bom. 10 of 1960 GBBSD • Public Trust Regn. No. F- 746 (Bom) dt. 4.4.1960)

Kalina, Santacruz (East), Mumbai - 400 098. India
E-mail : ipacentre@ipapharma.org • Website : http://www.ipapharma.org

MISSION

The Indian Pharmaceutical Association (IPA) is the national professional body of pharmacists engaged in various facets of the profession of pharmacy. The IPA is commited to promote the highest professional and ethical standards of pharmacy, focus the image of pharmacists as competent healthcare professionals, sensitize the community, government and others on vital professional issues and support pharmaceutical education and sciences in all aspects

2024 - 2026

National President
R. N. Gupta

Immediate Past National President
T. V. Narayana

Vice Presidents
Divisional Heads

Community Pharmacy
Raj Vaidya

Pharmacy Education
G. Sumalatha

Hospital Pharmacy
Ramesh Adepu

Industrial Pharmacy
M. Vasudev Rao

Regulatory Affairs
A. Ramkishan

National Hon. Gen. Secretary
Subhash Mandal

Treasurer
Alka Mukne

Editor - Pharma Times
Anuradha Majumdar

Editor - IJPS
S. Vidyadhara

August 17, 2026

To
Prof. (Dr.) G.D. Gupta
Director-cum-Principal
Convener : 22nd International Cyclodextrin Symposium (ICS-22)
ISF College of Pharmacy, Moga, Punjab

Dear Sir,

It gives me immense pleasure to extend my warm greetings and best wishes to the organizers, delegates, researchers, academicians, industry professionals and students participating in the 22nd International Cyclodextrin Symposium (ICS-22), being organized by ISF College of Pharmacy, Moga, Punjab, from 23–25 October 2026.

The theme of the Symposium, "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare," is highly relevant to the rapidly evolving landscape of pharmaceutical sciences. Cyclodextrins have emerged as versatile pharmaceutical excipients with significant applications in drug solubilization, bioavailability enhancement, drug delivery and formulation development. Their potential becomes even greater when integrated with modern approaches such as artificial intelligence, computational modelling, Quality by Design (QbD) and advanced formulation technologies.

The convergence of pharmaceutical science, artificial intelligence and data-driven approaches offers tremendous opportunities to accelerate drug development, optimize formulations, predict drug–excipient interactions and develop safer, more effective and patient-centric medicines. Such interdisciplinary approaches are essential for addressing the increasingly complex challenges of modern healthcare.

International scientific forums such as ICS-22 provide an excellent platform for sharing knowledge, encouraging young researchers, fostering academia–industry partnerships and strengthening global collaboration. I am particularly pleased that the Symposium will bring together experts and young minds from India and abroad, creating opportunities for meaningful scientific dialogue and future collaborations.

The Indian Pharmaceutical Association strongly believes in promoting research, innovation, professional excellence and collaboration across all sectors of pharmacy and pharmaceutical sciences. I am confident that ICS-22 will make a valuable contribution to these objectives and further strengthen India's role in the global pharmaceutical research ecosystem.

I congratulate ISF College of Pharmacy, Moga, and the entire Organizing Committee for organizing this prestigious international scientific event .

I wish the 22nd International Cyclodextrin Symposium great success and hope that the deliberations and collaborations emerging from this gathering will contribute significantly to the development of innovative pharmaceutical technologies and next-generation healthcare solutions.

Regards

Dr. R.N. Gupta
National President

Member of Federation International Pharmaceutique (FIP), Federation of Asian Pharmaceutical Association (FAPA), Commonwealth Pharmacists' Association (CPA) & International Pharmacy Students' Federation (IPSF)

Head Quarter: Bengaluru.
Secretariat/Communication Address:
Secretary, APTI, Krupanidhi College of Pharmacy,
Chikka Bellandur, Carmelram Post, Varthur Hobli,
Bangalore – 560035, Karnataka state, India
Email: aptienquiry@gmail.com &
aptipresident1@gmail.com
Website: http://www.aptiindia.org

ASSOCIATION OF PHARMACEUTICAL TEACHERS OF INDIA
(NATIONAL BODY)

MESSAGE

Dear Esteemed Colleagues and Participants,



Greetings...!

It gives me immense pleasure to extend my warm greetings and best wishes to the **ISF College of Pharmacy, Moga, Punjab,** on the occasion of the **22nd International Cyclodextrin Symposium (ICS-22),** being held from **23–25 October 2026** on the theme, **"Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."**

Cyclodextrin research has emerged as an important and promising area of pharmaceutical sciences, with wide applications in drug delivery, solubility enhancement, nanotechnology and allied fields. The integration of Artificial Intelligence, advanced modelling and Quality by Design (QbD) opens new avenues for accelerating innovation and developing smarter, safer and more effective healthcare solutions.

ICS-22 provides an excellent platform for academicians, researchers, industry professionals and students from India and across the globe to exchange knowledge, showcase innovative research and foster meaningful scientific collaborations. Its multidisciplinary scientific focus reflects the rapidly evolving landscape of pharmaceutical and allied sciences.

I sincerely appreciate the efforts of **Prof. (Dr.) G.D. Gupta** and the organizers in bringing together the global scientific community around such a contemporary and forward looking theme. I am confident that **ICS-22** will inspire young researchers, strengthen academia–industry collaboration and contribute to meaningful advancements in pharmaceutical research and next-generation healthcare.

On behalf of the **Association of Pharmaceutical Teachers of India (APTI),** I extend my sincere best wishes to the organizers, speakers, delegates and participants for a scientifically enriching and highly successful symposium.

With warm regards,

Prof. Milind J. Umekar
President, Indian Pharmaceutical Congress Association (IPCA)
President, Association of Pharmaceutical Teachers of India (APTI)
Principal, Smt. Kishoritai Bhoyar College of Pharmacy

President Office Address:
Principal, Smt. Kishoritai Bhoyar College of Pharmacy, Kamptee, Nagpur, Maharashtra, 441002.
Phone: +91 98229 41191 & +91 76662 23120 **Email :** aptipresident1@gmail.com **Website:** www.skb.edu.in

Estd. 1963

The Indian Hospital Pharmacists Association

(Regd. Under the Societies Act XXI of 1860)

Constituent of Indian Pharmaceutical Congress Association (IPCA)

Regd. Office
Department of Pharmacy,
St. Stephen's Hospital,
Tis Hazari, Delhi -110054

President
R. A. GUPTA
Former Member
Pharmacy Council of India
E-1/314, Sector-H, LDA Colony
Kanpur Road, Lucknow-226012
Mob: 09839027172
E-mail: ihpalko@gmail.com

Hon. Gen. Secretary
PANKAJ BECTOR
Store Officer
National Centre for Disease Control
Ministry of H & FW, Delhi-1150054
Tel. (O): 011-23985017
Mobile: 09891987904
E-mail: bectorp@gmail.com

Joint Secretary
GOVIND MIGLANI
3/54, Ground Floor,
Old Rajender Nagar,
New Delhi-110060
Mobile: 9810017015
Email: vaccines@hotmail.com

Treasurer
Dr. A. K. ADHIKARI
1/2 Singh Sabha Road,
Block 41, FF Shakti Nagar
Delhi-110060
Mob: 09811165897
E-mail: adhikariak2001@yahoo.com

Executive Secretary
VIJAY ROY
General Manager, Procurement
B.L.Kapur, Super SpecialityHospital
Pusa Road, New Delhi-110070
Mob.: 9650877742
Email: pgpharm@rediffmail.com

Academic Registrar
Prof. PREETI KOTHIYAL
Dean.
Pharmaceutical Sciences Swami
Rama Himalayan University,
Dehradun

Council Members:
Prof. Velpandian T.
Dr. Pradeep Bhardwaj
Dr. Puneet Gupta
B. M. Agarwal
Taranjeet Singh Pasricha

-:MESSAGE : - Lucknow: 07.10.2026

It gives me immense pleasure to know that the ISF College of Pharmacy, Moga, Punjab State is organizing three day's mega event, "International Cyclodextrin Symposium (ICS 22)" from 23 to 25th October 2026. The theme selected by the organizing committee, "Transforming Cyclodextrin Research & Emerging AI- Enabled Technologies, modeling & QBD; Bridging Innovation& Collaboration for next Generation Health Care" is very appropriate and self explanatory.

I had read that Cyclodextrin research and emerging AI-enabled technologies have strong potential to transform next-generation healthcare by enabling safer, smarter, and more affordable solutions because of versatile solubility, stability, bioavailability, and targeted delivery of poorly water-soluble drugs. Their applications in nano-medicine, controlled drug release, vaccine delivery, diagnostics, and personalized therapeutics may help to address major Indian healthcare challenges, including affordability and access to advanced medicines.

I have been acknowledged that renowned international & national experts deliver the lecture on their own research. Pharmacy teachers, Researchers, Pharmacy Students & Health Care Professionals from different part of the country and abroad are joining the Conference. No doubt, it will be good platform to exchange their views on different topics. IHPA being associated with ISFCP from last many years, feel privileged to be part of the event & look forward to future collaboration for preparing skilled pharmacists for Health Sector of India.

I on behalf of the IHPA convey my best wishes for the grand success of the program.

To, The Chairman,

Organizing Committee- ICS 22

R.A. Gupta

National President, IHPA

Correspondence Address: E-1/314, Sector-H, L.D.A. Colony, Kanpur Road, Lucknow-226012, U.P., India
Phone: +91-9839027172 E-mail: ihpalko@gmail.com

INDIAN PHARMACY GRADUATES' ASSOCIATION
(Regd. Under Registration of Societies Act. XXI of 1860, Regn. No. S/8255 of 1976)

President	General Secretary	Treasurer
Atul Kr. Nasa	Dr. Arun Garg	Vijay Bhalla
9999095797	8470046553	9810540434
atulnasa@gmail.com	agarg333@hotmail.com	Vijay_0434@hotmail.com

Message

Ref. No.: IPGA/President/Sept/2026 **Date: 07/09/2026**



Dr. Atul Nasa
Pro Vice Chancellor
SGT University

It gives me immense pleasure to extend my warm greetings and best wishes to the organizers, delegates, academicians, researchers, industry professionals, and students participating in the **22nd International Cyclodextrin Symposium (ICS-22)**, being organized by **ISF College of Pharmacy, Moga, Punjab, from 23–25 October 2026**.

The theme of the Symposium, **"Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare,"** is both timely and forward-looking. The integration of cyclodextrin science with Artificial Intelligence, advanced modelling, and Quality by Design (QbD) offers exciting opportunities to advance pharmaceutical research, develop innovative drug delivery systems, and contribute to safer, more effective, and patient-centric healthcare solutions.

Cyclodextrins have emerged as important pharmaceutical excipients and enabling technologies, with wide-ranging applications in drug solubilization, formulation development, targeted delivery, and enhancement of therapeutic efficacy. The continued advancement of this field through interdisciplinary research and collaboration will play an important role in addressing the evolving challenges of modern pharmaceutical sciences.

I am confident that **ICS-22** will provide an excellent platform for meaningful scientific deliberations, knowledge exchange, and collaboration among researchers, academicians, industry experts, and young professionals from India and across the globe. Such forums are vital for nurturing innovation, encouraging young researchers, and strengthening academia–industry partnerships.

On behalf of the **Indian Pharmacy Graduates' Association (IPGA)**, I extend my sincere appreciation to **ISF College of Pharmacy, Moga**, and the entire Organizing Committee for their efforts in bringing together the global scientific community for this prestigious symposium.

I wish **ICS-22** great success and hope that the deliberations and collaborations emerging from this symposium will contribute significantly to the advancement of cyclodextrin research and the future of pharmaceutical and healthcare sciences.

I extend my best wishes for a scientifically enriching, inspiring, and memorable **22nd International Cyclodextrin Symposium**.

With Pharmaceutical Regards,

Prof. (Dr.) Atul Nasa
President, IPGA

Regd. Off.:F-2, A-Block DDA Shopping Complex, Meera Bagh, New Delhi-110087, India
Tele: 011-25289724, Website: www.ipga.in

R. P. Chaudhari
President,
All India Drug Control Officers' Confederation (AIDCOC)



Souvenir Message

It is an honour to extend my warmest greetings to all researchers, academicians, regulatory experts, and healthcare innovators gathered for this prestigious scientific event.

Cyclodextrins have consistently stood at the forefront of pharmaceutical innovation, playing a pivotal role in drug solubilization, bioavailability enhancement, and targeted delivery. Today, as global healthcare demands higher precision, efficiency, and safety, the fusion of emerging AI-enabled technologies, advanced computational modelling, and Quality by Design (QbD) principles represents a monumental shift in how we approach formulation science.

Integrating artificial intelligence and predictive modelling with cyclodextrin research accelerates complexation mapping, mitigates development risks, and optimizes therapeutic performance. When backed by a structured Quality by Design framework, these digital methodologies ensure that quality, stability, and safety are systematically built into the product from concept to clinical execution. From a regulatory and quality standpoint, this paradigm shift strengthens standards and builds patient trust in next-generation therapeutics.

Realizing the full potential of these advanced tools requires robust collaboration across academia, research bodies, regulatory authorities, and the pharmaceutical industry. By bridging technology with cross-disciplinary expertise, we can successfully translate benchtop innovation into safe, high-quality, and accessible healthcare solutions for all.

I compliment the organizers for selecting a highly relevant and forward-looking theme. I am confident that the deliberations, research presentations, and scientific exchanges during this event will ignite new ideas, strengthen professional networks, and guide the future trajectory of pharmaceutical research.

I wish the event grand success and extend my best wishes to all the delegates and participants.

Warm regards,

R. P. Chaudhari
President,
All India Drug Control Officers' Confederation (AIDCOC)



MESSAGE FROM

Mr. Ashok Goyal

Founder & CEO

Tirupati Group | Paonta Sahib

It is a privilege to extend my warm greetings to the distinguished delegates, scientists, academicians, industry leaders and young researchers participating in the 22nd International Cyclodextrin Symposium (ICS-22) at ISF College of Pharmacy, Moga.

The symposium's theme, "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare," reflects an important moment for pharmaceutical science. Cyclodextrins continue to offer valuable possibilities in improving drug solubility, formulation performance and drug delivery. When combined with artificial intelligence, advanced modelling and Quality by Design, these capabilities can accelerate the development of more effective and patient-centric solutions.

From an industry perspective, the true value of innovation lies in its successful translation from scientific discovery to dependable healthcare products. That journey requires rigorous research, uncompromising quality, scalable technologies and sustained cooperation between academia and industry. Such partnerships are essential to making scientific progress both meaningful and accessible.

At Tirupati Group, we believe that the advancement of healthcare is a shared responsibility. Research-led thinking, technology adoption and collaborative innovation are central to building solutions that respond to the evolving needs of patients and healthcare systems. Platforms such as ICS-22 create opportunities to connect pioneering ideas with practical applications and lasting impact.

I especially encourage the young researchers attending this symposium to remain curious, challenge established boundaries and pursue science with integrity, purpose and ambition. Your discoveries and determination will help shape the future of pharmaceutical innovation.

I congratulate ISF College of Pharmacy, the organizing committee and all supporting institutions for bringing this distinguished scientific community together. I wish ICS-22 great success and hope the exchange of knowledge and partnerships fostered here contribute meaningfully to better healthcare worldwide.

> *"The true measure of innovation is the difference it makes in people's lives."*

With best wishes,

Mr. Ashok Goyal

Founder & CEO • Tirupati Group, Paonta Sahib



Dr. Anil Kharia

M. Pharm, MBA, Ph.D.
Chairman, Modern Institute of Pharmaceutical Sciences, Indore (MP), India
Managing Director, Modern Laboratories, Nandani Medical Laboratories, Pvt. Ltd. & Notion Pharma

MESSAGE

It gives me immense pleasure to extend my warm greetings and best wishes on the occasion of the **22nd International Cyclodextrin Symposium (ICS-22)**, being organized by the **ISF College of Pharmacy, Moga, Punjab, India, from 23rd to 25th October 2026**.

The theme of the symposium, **"Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare,"** is highly relevant and forward-looking. Cyclodextrins have emerged as versatile pharmaceutical excipients with significant applications in drug solubilization, formulation development, targeted delivery, and enhancement of therapeutic efficacy. The integration of **Artificial Intelligence, computational modeling, and Quality by Design (QbD)** offers exciting opportunities to further accelerate innovation and translate scientific discoveries into meaningful healthcare solutions.

I am confident that the scientific deliberations, plenary lectures, oral and poster presentations, hands-on workshops, and interactive sessions will provide an enriching platform for **researchers, academicians, students, industry professionals, and pharmaceutical scientists** to exchange knowledge, share ideas, and explore new avenues of collaboration.

Such a symposium not only promotes scientific advancement but also encourages young researchers and students to engage with emerging technologies and contribute to the future of pharmaceutical sciences. I am sure that **ICS-22** will foster meaningful academic and industrial partnerships and contribute to the development of innovative, safe, and effective drug-delivery systems.

I sincerely appreciate and congratulate **Dr. G. D. Gupta, Director-cum-Principal, ISF College of Pharmacy** for his visionary leadership, meticulous planning, and commendable efforts in organizing this prestigious international scientific event.

I also appreciate the efforts of the **organizing committee, faculty members, and all associated with ISF College of Pharmacy** for bringing this prestigious international scientific gathering to India. I extend my heartfelt congratulations and best wishes for the grand success of **ICS-22** and for a stimulating and memorable scientific experience for all participants.

With my best wishes for a successful and intellectually enriching symposium.

Dr. Anil Kharia

To,

Dr. G. D. Gupta
Director-cum-Principal
ISF College of Pharmacy (An Autonomous College)
Moga–142001, Punjab, India

ESTD. 1984

ISF COLLEGE OF PHARMACY

(An Autonomous College)

NAAC Accredited "A" Grade College & Analytical Lab Approved by Govt.

Approved by PCI and Govt. of Punjab, Recognized by UGC under Section 2(f)

Affiliated to IK Gujral Punjab Technical University, Jalandhar and PSBTE & IT, Chandigarh

25th Rank in NIRF 2025 in Pharmacy in India

Message from the Patron



It is a matter of immense pride and pleasure to welcome distinguished scientists, academicians, researchers, industry professionals and young scholars to the 22nd International Cyclodextrin Symposium (ICS-22), being organized at ISF College of Pharmacy, Moga, Punjab, India, from 23–25 October 2026. The symposium is centred on the theme "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."

ICS-22 is a truly historic occasion for the cyclodextrin scientific community. After 44 years, this prestigious international conference is being conducted for the first time in India, and that too in the rural region of Punjab at Moga. This achievement symbolizes the expanding horizons of scientific excellence and reflects our commitment to bringing global scientific platforms to emerging educational and research destinations.

The symposium provides a unique platform for exchanging knowledge, presenting innovative research and establishing meaningful international collaborations. Its multidisciplinary scientific programme encompasses cyclodextrin-based drug delivery, nanotechnology, AI-enabled technologies, drug discovery, analytical sciences, biotechnology and next-generation healthcare.

I extend my warmest greetings to all delegates and participants and sincerely hope that ICS-22 will foster new ideas, lasting collaborations and transformative scientific advancements.

Parveen Garg

Patron, ICS-22

Chairman, ISF College of Pharmacy, Moga, Punjab, India

GT Road, Ghal Kalan, Moga - 142 001 (Punjab) India

Mob. 075770-00063, 098786-96688, 081465-62883 **E-mail:** director@isfcp.org, **Website:** www.isf cp.org

ESTD. 1984

ISF COLLEGE OF PHARMACY

(An Autonomous College)

NAAC Accredited "A" Grade College & Analytical Lab Approved by Govt.

Approved by PCI and Govt. of Punjab, Recognized by UGC under Section 2(f)

Affiliated to IK Gujral Punjab Technical University, Jalandhar and PSBTE & IT, Chandigarh

25th Rank in NIRF 2025 in Pharmacy in India

Message from the Co-Patron



It is my immense pleasure to extend a warm welcome to all distinguished scientists, academicians, researchers, industry professionals and young scholars participating in the 22nd International Cyclodextrin Symposium (ICS-22), being hosted by ISF College of Pharmacy, Moga, Punjab, India, from 23–25 October 2026. The symposium is organized around the theme "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."

ICS-22 is a landmark scientific gathering that brings together the global cyclodextrin community on a common platform to exchange ideas, share discoveries and foster meaningful collaborations. The symposium provides an opportunity to explore emerging developments in cyclodextrin-based drug delivery, nanotechnology, artificial intelligence, pharmaceutical research, biotechnology and sustainable healthcare solutions.

It is particularly gratifying that this prestigious international symposium is being hosted at ISF College of Pharmacy, Moga, providing a vibrant rural setting in Punjab for a truly global scientific event. We are confident that the convergence of eminent experts, researchers, academicians and students will generate innovative ideas and create new avenues for collaborative research.

I extend my sincere greetings and best wishes to every participant. May ICS-22 become a memorable celebration of innovation, knowledge, collaboration and scientific excellence, inspiring new contributions towards next-generation healthcare.

Er. Janesh Garg

Co-Patron, ICS-22

Secretary, ISF College of Pharmacy & Chairman, TLF-A Global School, Moga, Punjab, India

GT Road, Ghal Kalan, Moga - 142 001 (Punjab) India

Mob. 075770-00063, 098786-96688, 081465-62883 **E-mail:** director@isfcp.org, **Website:** www.isf cp.org

ISF COLLEGE OF PHARMACY
(An Autonomous College)
NAAC Accredited "A" Grade College & Analytical Lab Approved by Govt.
Approved by PCI and Govt. of Punjab, Recognized by UGC under Section 2(f)
Affiliated to IK Gujral Punjab Technical University, Jalandhar and PSBTE & IT, Chandigarh
25th Rank in NIRF 2025 in Pharmacy in India
ESTD. 1984

Message from the Convener



It gives me immense pleasure to welcome you all to the 22nd International Cyclodextrin Symposium (ICS-22), being hosted by ISF College of Pharmacy, Moga, Punjab, India, from 23–25 October 2026. The symposium is themed "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."

ICS-22 represents a remarkable milestone in the global cyclodextrin community. After 44 years, this prestigious international symposium is being organized for the first time in India, and notably in the rural region of Punjab at Moga. This historic occasion reflects the growing scientific capabilities of researchers, Scientist and demonstrates that excellence in research and innovation can flourish beyond metropolitan centres.

The symposium brings together eminent international experts, academicians, researchers, industry professionals and young scholars to exchange knowledge and establish meaningful collaborations. The programme encompasses Cyclodextrin-based drug delivery, nanotechnology, AI-enabled research, drug discovery, analytical sciences, biotechnology, pharmaceutical education and emerging healthcare technologies. During these three days, plenary technical session, Oral presentations, E-presentations, Quiz completion, Interactive sessions, panel discussion etc. will be organised during these days.

I sincerely invite all participants to make ICS-22 a celebration of science, innovation, collaboration and global fellowship. May this landmark gathering create enduring partnerships and inspire transformative advances in Cyclodextrin research and next-generation healthcare.

Again, Welcome and Thanks to all Guests and delegates for accepting our invitation.

Prof. (Dr.) G. D. Gupta
Convener, ICS-22
Director-cum-Principal, ISF College of Pharmacy, Moga, Punjab, India

GT Road, Ghal Kalan, Moga - 142 001 (Punjab) India
Mob. 075770-00063, 098786-96688, 081465-62883 **E-mail:** director@isfcp.org, **Website:** www.isf cp.org

ESTD. 1984

ISF COLLEGE OF PHARMACY

(An Autonomous College)

NAAC Accredited "A" Grade College & Analytical Lab Approved by Govt.

Approved by PCI and Govt. of Punjab, Recognized by UGC under Section 2(f)

Affiliated to IK Gujral Punjab Technical University, Jalandhar and PSBTE & IT, Chandigarh

25th Rank in NIRF 2025 in Pharmacy in India

Message from the Finance Secretary



It gives me immense pleasure to extend my warm greetings to all the distinguished scientists, academicians, researchers, industry professionals and students participating in the 22nd International Cyclodextrin Symposium (ICS-22), being organized at ISF College of Pharmacy, Moga, Punjab, India, from 23–25 October 2026. The symposium is dedicated to the theme "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."

ICS-22 is a significant international platform that brings together experts and young researchers from diverse disciplines to exchange scientific knowledge, showcase innovations and develop meaningful collaborations. The comprehensive programme covers cyclodextrin-based drug delivery, pharmacology and drug discovery, pharmaceutics, quality assurance, nanotechnology, medicinal chemistry, analytical sciences, biotechnology, clinical pharmacy, pharmaceutical education and AI-integrated innovations.

The organization of this prestigious symposium at Moga, Punjab, provides a unique opportunity to connect global scientific expertise with an emerging centre of pharmaceutical education and research. The participation of eminent international experts will undoubtedly enrich the scientific environment and encourage innovative thinking and collaborative research.

As Finance Secretary, I am honoured to contribute to this important academic endeavour and extend my sincere appreciation to the patrons, organizing committee, sponsors, delegates and all stakeholders whose support is making ICS-22 possible.

I wish ICS-22 great success and hope that this symposium creates lasting academic partnerships and contributes to meaningful advances in cyclodextrin research and next-generation healthcare.

Prof. (Dr.) R. K. Narang

Finance Secretary, ICS-22

Principal, ISF College of Pharmacy & Research, Moga, Punjab, India

GT Road, Ghal Kalan, Moga - 142 001 (Punjab) India

Mob. 075770-00063, 098786-96688, 081465-62883 **E-mail:** director@isfcp.org, **Website:** www.isf cp.org

ISF COLLEGE OF PHARMACY
(An Autonomous College)
NAAC Accredited "A" Grade College & Analytical Lab Approved by Govt.
Approved by PCI and Govt. of Punjab, Recognized by UGC under Section 2(f)
Affiliated to IK Gujral Punjab Technical University, Jalandhar and PSBTE & IT, Chandigarh
25th Rank in NIRF 2025 in Pharmacy in India
ESTD. 1984

Message from the Organizing Secretary



It gives me immense pleasure to welcome all distinguished scientists, academicians, researchers, industry professionals and students to the 22nd International Cyclodextrin Symposium (ICS-22), being organized at ISF College of Pharmacy, Moga, Punjab, India, from 23–25 October 2026. The symposium is themed "Transforming Cyclodextrin Research with Emerging AI-Enabled Technologies, Modeling and QbD: Bridging Innovation & Collaboration for Next-Gen Healthcare."

ICS-22 is envisioned as a vibrant platform for scientific exchange, interdisciplinary dialogue and meaningful collaboration among researchers, academicians, industry professionals and students from across the world. The scientific programme encompasses diverse areas including cyclodextrin-based drug delivery, pharmacology and drug discovery, pharmaceutics, analytical sciences, nanotechnology, biotechnology, pharmaceutical education and AI-integrated innovations and biomedical devices.

The symposium is particularly significant as it brings a prestigious international scientific gathering to Moga, Punjab, creating an opportunity for a global exchange of knowledge in a rural setting. The participation of eminent international experts and researchers will further enrich the scientific environment and encourage new avenues for collaborative research.

As the Organizing Secretary, I extend my sincere gratitude to all our patrons, speakers, delegates, sponsors and organizing team members for their valuable support. I am confident that ICS-22 will be a memorable academic experience, fostering innovation, collaboration and scientific excellence for next-generation healthcare.

S. Mehan

Prof. (Dr.) Sidharth Mehan
Organizing Secretary, ICS-22
Dean, IQAC & Coordinator, MSME
ISF College of Pharmacy, Moga, Punjab, India

GT Road, Ghal Kalan, Moga - 142 001 (Punjab) India
Mob. 075770-00063, 098786-96688, 081465-62883 **E-mail:** director@isfcp.org, **Website:** www.isf cp.org

INVITED SPEAKER



Professor Francesco Trotta

Full Professor of Industrial Chemistry, Department of Chemistry

University of Turin, Turin

ITALY

TITLE OF PRESENTATION

"Evolution of Cross-Linked and Branched Cyclodextrin Polymers: Green, Sustainable and Versatile Materials"

ABOUT THE SPEAKER

Prof. Francesco Trotta is Professor of Industrial Chemistry in the Department of Chemistry at the University of Turin, where he coordinates the nanosponge research group. His research centres on the chemistry and applications of cyclodextrins and the modification of biopolymers, especially cyclodextrin-based nanosponges for drug delivery and cancer therapy. He has authored over 250 scientific publications, holds around 20 industrial patents, and has been listed among the top 3% of world scientists in the Stanford University ranking. His work is supported by European Union and industrial research funding. His invited lecture traces how cross-linked and branched cyclodextrin polymers have evolved from laboratory curiosities into a versatile family of sustainable materials.

INVITED SPEAKER



Professor Thorsteinn Loftsson

Professor Emeritus, Faculty of Pharmaceutical Sciences

University of Iceland, Reykjavik

ICELAND

TITLES OF PRESENTATION

1. **"Pharmaceutical Applications of Cyclodextrins"**
2. **"Cyclodextrins in Ophthalmology"**

ABOUT THE SPEAKER

Prof. Thorsteinn Loftsson is Professor Emeritus of Pharmaceutical Technology at the Faculty of Pharmaceutical Sciences, University of Iceland, and is widely regarded as a pioneer of cyclodextrin research in drug delivery. His work spans drug solubilization, drug stability, and cyclodextrin-based formulations, with a particular focus on ophthalmic delivery. He is the author of the textbook Drug Stability for Pharmaceutical Scientists and a co-founder and scientific leader of Oculis, a company developing cyclodextrin-based eye-drop technologies for retinal and other ocular diseases.

INVITED SPEAKER



Professor François Estour

Professor, COBRA Laboratory – Institut CARMeN (UMR 6064)

Université de Rouen Normandie, Rouen

FRANCE

TITLE OF PRESENTATION

"From Molecular Cages to Decontamination Tools: Exploring the Potential of Modified Cyclodextrins against Organophosphorus Nerve Agents"

ABOUT THE SPEAKER

Prof. François Estour is Professor at the Université de Rouen Normandie and a member of the bio-organic chemistry team of the COBRA laboratory (Institut CARMeN). After a PhD in organic chemistry in 1998 and postdoctoral research at the French Armed Forces Biomedical Research Institute, he joined the University of Rouen in 2000. His research focuses on functionalized cyclodextrins as enzyme mimics and scavengers for decontaminating organophosphorus nerve agents, as well as cyclodextrin-based contrast agents for MRI and other bio-inspired structures. In his invited lecture, Prof. Estour explores how the well-known cavity of the cyclodextrin can be repurposed from a passive molecular container into an active tool for detoxification.

INVITED SPEAKER



Professor Véronique Bonnet

Professor, LG2A – Laboratoire de Glycochimie et des Agroressources d'Amiens (UR 7378)

Université de Picardie Jules Verne, Amiens

FRANCE

TITLE OF PRESENTATION

"Chemically-Modified Cyclodextrins as New Building Blocks for Pharmaceutical Formulations"

ABOUT THE SPEAKER

Prof. Véronique Bonnet is Professor of Chemistry at the Laboratoire de Glycochimie et des Agroressources d'Amiens (LG2A), Université de Picardie Jules Verne. She completed her doctoral research at the University of Nantes on the chemo-enzymatic synthesis of glycosylated cyclodextrins and joined LG2A in 2005. Her research explores amphiphilic and chemically modified cyclodextrins for drug delivery, including their self-assembly in water, nanoparticles for crossing the blood–brain barrier, targeted and controlled delivery, α-glucosidase inhibitors for type 2 diabetes, and carbohydrate–metal supramolecular interactions. Her invited lecture examines how targeted chemical modification of the cyclodextrin skeleton creates new building blocks for pharmaceutical formulation.

INVITED SPEAKER



Professor Antonino Mazzaglia

Senior Researcher, Institute for the Study of Nanostructured Materials (ISMN)

CNR-ISMN URT Messina, Messina

ITALY

TITLE OF PRESENTATION

"Cyclodextrin Supramolecular Nanomaterials for Anti-Inflammatory and (Photo)Antimicrobial Strategies"

ABOUT THE SPEAKER

Prof. Antonino Mazzaglia is a Senior Researcher at the Institute for the Study of Nanostructured Materials of the Italian National Research Council (CNR-ISMN), Messina. His research focuses on supramolecular nanomaterials based on amphiphilic and cationic cyclodextrins, including nanoassemblies for photodynamic and photothermal therapy, intra-articular anti-inflammatory delivery, gene and drug delivery, and cyclodextrin–graphene and cyclodextrin–gold hybrid systems for therapy and electrochemical sensing. He has published widely on cyclodextrin nanomedicine and serves as guest editor for international journals. His invited lecture presents cyclodextrin-based supramolecular nanomaterials designed to address inflammation and infection.

INVITED SPEAKER



Professor László Biczók

HUN-REN Research Centre for Natural Sciences, Budapest

HUNGARY

TITLE OF PRESENTATION

"Tuning Anionic β-Cyclodextrin–Antimicrobial Peptide Interactions for Designing Alkaloid-Loaded Nanoparticles"

ABOUT THE SPEAKER

Prof. László Biczók is a researcher at the HUN-REN Research Centre for Natural Sciences, Budapest. His research lies at the interface of supramolecular chemistry and photochemistry, covering host–guest complexation with macrocycles such as cyclodextrins, cucurbiturils and calixarenes, the binding kinetics and thermodynamics of alkaloid inclusion, photochromic switches, fluorescence spectroscopy, and nanoparticle formation from supramolecular assemblies. He has authored more than 130 research articles in these fields. His invited lecture focuses on the molecular interactions between anionic β-cyclodextrin derivatives and antimicrobial peptides, and on how these interactions can be tuned to build stable nanoparticles for delivering alkaloid drugs.

INVITED SPEAKER



Dr. Ardila Hayu Tiwikrama

Associate Professor, Department of Chemical Engineering & Biotechnology

National Taipei University of Technology, Taipei

TAIWAN

TITLE OF PRESENTATION

"Transforming Cyclodextrin Research in Pharmaceutical Sciences"

ABOUT THE SPEAKER

Dr. Ardila Hayu Tiwikrama is an Associate Professor in the Department of Chemical Engineering and Biotechnology at National Taipei University of Technology, where she leads the TSEL laboratory. She received her bachelor's and master's degrees from Institute Teknologi Sepuluh Nopember, Indonesia, and her PhD from National Taiwan University of Science and Technology. Her research covers thermophysical properties, phase equilibria, and green separation processes for sustainable water, energy, and environmental goals. She received the inaugural Journal of Chemical & Engineering Data Early Career Award (ACS) and serves on its Early Career Board. Her invited lecture reflects on how cyclodextrin research is being transformed by new materials, analytical tools and computational approaches.

INVITED SPEAKER



Dr. Juan Manuel Benito Hernández

Institute for Chemical Research (IIQ)

CSIC – University of Seville, Seville

SPAIN

TITLE OF PRESENTATION

"On Route to Artificial Viruses through Precision Chemical Manipulation of Cyclodextrin Templates"

ABOUT THE SPEAKER

Dr. Juan Manuel Benito Hernández is a researcher at the Institute for Chemical Research (IIQ), a joint centre of the Spanish National Research Council (CSIC) and the University of Seville. His work focuses on the precision chemical modification of cyclodextrins to build multivalent, self-assembling molecular platforms, including polycationic amphiphilic cyclodextrins and "click" clusters for DNA complexation and gene delivery, cyclodextrin-based glyconanomaterials, and cyclodextrin–aromatic hybrids, with the long-term goal of creating synthetic, virus-like delivery systems. His invited lecture describes a route towards artificial viruses built on cyclodextrin templates. By precisely manipulating the chemistry of the cyclodextrin scaffold, researchers can assemble multivalent, well-defined architectures to carry and protect nucleic acids and mimic key features of viral vectors.

INVITED SPEAKER



Dr. Eric Kuenstner

Beren Therapeutics, Thousand Oaks, California

USA

TITLE OF PRESENTATION

"Beyond Solubilization: Derivatized Cyclodextrins as Active Therapeutic Agents"

ABOUT THE SPEAKER

Dr. Eric Kuenstner is a scientist at Beren Therapeutics, a public benefit biotechnology company that discovers and develops cyclodextrin-based medicines for disorders of impaired cholesterol metabolism. Beren's lead programme, adrabetadex, is being developed for Niemann-Pick disease type C, an ultra-rare genetic disorder affecting the brain and other organs. Dr. Kuenstner's talk will highlight how derivatized cyclodextrins can move beyond their traditional role as solubilizing excipients to act as therapeutic agents in their own right. His invited lecture looks beyond the classical role of cyclodextrins as solubilising excipients, presenting derivatised cyclodextrins as active therapeutic agents in their own right. It outlines how chemical modification gives these molecules distinct biological activity, how this opens the way to treating diseases of lipid and cholesterol handling, and what developers must consider as such compounds move from the laboratory towards clinical evaluation.

INVITED SPEAKER



Dr. Fabrizio Caldera

Researcher, Department of Chemistry

University of Turin, Turin

ITALY

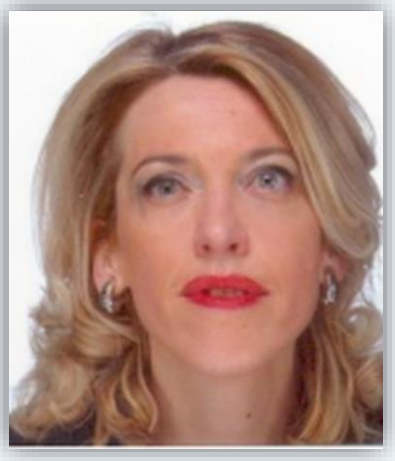
TITLE OF PRESENTATION

"Cross-Linked Cyclodextrin-Based Metal-Organic Frameworks as Water-Stable Adsorbents: From Textile Dye Removal to Iodine Vapour Capture"

ABOUT THE SPEAKER

Dr. Fabrizio Caldera is a researcher at the Department of Chemistry, University of Turin, and a member of the nanosponge research group led by Prof. Francesco Trotta. His research deals with the design and synthesis of cyclodextrin-based nanosponges and cross-linked cyclodextrin polymers, including bio-responsive nanosponges for smart drug delivery and porous cyclodextrin materials for environmental remediation and sensing. He has co-authored numerous articles and reviews on the evolution and applications of cyclodextrin nanosponges. His invited lecture presents cross-linked cyclodextrin-based metal–organic frameworks as water-stable adsorbents.

INVITED SPEAKER



Professor Roberta Cavalli

Professor of Pharmaceutical Technology, Department of Drug Science and Technology

University of Turin, Turin

ITALY

TITLE OF PRESENTATION

"Harnessing Cyclodextrins and Maltodextrins for the Development of Paediatric Orodispersible Granules: From Laboratory to Industrial Scale"

ABOUT THE SPEAKER

Prof. Roberta Cavalli is Professor of Pharmaceutical Technology at the Department of Drug Science and Technology, University of Turin. Her research focuses on designing innovative drug delivery systems, including cyclodextrin nanosponges, solid lipid nanoparticles, nanosuspensions, nanobubbles, and polysaccharide-based nanomedicines for nucleic acid and anticancer delivery. She has published extensively on nanomedicine and pharmaceutical technology, with work extending from laboratory formulation to industrial scale-up. Her invited lecture describes the development of paediatric orodispersible granules based on cyclodextrins and maltodextrins, a patient-friendly dosage form that avoids the difficulty of swallowing tablets and allows flexible dosing.

INVITED SPEAKER



Dr. Alex Fragoso

Associate Professor, Department of Chemical Engineering

Universitat Rovira i Virgili, Tarragona

SPAIN

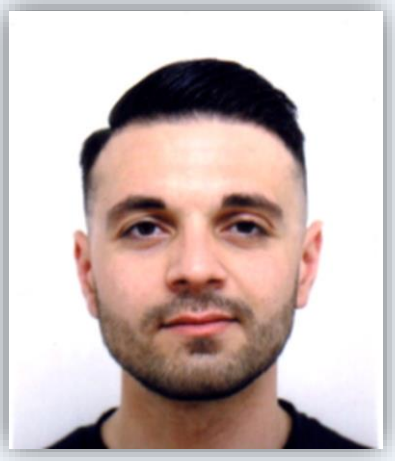
TITLE OF PRESENTATION

"Cyclodextrin-Based Materials for the Capture and Quantification of Marine Toxins"

ABOUT THE SPEAKER

Dr. Alex Fragoso is an Associate Professor at Universitat Rovira i Virgili, Spain, and coordinator of its PhD programme in Nanoscience, Materials and Chemical Engineering. He obtained his BSc and PhD in Chemistry from the University of Havana, receiving the Cuban National Award of Chemistry for Young Researchers, and held positions at the University of Havana and Universidad Autónoma de Madrid before joining URV as a Ramón y Cajal researcher in 2006. His research applies supramolecular chemistry and nanoscale surface engineering, notably cyclodextrin-modified interfaces, to biosensing, bioanalysis and environmental applications. His invited lecture shows how cyclodextrin-based materials can be used to capture and quantify marine toxins, a growing concern for food safety and public health.

INVITED SPEAKER



Dr. Giuseppe Nocito

Research Fellow, Institute for the Study of Nanostructured Materials (ISMN)

CNR-ISMN URT Messina, Messina

ITALY

TITLE OF PRESENTATION

"Cyclodextrin-Based Supramolecular Sensing Strategies: From Biomacromolecules to Single Cells"

ABOUT THE SPEAKER

Dr. Giuseppe Nocito is a Research Fellow at the Institute for the Study of Nanostructured Materials of the Italian National Research Council (CNR-ISMN), Messina, with a background in pharmaceutical sciences. His research focuses on cyclodextrin-based supramolecular systems, including cyclodextrin–gold nanohybrids for electrochemical sensing, amphiphilic cyclodextrin nanocarriers for magnetic and redox-responsive delivery, and poly-cyclodextrin materials for water remediation, with an emphasis on translating supramolecular recognition into sensing tools for biomolecules and cells. His invited lecture presents supramolecular sensing strategies in which cyclodextrins act as recognition elements, from detecting biomacromolecules to measurements at the level of single cells.

INVITED SPEAKER



Dr. Mehdi Irani

Associate Professor, Faculty of Science

University of Kurdistan, Sanandaj

IRAN

TITLE OF PRESENTATION

"Computational Chemistry in Biological Systems and Emerging Opportunities for Machine Learning"

ABOUT THE SPEAKER

Dr. Mehdi Irani is an Associate Professor at the Faculty of Science, University of Kurdistan, Iran. He received his MSc in Physical Chemistry and PhD in Theoretical Chemistry from Sharif University of Technology, Tehran. His research focuses on computational biochemistry and reaction kinetics and mechanisms, particularly using quantum mechanics/molecular mechanics (QM/MM) methods to study enzyme catalysis. He is increasingly interested in combining computational chemistry with machine learning to model biological systems. His invited lecture introduces computational chemistry as a powerful partner of experiment in biological systems, from molecular dynamics and quantum-chemical studies of host–guest complexes to the modelling of drug–biomolecule interactions.

INVITED SPEAKER



Dr. Gjylije Hoti

Researcher, Polymeric Materials Group – Department of Chemistry

University of Turin, Turin

ITALY

TITLE OF PRESENTATION

"What Does Cross-Linking Really Control? The Capture–Concentrate–Control (C^3) Framework for Bio-Based Nanosponges"

ABOUT THE SPEAKER

Dr. Gjylije Hoti is a researcher in the Polymeric Materials Group of the Department of Chemistry, University of Turin, working within the nanosponge research team. Her research concerns the synthesis, characterization, and application of cyclodextrin- and dextrin-based nanosponges as drug delivery systems, sustainable synthesis routes using natural deep eutectic solvents, and bio-based nanosponges from waste materials such as wool keratin for wastewater treatment. She contributes to the Italian NODES–INNDIANA research programme on nanotechnology for health. Her invited lecture asks what cross-linking really controls in cyclodextrin nanosponges and proposes the Capture–Concentrate–Control (C^3) framework to explain it.

INVITED SPEAKER



Prof. (Dr.) S. K. Jain

Emeritus Professor

Dr. Hari Singh Gour Vishwavidyalaya, Sagar, Madhya Pradesh

INDIA

TITLE OF PRESENTATION

"Pharmaceutical Applications of Beta-Cyclodextrin"

ABOUT THE SPEAKER

Prof. (Dr.) S. K. Jain is an Emeritus Professor at Dr. Hari Singh Gour Vishwavidyalaya, Sagar, Madhya Pradesh. he was honored with the prestigious Visitor's Award for Research (Basic and Applied Sciences) by the then President of India, Shri Ram Nath Kovind. The award recognized his groundbreaking work in developing an advanced drug delivery system designed to make cancer treatment safer, more effective, and more affordable. His invited lecture examines the pharmaceutical applications of beta-cyclodextrin, the most widely used member of the cyclodextrin family. The talk explains how its hydrophobic cavity forms inclusion complexes with poorly water-soluble drugs, and how this improves solubility, dissolution rate, chemical stability and oral bioavailability. It also covers the use of beta-cyclodextrin and its derivatives for taste masking, reducing gastric irritation, converting liquid drugs into stable powders, and in controlled and targeted drug delivery systems. Practical aspects of complex preparation, characterization and regulatory acceptance will be discussed, together with emerging opportunities for beta-cyclodextrin in modern pharmaceutical formulation.

INVITED SPEAKER



Dr. Vaibhav Dubey

Senior General Manager, Formulation Development

Sun Pharmaceutical Industries Ltd.

INDIA

TITLE OF PRESENTATION

"Pharmaceutical Applications of Cyclodextrins"

ABOUT THE SPEAKER

Dr. Vaibhav Dubey is a pharmaceutical industry leader with over 20 years of experience in biologic and small molecule formulation, combination product development, and non-clinical sciences. He currently serves as Senior General Manager at Sun Pharmaceuticals, where he leads formulation development teams focused on operational excellence, risk mitigation, and global regulatory readiness.

Previously, Dr. Dubey served as Associate Vice President at Kashiv BioSciences, leading formulation, device, and non-clinical development for biosimilar programs, and as General Manager of Specialty Formulation Development at Alembic Pharmaceuticals. Across his career, Dr. Dubey has driven innovation in biosimilars, injectables, and drug-device platforms, building high-performing teams and advancing patient-centric solutions at the intersection of science, engineering, and regulatory strategy.

INVITED SPEAKER



Dr. Pirthi Pal Singh

President & Group Head of R&D

Tirupati Group, Paonta Sahib, Himachal Pradesh

INDIA

TITLE OF PRESENTATION

"Pharmaceutical Applications of Cyclodextrins"

ABOUT THE SPEAKER

Dr. Pirthi Pal Singh is President and Group Head of Research & Development at Tirupati Group, Paonta Sahib. He holds an M. Tech and a PhD in Bioprocess Technology from the Institute of Chemical Technology, Mumbai, and earlier led formulation research at Dr. Reddy's Laboratories. His expertise covers nanotechnology-based and novel drug delivery systems, complex generics, solubility enhancement, hot-melt extrusion, and taste masking, with experience across NDA, 505(b)(2), and ANDA programmes. He has several granted patents and has served as chair of the Controlled Release Society's Young Scientist Mentor-Protégé Committee. His invited lecture presents the industrial perspective on cyclodextrins in pharmaceutical products. It reviews how these versatile excipients are used to enhance solubility, dissolution, stability and bioavailability of challenging molecules, discusses formulation and scale-up considerations encountered during product development, and reflects on the regulatory and commercial opportunities for cyclodextrin-based medicines in India and in global markets.

Scientific Categories

01 Cyclodextrin-Based Drug Delivery and Applications 46
02 Pharmacology & Drug Discovery 101
03 Pharmaceutics & Industrial Pharmacy 177
04 Quality Assurance & Drug Regulatory Affairs 245
05 Nanotechnology & Translational Research 263
06 Medicinal & Organic Chemistry 311
07 Analytical Techniques & Sensor Technology 364
08 Biotechnology & Life Sciences 380
09 Clinical Pharmacy, Pharmacovigilance & Pharmacy Practice (PharmD) 397
10 Pharmacognosy & Phytopharmaceuticals 441
11 Advancement in Pharmaceutical Education (NEP-2020) 460
12 AI-integrated Innovations, Bio-Medical Devices & Startups 472

800+ abstracts accepted across 12 scientific categories

Awards

432

TOTAL SCIENTIFIC AWARDS · ACROSS 12 CATEGORIES

- Oral Presentation (Faculty / Research Scholars)
- Oral Presentation (UG & PG Students)
- Oral Presentation — Online (Faculty / Research Scholars)
- Oral Presentation — Online (UG & PG Students)
- Poster Presentation (Faculty / Research Scholars)
- Poster Presentation (UG & PG Students)

First, Second, Third

03 Consolation Awards in each category

CATEGORY 1 | 101 ABSTRACTS

Cyclodextrin-Based Drug Delivery and Applications

DAKSH GROUP OF INSTITUTIONS
CHHATARPUR

Approved by : PCI, New Delhi, Affiliated by : RGPV, BHOPAL MP INDIA

COURSES OFFERED

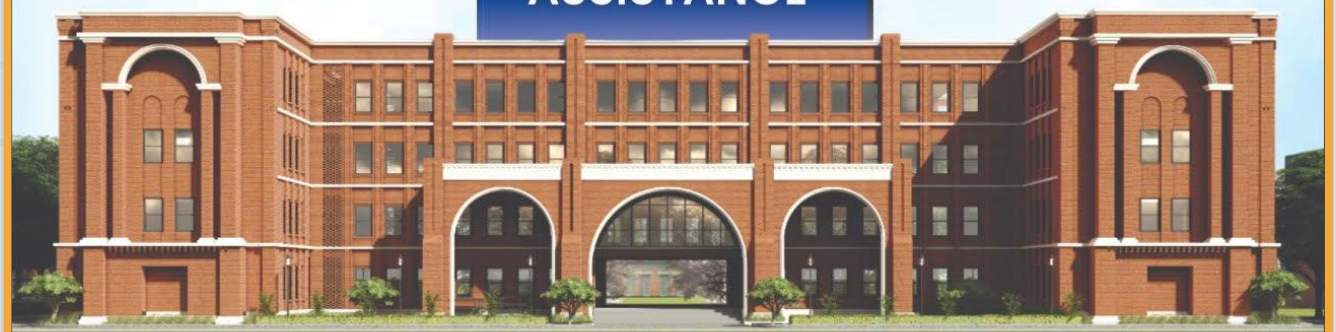
- B. PHARMACY → P' COLOGY
- M. PHARMACY → P' CEUTICS
- D. PHARMACY → P' CHEMISTRY
- LAW • LL.B. • B.A.LL.B.
- ITI Electrician

SPECIAL FEATURES

1. Experienced Faculty Members
2. Animal House
3. Well Equipped Labs
4. Digital Library
5. Herbal Garden
6. Digital Class Room
7. Internal Training Programme
8. Personality Development Programme
9. 100% Students Industrial Training & Hospital was conducted
10. Free Bus Facility
11. Special class for weak students

Placement Highlights

100% JOB PLACEMENT ASSISTANCE



"Elevating Bundelkhand's pride in the field of pharmacy:
15 successful batches with 100% placements over the last 19 years!"

Pharmacy- 8982353354, 9893132439, Law-9826655962, ITI -7694079197

NARAYANPURA ROAD, CHHATARPUR (M.P.)

Website : www.dakshcollege.com | Email : dakshinstitutechp@gmail.com

O-01/F/001 ORAL · OFFLINE

Formulation and Characterization of Embelin-Loaded 2-Hydroxypropyl-β-cyclodextrin Nanosponges to Improve Physicochemical Properties of Embelin for Efficient Drug Delivery

Thevashree Rajanderan[1]*, Mohammed Tahir Ansari[2] and Sreenivas Patro Sisinthy[1]

[1]School of Pharmacy, Faculty of Science and Engineering, University of Nottingham Malaysia, 43500 Semenyih, Selangor, Malaysia
[2]Leichester School of Pharmacy, Health and Life Sciences, De Montfort University, The Gateway, Leichester, LE1 9BH, United Kingdom
Email: hyxtr1@nottingham.edu.my

Introduction: Embelin is a benzoquinone found in the berries of Embelia ribes. Recent studies highlighted its potential anti-Alzheimer's properties. However, embelin possess extremely low aqueous solubility due to the presence of a long hydrocarbon chain, making embelin highly non-polar and hydrophobic; limiting its oral bioavailability. This research aimed to develop and characterize embelin-loaded 2-hydroxypropyl-β-cyclodextrin (EMB-2HPβCD) nanaosponges to improve the solubility, stability and bioavailability of embelin for enhanced therapeutic potential in Alzheimer's disease management.

Methodology: EMB-2HPβCD nanosponges were formulated using four ratios of 2HPβCD to crosslinker (1:1, 1:2, 1:4, 1:6) and prepared using the freeze-drying method. HPLC was employed to quantify embelin. TGA and DSC were employed to understand thermal behaviours. FTIR, XRD, SEM and Zetasizer were used to observe structural changes. Solubility and stability degradation studies were conducted to evaluate the effect of nanopsonge encapsulation on physicochemical stability and aqueous solubility of embelin.

Results: The 1:4 ratio nanosponge increased solubility of embelin in aqueous fluid by 7.3-folds followed by 6.8-folds, 4.9-folds and 4.1-folds increase seen in 1:6, 1:2 and 1:1 nanosponges, respectively. The 1:1 ratio recorded the smallest particle size of 359.03 d.nm and zeta potential of -30.93 mV.

Summary and Conclusion: The nanosponges successfully encapsulated embelin and improved its solid-state properties. Increased amorphization resulted in improved aqueous solubility. Increased surface area improved dissolution rate which may indicate improved bioavailability. Reduced rate of degradation and higher melting point indicated improved thermal stability, suggesting lower chances of premature molecular breakdown; in addition to improved colloidal stability which suggests better protection from factors influencing storage conditions and shelf-life.

Keywords: *2-hydroxypropyl-β-cyclodextrin, Embelin, Solubility Enhancement, Drug Delivery.*

O-01/F/002 ORAL · OFFLINE

AI-Driven Cyclodextrin-Based Drug Delivery Systems: From Molecular Modeling to Personalized Medicine

Rishav Raj*

Department of Pharm D, ISF College of Pharmacy, Moga

Email: officialrishavraj17@gmail.com

Background: One of the major challenges in drug formulation and development is poor aqueous solubility. Approximately 40% of marketed drugs and nearly 90% of new chemical entities exhibit low water solubility. Cyclodextrins (CDs) have been widely used as pharmaceutical excipients because of their ability to form inclusion complexes that enhance drug solubility, dissolution, stability, and oral bioavailability. However, the selection of the most appropriate cyclodextrin derivative and optimization of drug–cyclodextrin complexation still relies largely on empirical and time-consuming formulation approaches. Recent advances in artificial intelligence (AI), molecular docking, molecular dynamics (MD) simulations, and machine learning (ML) have opened new opportunities for cyclodextrin-based formulation development.

Current Research Gap: Although AI- and QSPR/QSAR-based models have shown promising results in predicting cyclodextrin–drug complexation, these approaches primarily focus on molecular interactions. They rarely incorporate patient-specific physiological factors such as gastrointestinal pH, metabolic phenotype, pharmacogenomic variability, or disease-associated microenvironments. As a result, current computational models remain disconnected from the broader goal of personalized drug delivery.Next-Generation Conceptual Framework: We propose a novel framework integrating molecular docking, ML-based affinity prediction, and advanced cyclodextrin-based nanocarriers, including nanosponges, polymeric nanoparticles, and hydrog el-based delivery systems. Incorporating patient-specific physiological parameters into computational workflows could transform cyclodextrin formulations from conventional solubility enhancers into intelligent, precision-oriented drug delivery platforms.

Novelty Statement: This perspective proposes a patient-centric computational framework integrating cyclodextrin chemistry, molecular docking, machine learning, and physiologically informed modeling to advance precision drug delivery. By incorporating patient-specific physiological variables, it extends conventional drug–cyclodextrin interaction studies toward personalized formulation design.

Future Perspectives: Emerging technologies such as AI-assisted experimental optimization, automated formulation platforms, federated learning, and digital twins may further accelerate the development of personalized cyclodextrin formulations. Although these technologies are still evolving, they represent scientifically plausible future directions in computational pharmaceutics.

Conclusion: Integrating cyclodextrin chemistry with artificial intelligence and precision medicine has the potential to transform pharmaceutical formulation science. This interdisciplinary strategy may improve formulation efficiency, reduce experimental burden, and support the development of safer and more individualized drug therapies.

Keywords: *Cyclodextrins; Artificial Intelligence; Molecular Docking; Machine Learning; Precision Medicine; Pharmaceutical Nanotechnology.*

O-01/F/003 ORAL · OFFLINE

Cyclodextrins for Space-Ready Medicines: A Perspective on Long-Duration Human Spaceflight

Sonali Vasdev[1], Navneesh Kumar[2], *

[2]Department of Pharmaceutical Chemistry & Analysis, ISF College of Pharmacy, Moga-142 001, (Punjab), India

Email: sonalivasdev123@gmail.com

Medical resupply and evacuation are limited during long-duration human spaceflight, such as future lunar and Mars explorations, and maintaining the stability, safety, and effectiveness of medicines are significant challenges. The pharmaceutical formulations developed and validated under terrestrial conditions do not take into account specific spaceflight stressors that may impact drug pharmacokinetics, pharmacodynamics and physicochemical stability: microgravity, galactic cosmic radiation, launch-induced vibration, temperature changes, and long storage time. We argue that such an approach is inadequate and suggest a "Space-by Design" pharmaceutical development framework, in which space-relevant environmental parameters are treated as design variables throughout drug formulation development and evaluation, based on QbD principles. In this context, cyclodextrins (CDs)-cyclic oligosaccharides that are capable of forming host–guest inclusion complexes-are emphasized as multifunctional excipients with potential application to improve the solubility, bioavailability, and stability of drugs, as well as protection from radiation-induced degradation and other space-related stressors. Radiation, microgravity and launch force resistance data with SBEβCD indicate that there is no loss of radiation, microgravity and launch force resistance without impacting drug-excipient compatibility. The Perspective also envisions the use of a combination of these technologies - cyclodextrin-based platforms, complementary technologies such as nanoencapsulation and polymer-based delivery systems, and artificial intelligence-assisted formulation - as a unified, hybrid strategy for the development of safe, stable, and effective space-optimized medications for future long-duration missions.

Keywords: *Cyclodextrins, Space-by-Design pharmaceutical framework, Space radiation induced drug degradation, Microgravity pharmacokinetics, Space-ready medicine stability.*

O-01/F/004 ORAL · OFFLINE

Cyclodextrin-Based Drug Delivery and Applications

Piyush Dadwal[1]
[1]*B. Pharm, ISF College of Pharmacy, Moga-142 001, (Punjab), India*
Email: piyushdadwal27@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides with a hydrophilic outer surface and a relatively hydrophobic central cavity, enabling them to form inclusion complexes with a wide range of pharmaceutical molecules. This unique host–guest architecture has made cyclodextrins valuable excipients and functional carriers in modern drug delivery. By complexing poorly soluble drugs, CDs can improve aqueous solubility, dissolution rate, chemical and photostability, and, in selected cases, bioavailability while also helping reduce local irritation and undesirable drug interactions. Native cyclodextrins, including α-, β-, and γ-cyclodextrin, together with chemically modified derivatives such as hydroxypropyl-β-cyclodextrin and sulfobutylether-β-cyclodextrin, have expanded the range of drugs and delivery routes that can be effectively addressed. Beyond conventional inclusion complexes, cyclodextrin-based systems are increasingly integrated into nanosponges, hydrogels, polymeric networks, nanoparticles, and other advanced formulations to enable controlled release, improved targeting, and enhanced therapeutic performance. Their applications extend across oral, parenteral, ocular, pulmonary, topical, and transdermal drug delivery, supporting the formulation of both small-molecule drugs and emerging therapeutic agents. This abstract highlights the fundamental principles governing cyclodextrin–drug complexation, the role of cyclodextrins in overcoming key biopharmaceutical limitations, and their evolving applications in advanced drug delivery systems. Despite important challenges related to complex stability, dose limitations, excipient selection, and safety considerations, continued advances in cyclodextrin chemistry and formulation design position these versatile carriers as significant tools for improving pharmaceutical product development and therapeutic outcomes.

Keywords: *Cyclodextrins; Inclusion complexes; Drug delivery; Solubility enhancement; Controlled release; Nanosponges; Pharmaceutical applications.*

O-01/F/005 ORAL · OFFLINE

Cyclodextrin-Liposome Hybrid Nanocarriers for Blood–Brain Barrier Transport: Mechanistic Insights and AI-Enabled Design for CNS Therapeutics

Gurnam[1], **Shubham Singh**[2]*
[1]*Research Scholar, Department of Pharmaceutical Quality Assurance, ISF College of Pharmacy, Moga-142001, Punjab, India*
[2]**Associate Professor, Department of Pharmaceutics ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: 2507004@isfcp.org

Cyclodextrins (CDs) have been introduced as promising platforms to improve drug delivery across the blood–brain barrier (BBB) and thus central nervous system (CNS) drug delivery. The cyclic oligosaccharide structure allows for the formation of inclusion complexes with hydrophobic therapeutics, enhancing their solubility, stability, and bioavailability, and the ability to interact with membrane cholesterol homeostasis has direct effects on BBB permeability. This is further extended by the hybrid nanocarriers of drug-in-cyclodextrin-in-liposome (DCL) which simultaneously possess the properties of a CD, a liposomal membrane and receptor-ligand functionality, allowing for receptor-mediated transcytosis across the brain endothelium with the help of transporters like GLUT1, MCT1, TfR, and LRP1. This poster discusses the three converging BBB transport mechanisms (carrier-mediated transport, receptor-mediated transcytosis, and cholesterol-mediated permeability modulation) and suggests a structure–transport–therapy pathway for the design of the nanocarrier related to clinical outcome. Applications are featured in the fields of Alzheimer's disease, Parkinson's disease and glioma, where CD-liposome hybrids have demonstrated improved brain targeting and decreased pathological protein aggregation in preclinical models. Following the symposium theme of AI and QbD, we explore how molecular docking, PBPK/BBB permeability modelling and machine learning-driven formulation screening can help speed up rational design of brain targeted CD nanocarriers for precision CNS therapeutics.

Keywords: *Cyclodextrin, liposomes, targeted delivery, blood-brain barrier, nanocarriers.*

O-01/F/006 ORAL · OFFLINE

Integrating Artificial Intelligence, Molecular Modelling, and Quality by Design in Cyclodextrin-Based Drug Delivery

Sneahpreet Kour[1], Shubham Singh[2]*

[1]*Research Scholar, Department of Pharmaceutical Quality Assurance, , ISF College of Pharmacy, Moga-142001, Punjab, India*
[2]**Associate Professor, Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: 2507012@isfcp.org

Conventional solubility-enhancing excipients have evolved into supramolecular platforms for advanced drug delivery, the cyclodextrins (CDs). Their host-guest complexation may enhance the solubility, stability, dissolution and bioavailability of poorly water-soluble drugs. Most recently, reviews also report expanding to polymers, nanocarriers, hydrogels and more. Rational selection of CD derivatives and prediction of drug-CD interactions are, however, difficult and are quite often based on experimental screening. A 2023 literature curated database of CD-guest association constants shows that machine-learning methods can be supported by the standard computational data. However, molecular recognition and formulation optimization are not yet fully connected within a validated workflow which incorporates AI/ML prediction, molecular modelling and Quality by Design (QbD). This literature overview summarizes the evidence from published articles since 2023-2026 to assess an integrated approach of AI/ML, molecular modelling and QbD for rational development of CD-based drug-delivery. It emphasizes ML for prediction of host–guest affinity, molecular modelling for mechanistic interpretation and QbD for systematic formulation optimization by means of risk assessment. The evidence shows that both AI/ML can help to decrease screening needs and molecular modelling for prediction of interactions can be made more interpretable. But, yet, data heterogeneity, limited external validation and translation of molecular predictions to critical quality attributes are still important challenges. The integration of approaches could provoke a change in CD development in the direction of predictive and reproducible data-driven formulation.

Keywords: *Cyclodextrins; Artificial Intelligence; Machine Learning; Molecular Modelling; Quality by Design; Host-Guest Complexation.*

O-01/F/007 ORAL · OFFLINE

Cyclodextrin-based Nanosponges for Pediatric Formulation

Hitika Sood*

Department of Pharmacy, , ISF College of Pharmacy, Moga-142001, Punjab, India
Email: hitikasood5541@gmail.com

Pediatric drug administration frequently encounters critical challenges, notably pediatric dysphagia, poor aqueous solubility of active pharmaceutical ingredients, and unpalatable or bitter organoleptic properties. Cyclodextrin-based nanosponges (CD-NSs) have emerged as advanced colloidal nano-architectures capable of encapsulating diverse therapeutics to successfully overcome these formulation barriers. The primary aim of this research is to design, optimize, and evaluate novel cyclodextrin nanosponges to significantly enhance the solubility, oral bioavailability, and palatability of poorly water-soluble drugs intended for pediatric use.

CD-NSs were synthesized via cross-linking beta-cyclodextrin (β-CD) with appropriate cross-linking agents utilizing melt and ultrasonication methodologies. The optimized formulations underwent rigorous characterization for particle size, zeta potential, entrapment efficiency, Fourier-transform infrared spectroscopy (FT-IR), and differential scanning calorimetry (DSC), alongside in vitro dissolution studies and taste-masking efficiency evaluations.

The optimized nanosponge formulations exhibited a uniform nanometric size distribution below 500 nm, high drug entrapment efficiency, and a stable negative zeta potential. Encapsulation within the porous three-dimensional internal cavities markedly improved drug dissolution rates and oral bioavailability relative to unformulated active ingredients. Furthermore, the nanosponges effectively masked bitter tastes, rendering liquid formulations substantially more acceptable for pediatric compliance. In conclusion, cyclodextrin-based nanosponges represent a viable, safe, and highly efficient nanocarrier strategy for optimizing pediatric drug delivery systems.

Keywords: *Cyclodextrin nanosponges; Pediatric formulation; Taste-masking; Solubility enhancement; Drug delivery.*

O-01/F/008 ORAL · OFFLINE

Cyclodextrins: Structural Insights, Production, Pharmaceutical Applications, and Emerging Drug Delivery Strategies

Mankeerat Kaur[1], Aman Kumar[1]*

[1]*Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India.*

Cyclodextrins (CDs) are cyclic oligosaccharides composed of α-(1,4)-linked glucopyranose units and have gained considerable attention as multifunctional pharmaceutical excipients. Poor aqueous solubility remains a major challenge in drug development, affecting formulation performance, bioavailability, and therapeutic efficacy. CDs can overcome these limitations through the formation of non-covalent inclusion and non-inclusion complexes, thereby improving drug solubility, stability, dissolution, and overall biopharmaceutical performance. This review provides a comprehensive overview of CDs, covering their historical development, structural features, and production from starch through the action of cyclodextrin glucanotransferase (CGTase). Particular emphasis is placed on the CGTase-mediated transglycosylation reactions involved in CD formation, including cyclization, coupling, and disproportionation. Recent advances in CD structural characterization using X-ray crystallography, nuclear magnetic resonance spectroscopy, molecular dynamics simulations, and ion mobility mass spectrometry are also discussed. The pharmaceutical applications of CDs are critically examined, with emphasis on their roles as solubility enhancers, taste-masking agents, stabilizers, and functional components of nanocarrier-based and targeted drug delivery systems. Their emerging applications in cosmetics and dermopharmaceutical formulations, particularly for improving stability and enabling controlled drug delivery, are also highlighted. In addition, the pharmacokinetic behavior, toxicological profiles, and regulatory considerations of different CD types are reviewed. Overall, this review highlights the evolving role of CDs as versatile pharmaceutical excipients and supramolecular platforms that connect molecular recognition with contemporary drug delivery strategies.

Keywords: *Cyclodextrin; Glucopyranose; CGTase-mediated Transglycosylation.*

O-01/F/009 ORAL · OFFLINE

Cyclodextrin: Enhancing Drug Delivery, Solubility, and Bioavailability for Modern Therapeutics

Nishtha

Department of Pharmacy, ISF College of Pharmacy, Moga-142001, Punjab, India

Email: nishthagumber999@gmail.com

Cyclodextrins (CDs) have revolutionized the pharmaceutical industry with their ability to enhance the stability, solubility, and bioavailability of a wide range of active substances. These cyclic oligosaccharides, with a unique hydrophilic exterior and hydrophobic cavity, form inclusion complexes with poorly soluble drugs, improving their pharmacokinetic profiles and therapeutic efficacy. This review explores the multifaceted roles of cyclodextrins in pharmaceutical formulations, ranging from oral, ophthalmic, parenteral, and topical applications to their emerging use in targeted therapies, gene delivery, and treatment of neurodegenerative, cardiovascular, and infectious diseases. Cyclodextrins not only improve drug solubility and controlled release but also reduce toxicity and side effects, leading to safer and more effective treatments. Recent advancements, such as cyclodextrin-based nanoparticles, offer promising pathways for cancer therapy, chronic disease management, and personalized medicine. As research continues, cyclodextrins remain at the forefront of innovation in drug delivery systems, ensuring better patient outcomes and expanding the possibilities of modern therapeutics

O-01/F/010 ORAL · OFFLINE

Development and Evaluation of Indapamide–SBE-β-Cyclodextrin Inclusion Complex for Enhanced Drug Delivery

Sudhir Kumar[1], Kumari Kajal[2]

[1]*Department of Pharmaceutical Sciences, ISF College of Pharmacy and Research, Moga – 142001, Punjab, India*
[2]*Department of Pharmaceutical Chemistry, ISF College of Pharmacy and Research, Moga – 142001, Punjab, India*
Email: sudhirskumar@gmail.com

Introduction: Indapamide is a thiazide-like diuretic commonly used for the treatment of hypertension and edema. Its poor aqueous solubility can affect dissolution and drug absorption. Sulfobutylether-β-cyclodextrin (SBE-β-CD) is a modified cyclodextrin that can enhance the solubility and dissolution of poorly water-soluble drugs through inclusion complex formation.

Aim: To develop and evaluate an indapamide–SBE-β-cyclodextrin drug delivery system for improving the aqueous solubility and dissolution of indapamide.

Objectives: To prepare an inclusion complex of indapamide with SBE-β-CD. To characterize the prepared complex. To evaluate its solubility and in-vitro drug dissolution. To compare the performance of the complex with pure indapamide.

Methodology: The indapamide–SBE-β-CD complex will be prepared using a suitable technique such as kneading or solvent evaporation. The formulation will be evaluated for drug content, aqueous solubility, in-vitro dissolution, FTIR, and DSC studies. The results will be compared with pure indapamide.

Expected Result: The SBE-β-CD complex is expected to demonstrate improved aqueous solubility, dissolution rate, and drug release compared with pure indapamide.

Summary: The proposed SBE-β-CD-based drug delivery system may provide an effective approach for enhancing the pharmaceutical performance of indapamide and may improve its dissolution and absorption characteristics.

Keywords: *Indapamide; SBE-β-cyclodextrin; Inclusion complex; Solubility enhancement; Dissolution; Drug delivery*

O-01/F/011 ORAL · OFFLINE

Cyclodextrin-Based Drug Delivery Systems for Targeted Therapy of Rheumatoid Arthritis

Gyan Prakash, Dr. Balak Das Kurmi*

Department of Quality Assurance, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: gyanprakashgupta79033@gmail.com

Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by persistent synovial inflammation, progressive joint damage and functional disability. Conventional antirheumatic drugs can be limited by poor aqueous solubility, inadequate bioavailability, systemic adverse effects and nonspecific distribution. Cyclodextrins (CDs) are cyclic oligosaccharides capable of forming inclusion complexes with suitable drug molecules and thereby modifying their physicochemical and biopharmaceutical properties. This review aims to explore the potential of CD-based drug delivery systems for improving the therapeutic performance and targeted delivery of drugs in RA. Relevant literature on natural and modified CDs, drug–CD inclusion complexes, CD-based nanoparticles and other advanced delivery systems for RA therapy will be examined, with emphasis on solubility enhancement, stability, controlled release, drug permeation and reduction of systemic exposure. Particular attention will be given to the application of CDs in delivering antirheumatic agents and poorly water-soluble bioactive compounds. Available evidence suggests that CD complexation and CD-based nanocarriers can improve drug solubility and stability and may facilitate site-oriented and sustained drug delivery. These approaches may also enhance therapeutic efficacy while minimizing dose-related adverse effects. Overall, cyclodextrin-based drug delivery represents a promising strategy for developing safer, more effective and targeted therapies for RA, although further optimization and in vivo validation are required for clinical translation.

Keywords: *Rheumatoid arthritis; Cyclodextrins; Inclusion complex; Targeted drug delivery; Nanocarriers; Solubility enhancement*

O-01/F/012 ORAL · OFFLINE

Development and In-vitro Characterization of Candesartan Solid Dispersion Using Natural Gum.

Jatin*, Rameshwar Dass
Guru Gobind Singh College of Pharmacy, Yamunanagar-135001, Haryana, India
Email: sethjatin6727@gmail.com

Background: Candesartan is an angiotensin II receptor blocker used for the treatment of hypertension and cardiovascular disorders. Its poor aqueous solubility may limit dissolution and oral absorption. Natural gums offer a biocompatible, economical, and safe carrier system for improving drug dissolution.

Objective: The study aimed to develop and optimize a candesartan solid dispersion using natural gum as a carrier to improve its solubility, wetting, and dissolution characteristics.

Methodology: Candesartan solid dispersions were prepared using a suitable solvent-based method and optimized by evaluating important formulation variables. The optimized formulation was characterized for drug content, saturation solubility, FTIR, DSC, XRD, particle morphology, and in-vitro dissolution.

Results: The optimized solid dispersion showed improved wetting, saturation solubility, and dissolution compared with pure candesartan. Characterization studies indicated changes in the drug's physical state and crystallinity after formulation.

Conclusion: Natural gum-based solid dispersion appears to be a simple, economical, and promising approach to enhancing the dissolution characteristics of poorly water-soluble candesartan and may have potential for further development as an oral drug-delivery system.

Keywords: *Candesartan; Solid dispersion; Natural gum; Solubility; Dissolution rate; Poorly water-soluble drug; optimization; Bioavailability.*

O-01/F/013 ORAL · OFFLINE

AI-Enabled Cyclodextrin–Drug Inclusion Complexes: Emerging Approaches for Optimizing Drug Solubility, Bioavailability and Therapeutic Performance

Nitigia
Chandigarh Group of Colleges, Landran, Mohali
Email: nitigiasinglaa@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides widely explored as pharmaceutical excipients for improving the solubility, dissolution, stability and bioavailability of poorly water-soluble drugs. Their hydrophilic outer surface and relatively hydrophobic internal cavity enable the formation of inclusion complexes with suitable drug molecules, thereby modifying important physicochemical and biopharmaceutical properties. However, the selection of an appropriate cyclodextrin, optimization of drug–cyclodextrin ratios and prediction of complexation efficiency can be challenging using conventional trial-and-error approaches. Recent advances in artificial intelligence (AI) and machine learning (ML) offer promising opportunities to address these challenges through data-driven prediction and formulation optimization. The present review highlights emerging applications of AI-enabled approaches in the development and optimization of cyclodextrin–drug inclusion complexes. The discussion focuses on the structural characteristics and complexation mechanisms of commonly used cyclodextrins, particularly α-, β- and γ-cyclodextrins, and their role in enhancing drug solubility and bioavailability. Furthermore, the potential application of AI/ML models for predicting drug cyclodextrin interactions, complexation efficiency, aqueous solubility and formulation performance is explored. The integration of computational modelling with experimental formulation approaches may reduce formulation development time, minimize resource intensive experimentation and facilitate rational selection of cyclodextrin systems. The relevance of Quality by Design (QbD) principles in identifying critical material attributes and critical process parameters for optimized cyclodextrin-based formulations is also discussed. In addition, the potential impact of improved drug exposure on therapeutic performance and safety is considered. Overall, the integration of cyclodextrin-based drug delivery with AI, computational modelling and QbD represents a promising strategy for developing optimized and patient-oriented pharmaceutical formulations. Such interdisciplinary approaches may contribute to faster, more predictable and scientifically driven drug-delivery development.

Keywords: *Cyclodextrins, Inclusion Complexes, Artificial Intelligence, Machine Learning, Drug Delivery, Bioavailability, Quality by Design.*

O-01/F/014 ORAL · OFFLINE

Green-Synthesized Myricetin-Loaded Carbon Dot Hydrogel for Diabetic Wound Healing: An Integrated In Vitro, In Silico and In Vivo Study

Lovish Sharma*, Naresh Kumar Rangra
Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India
Email: lovishsharma0178@gmail.com

Introduction: Diabetic wound healing is impaired by oxidative stress, inflammation and defective cellular regeneration, myricetin is a promising natural flavonoid, but limited aqueous solubility restricts its topical application.

Aim: This study aimed to develop a sustainable myricetin delivery system using biomass-derived carbon dots (C-dots), incorporate it into a topical hydrogel, and evaluate wound-healing potential through integrated in vitro, in silico and in vivo approaches.

Methods: C-dots were synthesized from orange-peel biomass by an autoclave-free hydrothermal process and characterized using spectroscopic, microscopic and colloidal techniques, myricetin was loaded by sonication-assisted non-covalent association, entrapment, release, antioxidant activity, HaCaT cytocompatibility and scratch closure were evaluated. Molecular docking, network pharmacology and molecular-dynamics analyses investigated potential mechanisms. The optimized formulation was incorporated into hydrogel and evaluated in an STZ-induced diabetic rat excision-wound model.

Results: Myricetin-loaded C-dots exhibited 5.2–8.8 nm TEM size and 81.4 nm hydrodynamic diameter (PDI 0.25), with ~62% entrapment efficiency and sustained 72-h release, HaCaT studies demonstrated an IC_{50} of ~19.7 µg/mL and concentration-dependent wound closure, reaching 76.48% at 100 µg/mL. In silico analyses supported multitarget interactions of myricetin with wound-healing-associated pathways. In vivo, 0.4% and 0.8% hydrogel formulations achieved 91.06% and 92.40% wound contraction on day 7, respectively, with ~99% closure by day 14. Histopathology demonstrated improved re-epithelialization and collagen deposition with reduced inflammatory infiltration.

Conclusion: The integrated C-dot–myricetin hydrogel demonstrated controlled delivery and promising antioxidant, cellular and diabetic wound-healing activity, supported by computational mechanistic evidence.

Keywords: *Carbon dots; Myricetin; Hydrogel; Diabetic wound; Wound healing; Molecular docking*

O-01/F/015 ORAL · OFFLINE

Cyclodextrin-Based Hydrogel Systems for Targeted Treatment of Vaginal Fungal Infections

Akhil Sharma*, Vema Kiran
Department of Pharmaceutics, ISF College of Moga-142001, Punjab, India.
Email: akhilsharma1922005@gmail.com

Vulvovaginal candidiasis (VVC) is a common fungal infection affecting a substantial proportion of women of reproductive age, while recurrent infections remain a major therapeutic challenge. Conventional treatments such as clotrimazole (Clo) often require repeated administration because of its poor aqueous solubility and rapid clearance from the vaginal site. To overcome these limitations, a novel hydrogel-based drug delivery system (DDS) was developed using β-cyclodextrin (β-CD) for clotrimazole encapsulation and halloysite nanotubes (HNT) for curcumin (Cur) delivery. The developed system was designed to improve drug solubility, vaginal retention, stability, and localized drug release. β-CD enhanced the aqueous solubility of Clo and contributed to prolonged antifungal activity, whereas HNT provided sustained release of Cur for up to 5 days, potentially providing anti-inflammatory, antioxidant, and antimicrobial effects. The hydrogel matrix further enhanced drug retention and stability, while the incorporation of HNT improved its mechanical strength and durability under moderate strain. Microbiological evaluation demonstrated strong antifungal activity, with inhibition zones of 39.2 ± 0.2 mm, 39.1 ± 0.2 mm, and 42.1 ± 0.2 mm against Candida krusei, Candida albicans 10231, and Candida parapsilosis 22019, respectively. Drug-release studies showed an initial rapid release of Clo during the first 30 min, followed by sustained release of Cur. Overall, the dual action hydrogel provides a localized approach for simultaneously addressing fungal infection, oxidative stress, and inflammation, with the potential to improve therapeutic efficacy and patient adherence.

Keywords: *Cyclodextrin, clotrimazole, Vulvovaginal candidiasis, Fungal infection, Candida Parapsilosis, Halloysite Nanotubes.*

O-01/F/016 ORAL · OFFLINE

Cyclodextrin-Based Drug Delivery: A Novel Approach for Enhancing Brain Delivery in Parkinson's Disease

Vanshika
ISF College Of Pharmacy, Moga-142001, Punjab, India
Email: joshivanshika895@gmail.com

Parkinson's disease (PD) is a progressive neurological disorder in which dopaminergic neurons in the substantia nigra gradually degenerate. This leads to a decrease in dopamine levels in the brain and causes major motor symptoms such as tremor, rigidity and bradykinesia. Although several medicines are available to control the symptoms of PD, delivering drugs effectively to the brain is still a major challenge because of the protective nature of the blood–brain barrier (BBB). Poor brain penetration, low water solubility and limited bioavailability of some drugs may reduce their therapeutic effectiveness. Cyclodextrins are widely studied pharmaceutical excipients that can be used to improve drug delivery. They have a hydrophilic outer surface and a relatively hydrophobic inner cavity. This unique structure allows cyclodextrins to form inclusion complexes with suitable drug molecules. As a result, they can improve the solubility, stability and dissolution of poorly water-soluble drugs. Cyclodextrins can also be incorporated into nanocarriers to improve drug uptake and support targeted drug delivery. Recent studies have investigated cyclodextrin-based nano-formulations and intranasal drug-delivery systems for improving the delivery of antiparkinsonian drugs such as bromocriptine. Intranasal administration is particularly interesting because it may provide a direct nose-to-brain pathway and can partially avoid the limitations of the systemic BBB. Therefore, cyclodextrin-based drug-delivery systems show promising potential for improving the delivery of antiparkinsonian drugs to the central nervous system. However, further optimization may help to establish brain targeting efficiency and evaluate long term safety and therapeutic efficacy.

Keywords: *Parkinson's disease, Cyclodextrin, Blood–brain barrier, Drug delivery, Nanocarriers, Nose-to-brain delivery.*

O-01/F/017 ORAL · OFFLINE

AI-Driven Cyclodextrin-Based Drug Delivery: Applications of Machine Learning and Molecular Modelling

Aakriti Kumari
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: pranita.kumari17@gmail.com

Cyclodextrins (CDs) are multi-functional pharmaceutical excipients which interact with drugs via inclusion complexes to increase aqueous solubility, dissolution, stability, and bioavailability of poorly water-soluble drugs. However, choosing appropriate CDs and optimizing drug-CD interaction by means of conventional experimental approaches may take much time and require additional resources. Modern advances in artificial intelligence (AI), machine learning (ML) and molecular modeling present prospective tools to accelerate the process of rationally designed cyclodextrin-based drug delivery system. This review describes novel applications of AI and computational approaches to cyclodextrin studies. Machine learning models may predict drug solubility, complexing efficiency, binding affinity and formulation performance on the basis of molecular and physicochemical descriptors. Molecular docking could give information about host-guest interaction and possible orientation of the inclusion, while molecular dynamics simulation may estimate the stability of drug-CD complex. Combination of these computational approaches with experimental data and principles of Quality by Design (QbD) could significantly facilitate the process of formulation optimization and limit experimental screening. The review also considers application in poorly soluble drugs, natural compounds, nanomedicine and targeted drug delivery. Nevertheless, there are still some difficulties like limited number of available datasets, model interpretability, standardization and experimental validation. AI integrated cyclodextrin research is a promising way to more rapid and development of advance drug delivery systems.

Keywords: *Cyclodextrins, artificial intelligence, machine learning, molecular modelling, inclusion complex, Drug delivery, QbD*

O-01/F/018 ORAL · OFFLINE

AI-Assisted Optimization of Cyclodextrin-Based Pharmaceutical Formulations

Astha
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: asthakapoor03@gmail.com

The inclusion complexation technology based on cyclodextrins (CDs) is a widely used approach employed in pharmaceutical development of poorly water-soluble drugs to increase their aqueous solubility, dissolution, stability and bioavailability by forming host–guest complexes. Nevertheless, the cyclodextrin-based formulation optimization requires consideration of several factors that include the type and amount of CDs, drug:CD ratio, complexation method, complexation efficiency, formulation properties and others. Therefore, the traditional optimization methods based on trials and errors can be rather costly and long-lasting. On the other hand, artificial intelligence (AI) and machine learning (ML) can become a promising tool to assist formulation optimization by analyzing and predicting complex relations between formulation variables and the product properties. The possibilities of AI-assisted formulation optimization are discussed as applied to cyclodextrin based formulations. Machine learning models can use experimental and physicochemical datasets to predict various parameters like enhancement of solubility, complexation efficiency, dissolution properties and formulation performance. Molecular docking and molecular dynamics analysis can give additional information about the interactions between drug molecules and cyclodextrin hosts. At the same time, the integration of the mentioned models with the Quality by Design concept (QbD) can help identify critical process parameters. Limitations, including issues with data, model validation, interpretation and confirmation with experiments, are also discussed.

Keywords: *Cyclodextrins, artificial intelligence, machine learning, formulation optimization, molecular modelling, QbD, drug delivery.*

O-01/F/021 ORAL · OFFLINE

Cyclodextrin-Based Drug Delivery Systems: Advancing Bioavailability and Therapeutic Efficacy

Dr.Shaikh Mehmood Dawood
Department of Pharmacology & Toxicology, Aurangabad Pharmacy College, Mitmita, Chh.Sambhajinagar (Aurangabad)-431002 Maharashtra India.
Email: mehmoodpharma99@gmail.com

Poor aqueous solubility remains one of the major challenges in the development of effective pharmaceutical formulations, often resulting in reduced drug absorption and low bioavailability. Cyclodextrins (CDs), a family of cyclic oligosaccharides, have emerged as versatile pharmaceutical excipients capable of enhancing the solubility and bioavailability of poorly water-soluble drugs through inclusion complex formation. The unique molecular structure of cyclodextrins, characterized by a hydrophobic inner cavity and hydrophilic outer surface, enables them to encapsulate drug molecules and improve their physicochemical properties.

This study reviews the role of cyclodextrins and their derivatives, including β-cyclodextrin, hydroxypropyl-β-cyclodextrin (HP-β-CD), and sulfobutyl ether β-cyclodextrin (SBE-β-CD), in enhancing drug dissolution, stability, permeability, and therapeutic efficacy. Various complexation techniques such as kneading, co-precipitation, spray drying, and freeze drying are discussed with respect to their impact on drug delivery performance. Several case studies demonstrate significant improvements in the oral bioavailability of poorly soluble drugs following cyclodextrin complexation.

The findings highlight cyclodextrins as effective carriers for overcoming solubility-related limitations and improving drug absorption. Their ability to enhance bioavailability while maintaining safety and formulation flexibility makes them valuable tools in modern pharmaceutical development. Continued research into novel cyclodextrin derivatives and advanced drug delivery systems is expected to further expand their applications in improving therapeutic outcomes.

Overall, cyclodextrin-based delivery systems represent a promising and adaptable platform for overcoming bioavailability barriers and improving therapeutic outcomes. Continued innovation in molecular design, formulation engineering, and nanotechnology is expected to strengthen the role of cyclodextrins in next-generation pharmaceutical and phytopharmaceutical delivery.

Keywords: *Cyclodextrin, Bioavailability, Inclusion Complex, Drug Solubility, Drug Delivery, Pharmaceutical Formulation.*

O-01/F/022 ORAL · OFFLINE

Reimagining Cyclodextrins: From Passive Excipients to Active Therapeutic Agents

Anubhav Sharma, Yaksham Garg, Pinal Chaudhari
Amity Institute of Pharmacy, Amity University Punjab, Mohali-140306
Email: anubhavsh15@gmail.com

Cyclodextrins (CDs), including both their parent forms and derivatives, have been recognized for an extended period as essential functional excipients within the pharmaceutical industry. Numerous formulations based on cyclodextrins are currently available in the market. Their effectiveness is due to their unique toroidal structure, which features a hydrophilic outer surface and a hydrophobic inner cavity. The hydrophobic inner cavity encapsulates poorly water-soluble, lipophilic drug molecules, thereby improving their solubility, stability, and bioavailability. However, recent advancements have altered our understanding of these molecules, transforming them from passive drug carriers into active therapeutic agents. New findings reveal that cyclodextrins have inherent medicinal properties, enabling them to directly interact with biological membranes, influence lipid balance, and sequester lipid species, such as cholesterol and sphingolipids, which are relevant in different diseases. Our topic highlights two key therapeutic areas where CDs show significant potential as therapeutic agents: neurodegenerative diseases, including Alzheimer's and Parkinson's, and cardiovascular diseases. Cyclodextrins, particularly hydroxypropyl-β-cyclodextrin (HP-β-CD), alleviate Alzheimer's disease by reducing cell membrane cholesterol accumulation, thereby lowering amyloid-beta (Aβ42) production and enhancing clearance mechanisms, which improve cognitive deficits and reduce amyloid plaque deposition in models of the disease. Cyclodextrin, particularly HP-β-CD, exerts anti-atherosclerotic effects by solubilizing and promoting the removal of cholesterol crystals from plaques, thereby reducing cholesterol-induced inflammation through modulation of complement activation and suppressing inflammatory cytokine responses. These examples collectively demonstrate a shift in perspective that CDs are not just adaptable excipients but also active compounds with direct therapeutic benefits positioning CDs at the forefront of the next generation of medicines.

Keywords: *Cyclodextrins, Hydroxypropyl-β-CD, Alzheimer's disease, Parkinson's disease, atherosclerosis.*

O-01/F/023 ORAL · OFFLINE

Cyclodextrin Complexes: From Formulation Innovation to Market Expansion

Anubhav Sharma, Yaksham Garg*, Poonam Arora and Sandeep Arora
Amity Institute of Pharmacy, Amity University Punjab, Mohali-140306
Email: yakshamgarg7@gmail.com

Cyclodextrins are highly valued for their ability to enhance the solubility, stability, and bioavailability of active ingredients. Pharmaceutical companies utilize these complexes to improve drug delivery systems, as they enable the encapsulation of hydrophobic compounds, enhancing their therapeutic efficacy. In the food and beverage sector, cyclodextrin complexes are increasingly used to improve product stability and preserve flavour integrity, which is driving demand across various industries.

Technological advancements in cyclodextrin production and growing regulatory acceptance is fuelling the growth of this molecule in market. Manufacturers are focusing on expanding their market presence through investments in production technologies and strategic partnerships across key industries. According to a report by Future Market Insights, the global value of the cyclodextrin complexes market was worth approximately USD 18.2 million in 2025 and is projected to reach USD 43.3 million by 2035. There is also a growing demand for the powdered form of the product and its application in skincare products. In addition, the report predicts that the Indian market will witness the second-highest compound annual growth rate (CAGR) over the next decade. The report notes that market growth will be attributed to the escalating demand for novel dosage forms and advanced drug delivery systems as well as the need for improved formulations to address the poor water solubility of numerous active pharmaceutical ingredients. Increased regulatory support and consumer awareness of the benefits of cyclodextrin complexes in improving product functionality are further supporting their adoption. Therefore, the use of cyclodextrins in the pharmaceutical and related industries is anticipated to increase.

Despite these growth drivers, high production costs and the complexity of large-scale manufacturing can limit the accessibility of cyclodextrin complexes. These constraints can be overcome adoption of innovative solutions and technological advancements, fuelling further growth in the market.

Keywords: *Cyclodextrins; Inclusion Complexes; Host–Guest Interaction; Drug Delivery; Solubility Enhancement; Bioavailability; Pharmaceutical Formulation.*

O-01/F/024 ORAL · OFFLINE

Cyclodextrins: Pharmaceutical Applications, Drug Delivery Systems and Safety Perspectives

Utkarsh[1], Aman Kumar[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, GT Road, Moga–142001, Punjab, India*

Email: uksh164@gmail.com

Introduction: Cyclodextrins (CDs) are cyclic oligosaccharides, whose interior is hydrophobic and whose exterior is hydrophilic, which facilitates host–guest complex formation. They have been proven to be versatile as pharmaceutical excipients, having the ability of improving the aqueous solubility, stability, dissolution, bioavailability and delivery efficiencies of poorly soluble drugs.

Methodology: The review will synthesize information on structural features, type, enzymatically-made CDs, transglycosylation reactions, pharmacopeutically-applicable, targeted drug delivery and dermopharmaceutically-applicable CDs, their structural characterization, and the toxicological safety and regulatory aspects of CDs.

Results: CDs are produced by transglycosylation reactions mediated by Cyclodextrin glucanotransferase (CD-gT), among which cyclization is the main reaction, using starch as raw material. The physicochemical and functional properties of natural α-, β- and γ-CDs differ considerably from each other and semisynthetic derivatives, including hydroxypropyl-β-CD, methyl CDs and sulfobutyl-ether β-CD. They are used as pharmaceuticals for enhancing solubility, taste masking, stabilizing agent and as components in nanocarrier based delivery along with targeted delivery system. Analytical techniques such as X-ray crystallography, nuclear magnetic resonance spectroscopy, molecular dynamics simulation and ion mobility mass spectrometry offer in-depth knowledge of host–guest interactions. Safety and regulatory acceptability are a function of CD type, dose, route and exposure.

Summary and Conclusion: CD represent multifunctional excipients having wide scope in advanced applications like of drug delivery and dermopharmaceutical applications. There is a need for further research in order to improve complexation, solve regulatory problems, and better understand molecular interactions to expand their therapeutic applications.

Keywords: *Drug solubility enhancement; Targeted drug delivery; Cyclodextrin inclusion complexes; Drug/dye-cyclodextrin complexes; Dermopharmaceutical applications; Cyclodextrins.*

O-01/F/025 ORAL · OFFLINE

Development and Characterization of β-Cyclodextrin and Methotrexate Inclusion Complex-Based Nanogel for the Management of Rheumatoid Arthritis

Abhishek Sharma[1], Balak Das Kurmi[1]

[1] *Department of Pharmaceutics, ISF College of Pharmacy Moga Punjab*

Email: Abhisheksharmapharmaceutics@gmail.com

Introduction: Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by synovial inflammation, joint destruction, and functional disability. Methotrexate (MTX) is a first-line disease-modifying antirheumatic drug; however, its long-term oral or parenteral administration is associated with systemic toxicity, poor solubility, and reduced patient compliance. Topical nanotechnology-based delivery systems may overcome these limitations, but poor drug solubilization and restricted skin penetration remain challenges. Therefore, the present study aimed to develop and evaluate a β-cyclodextrin (β-CD)-MTX inclusion complex-loaded nano emulsion gel for enhanced topical delivery of MTX in RA.

Methodology: The MTX-β-CD inclusion complex was prepared and characterized using phase-solubility analysis, FT-IR, DSC, XRD, TGA, and ^{1}H NMR. The optimized nanoemulsion was formulated using chaulmogra oil, Tween 80, and PEG 400 and subsequently incorporated into a gel matrix. The formulation was evaluated for physicochemical characteristics, in-vitro drug release, ex-vivo permeation, and in-vivo anti-arthritic activity using a Complete Freund's adjuvant-induced arthritis model.

Results: The optimized nano emulsion exhibited a droplet size of 199.1 ± 14.55 nm and zeta potential of −14.7 ± 1.45 mV. The nanoemulsion gel demonstrated sustained MTX release of 77.99 ± 0.79% over 24 h and enhanced ex-vivo permeation of 83.79 ± 2.63%, compared with 53.99 ± 2.22% for conventional gel. In-vivo evaluation showed improvement in inflammatory symptoms and joint integrity.

Summary and Conclusion: The developed β-CD-MTX nano emulsion gel enhanced topical MTX delivery, sustained drug release, improved permeation, and demonstrated promising anti-arthritic activity, indicating its potential to improve therapeutic efficacy while reducing systemic exposure associated with conventional MTX therapy.

Keywords: *Rheumatoid arthritis; Methotrexate; β-Cyclodextrin; Nanoemulsion gel; Topical drug delivery.*

O-01/F/026 ORAL · OFFLINE

Host–Guest Inclusion Complex of β-Cyclodextrin with Biogenic Silver Nanoparticles: Structural Insights and Biological Performance

Avinash Kumar Pathak, Dr. Manisha Sharma *

Institute of Applied Sciences, Mangalayatan University, Aligarh-212146, Uttar Pradesh, India
Email: sharmamani21@gmail.com, 20231867_avinash@mangalayatan.edu.in

Silver nanoparticles (AgNPs) have garnered significant attention due to their potent antimicrobial, antioxidant, and catalytic properties. Functionalization with β-cyclodextrin (β-CD), a cyclic oligosaccharide with a hydrophobic cavity and hydrophilic exterior, enhances nanoparticle stability, dispersibility, and bioactivity. This study reports the synthesis of β-CD-capped AgNPs using a green reduction approach and presents their comprehensive physicochemical and biological characterization. Analytical techniques including UV–Visible spectroscopy, Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), and transmission electron microscopy (TEM) were employed. The synthesized nanoparticles exhibited spherical morphology, uniform size distribution (~10–50 nm), and enhanced stability. Bioactivity studies confirmed significant antimicrobial and antioxidant properties. The results demonstrate the potential of β-CD-functionalized AgNPs in biomedical and pharmaceutical applications.

Keywords: *Antimicrobial, Antioxidant, Catalytic properties, β-cyclodextrin (β-CD), Nyctanthes arbor-tristis*

P-01/F/001 POSTER · OFFLINE

AI-Driven Design of Cyclodextrin-based Drug Delivery Systems: Current Advances, Challenges and Future Perspectives

Mehak Dhand, Dr. Vema Kiran

Department of Pharmaceutics, ISF college of Pharmacy, Moga-142001, India
Email: 2504008@isfcp.org

Cyclodextrins (CDs) are versatile cyclic oligosaccharides which form numerous inclusion complexes with poorly water-soluble drugs to enhance solubility, stability, bioavailability and safety of such drugs. The advent of artificial intelligence (AI) particularly machine learning (ML) integrated with molecular modelling has revolutionized drug delivery systems from traditional trial-and-error phase to a new predictive and mechanism-based development. This review aims to examine the existing formulation strategies for CD formulations, difficulties as well as scope for future research in this field using AI applications. It covers binary/ternary cyclodextrin inclusion complexes, quantity structure activity/property relationship (QSAR/QSPR) models, molecular docking, molecular dynamic simulations, ML-based prediction of binding affinity, drug formulation attributes, physiologically based pharmacokinetic (PBPK) modelling and smart drug delivery. Recent studies have shown that gradient boosting was able to predict complexation free energy with a mean absolute error of 1.38 kJ/mol while random forest models were able to predict the ternary formulation performance with an R2 as high as 0.887. Additionally, AI also enables selection of suitable excipients based on molecular properties, rational identification of suitable cyclodextrin derivatives such as γ-CD, DM-β-CD, HP-β-CD. Despite this progress, it is hindered by incomplete datasets, incomplete understanding of model interpretability, validation procedures, regulatory and clinical translation pathways. Overall, the field is rapidly evolving towards addressing the need for synergy between data-driven learning and physics-based simulations, FAIR (findable, accessible, interoperable and reusable) data principles and experimental validation with significant potential to boost the rational design and successful clinical translation of next generation CD-based drug delivery systems.

Keywords: *Cyclodextrin, drug delivery, artificial intelligence, inclusion complex, molecular design, modelling.*

P-01/F/002 POSTER · OFFLINE

Cyclodextrin-Based Nanotechnology for Targeted Drug Delivery: Integrating Molecular Modelling and Artificial Intelligence for Next-Generation Therapeutics

Ruqia Bano*

Bachelor of Pharmacy, ISF College of Pharmacy, Moga, Punjab, India-142001
Email: mirruqia926@gmail.com

Cyclodextrin-based nanotechnology has emerged as a promising approach for addressing critical challenges in conventional drug delivery, including poor aqueous solubility, inadequate stability, limited bioavailability, and non-specific drug distribution. The unique molecular recognition and host–guest complexation properties of cyclodextrins enable the development of advanced nanocarriers capable of improving drug solubilization, protection, controlled release, and targeted delivery. Recent advances in molecular modeling and artificial intelligence (AI) offer new opportunities to accelerate the rational design and optimization of cyclodextrin-based delivery systems. Molecular docking and molecular dynamics simulations can provide insights into cyclodextrin–drug interactions, binding affinity, complex stability, and structural behavior, while machine learning approaches can identify complex structure–property relationships and predict formulation performance. Integrating these computational technologies with cyclodextrin nanotechnology may reduce experimental screening requirements, improve formulation optimization, and facilitate the development of more precise and efficient therapeutic delivery platforms. This emerging convergence of nanotechnology, computational modeling, and AI represents a transformative strategy for next-generation drug delivery and has considerable potential for advancing targeted and personalized therapeutics.

Keywords: *Cyclodextrins; Nanotechnology; Artificial Intelligence; Molecular Modeling; Targeted Drug Delivery.*

P-01/F/003 POSTER · OFFLINE

Clinical, Physicochemical, and Pharmacokinetic Efficacy of Cyclodextrin-Based Antiviral Delivery Systems for Bell's Palsy and Cranial Neuropathies

Babanpreet Singh Babhrah

Bachelor of Pharmacy, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: babanpreetsinghbabhrah@gmail.com

Background: Bell's palsy is the most common cranial mononeuropathy and accounts for approximately 60–75% of cases of acute unilateral facial paralysis. Reactivation of latent neurotropic herpesviruses, particularly herpes simplex virus type 1 (HSV-1) and varicella-zoster virus (VZV), has been implicated in inflammation, edema, and subsequent compression of the facial nerve within the fallopian canal. Although antiviral therapy is frequently used, conventional delivery of acyclovir is limited by physicochemical and pharmacokinetic constraints, including poor aqueous solubility and low oral bioavailability.

Objectives: This review evaluates the potential of cyclodextrin-based supramolecular drug-delivery systems to overcome physicochemical and pharmacokinetic limitations of antiviral therapy for Bell's palsy and related cranial neuropathies.

Methods: Published evidence concerning cyclodextrin-based formulations, antiviral solubilization, stabilization, intranasal nose-to-brain delivery, and pharmacokinetic enhancement was examined. Particular emphasis was placed on hydroxypropyl-cyclodextrin (HP-β-CD) and sulfobutyl ether-β-cyclodextrin (SBE-β-CD), as well as intranasal delivery strategies targeting cranial nerve-associated regions.

Results: Cyclodextrin complexation can improve aqueous solubility and physicochemical stability of poorly soluble antiviral agents, with reported increases in drug solubility of up to approximately 16-fold. Intranasal delivery may provide enhanced drug exposure in trigeminal and facial nerve-associated regions through olfactory and perineural pathways. One reported intranasal system demonstrated an absolute bioavailability of 60.72%, exceeding conventional oral delivery in the investigated model.

Conclusion: Cyclodextrin-enabled delivery systems, particularly when integrated with intranasal approaches, represent a promising strategy for improving antiviral exposure and local therapeutic concentrations in Bell's palsy and other cranial neuropathies. However, clinical validation remains necessary before their therapeutic advantages can be established.

Keywords: *Bell's palsy; Cyclodextrins; Acyclovir; Antiviral Delivery; Intranasal Delivery; Nose-To-Brain Delivery; Cranial Neuropathy; Pharmacokinetics; Bioavailability; Herpes Simplex Virus.*

P-01/F/004 POSTER · OFFLINE

Preparation and Evaluation of Silibinin Inclusion Complexes with β-Cyclodextrin Derivatives: Experimental and In Silico Investigation

Tanisha Rangnekar*, Rajasekhar Reddy Alavala, Vaishali Londhe

Department of Pharmaceutics, Shobhaben Pratapbhai Patel School of Pharmacy and Technology Management, SVKM's NMIMS V.L. Mehta Rd, Vile Parle West, Mumbai, Maharashtra, India 400056

Email: tanisharangnekar@gmail.com

Introduction: Silibinin (SLB), a phytoconstituent belonging to Biopharmaceutics Classification System Class II and IV, has poor aqueous solubility and extensive first-pass metabolism, resulting in low bioavailability.

Aim & Objectives: The study aims to improve SLB solubility through inclusion complexation with β-cyclodextrin (β-CD) derivatives. The specific objectives were to (i) screen and identify the most suitable β-CD derivatives using in silico docking studies (ii) prepare and characterize complexes using different techniques.

Methods: Ten hydrophilic β-CD derivatives were screened by molecular docking using AutoDock based on docking scores. Phase solubility studies determined the stability constant (Ks) and complexation efficiency (CE) of selected derivatives. Inclusion complexes were prepared by physical mixing, kneading and spray drying (SD). FTIR, SEM and DSC studies were done to characterize the prepared complex.

Results: SBEβCD exhibited the highest docking score (−6.21 kcal/mol), followed by HPβCD (−5 kcal/mol). Phase solubility studies showed the highest Ks (840 M^{-1}) and CE (0.093) for SBEβCD. SD complexes of SBEβCD and HPβCD demonstrated 16-fold (562 µg/ml) and 7.3-fold (259 µg/ml) higher saturation solubility, respectively, than pure SLB (35.34 µg/ml). FTIR, SEM, and DSC confirmed complexation with selected β-CD derivatives.

Summary: In silico docking identified HPβCD and SBEβCD to be complexed with SLB. Phase solubility indicated 1:1 complex formation, with the SD complexes having the highest saturation solubility.

Conclusion: The SD complexes with SBEβCD and HPβCD showed enhanced saturation solubility, supported by in silico docking and physicochemical characterization. This inclusion complex represents a promising strategy to overcome the solubility-limited bioavailability of SLB.

Keywords: *Silibinin; β-cyclodextrin; Inclusion complex; Molecular docking; Phase solubility.*

P-01/F/005 POSTER · OFFLINE

Cyclodextrin – Based Drug Delivery Systems for Cancer Therapy: A review of Inclusion Complexes and Targeted Delivery

Thashan Garg*

Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India

Email: 2439602@isfcp.org

Introduction: Cancer continues to be an important target for therapy because of poor solubility, instability, low bioavailability and toxicity related to some anticancer agents. Cyclodextrins are ring like cyclic carbohydrates capable of forming inclusion complexes with drug molecules drugs via hydrophobic core. This is beneficial way to enhance drug delivery process.

Aim & Objectives: To review application of Cyclodextrin for anticancer drug delivery, particularly their use in improving drug solubility, stability and delivery to tumor sites.

Methods: Published literature on Cyclodextrin – based anticancer drug delivery, inclusion complexes, modified Cyclodextrin, nanoparticles and targeted delivery systems was reviewed and summarized.

Results: Studies have shown that Cyclodextrin complexation can improve the apparent solubility, dissolution and stability of several poorly water-soluble anticancer drugs. Modified Cyclodextrins have further increased their usefulness in pharmaceutical formulations. Cyclodextrin also incorporated into nano – particles, polymeric systems and other advanced carriers to achieve improved and controlled drug delivery. Various anticancer agents including paclitaxel, curcumin, comptothecin, doxorubicin and cisplatin have been used investigating using Cyclodextrin based systems.

Summary and Conclusion: Cyclodextrins provide a promising and versatile approach for improving the delivery of anticancer drugs. Their use in advanced delivery systems enhance drug performance and therapeutic effectiveness. Further research is required to the clinical potential and safety.

Keywords: *Cyclodextrins; Anticancer drugs; Nano-carriers; Inclusion Complexes; Drug Delivery.*

P-01/F/006 POSTER · OFFLINE

Cyclodextrin Nanosponges for Space-Stable Therapeutics: A Modular Protective Strategy Against Radiation and Microgravity

Madhvi Jha*, Komal[1]
[1]*Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: 2315743@isfcp.org

Introduction: Long-duration spaceflight presents challenges for maintaining the stability and therapeutic performance of labile pharmaceuticals under radiation, prolonged storage and altered colloidal behaviour in microgravity. Cyclodextrins (CDs), through their host–guest cavities and tuneable cross-linked networks, can provide a protective molecular microenvironment and offer a promising foundation for space-adapted drug delivery.

Aim & objectives: To propose CD nano sponges as a modular stabilization platform for therapeutics intended for prolonged spaceflight, with LNP–mRNA systems as a representative high-sensitivity application.

Methods: A conceptual CD nano sponge architecture is proposed to provide molecular interactions and three-dimensional confinement around therapeutic formulations. The platform could be evaluated under simulated radiation, microgravity and thermal stresses, assessing drug/mRNA integrity, particle size, encapsulation efficiency, physicochemical stability and functional activity.

Results: The proposed architecture may mitigate aggregation, phase instability and radiation-associated degradation while preserving therapeutic integrity. CD composition, cross-linking density and network characteristics could be tuned according to formulation requirements.

Summary: CD nano sponges may complement conventional stabilization approaches while offering an adaptable protective environment for diverse therapeutics.

Conclusion: This concept provides a testable framework for developing space-stable pharmaceutical systems and reducing dependence on conventional cold-chain strategies during long-duration missions.

Keywords: *Cyclodextrin; Nano sponges; Drug delivery; Spaceflight; Radiation; Microgravity.*

P-01/F/007 POSTER · OFFLINE

Controlled Drug Delivery System: Current Status and Future Directions

Kajal Gupta
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2439431@isfcp.org

Drug delivery systems are designed to deliver an active pharmaceutical ingredient in a manner that produces the desired therapeutic effect. Conventional dosage forms such as tablets, capsules, syrups, and ointments may have limitations including variable bioavailability, fluctuations in plasma drug concentration, and difficulty in maintaining prolonged drug release. Therefore, controlled drug delivery systems have been developed to provide drug release at a predetermined rate and, when possible, deliver the drug to the desired site, thereby improving therapeutic efficacy and safety. Over the last two decades, significant advances have been made in controlled drug delivery, ranging from conventional and microscale systems to nanoscale, targeted, and intelligent delivery approaches. This review provides an overview of drug delivery systems with emphasis on pharmacokinetic principles and the limitations of conventional dosage forms. It further discusses the design, classification, and mechanisms of controlled drug delivery systems. Recent developments in nanodrug delivery, targeted delivery, and smart stimuli-responsive systems using intelligent biomaterials are also highlighted. Finally, the review discusses current challenges and future prospects in the field of controlled drug delivery.

Keywords: *Controlled release dosage forms, pharmacokinetics, nanodrug delivery, targeted drug delivery, stimuli-responsive systems, intelligent biomaterials.*

P-01/F/008 POSTER · OFFLINE

Cyclodextrins: Enhancing Drug Delivery, Solubility and Bioavailability for Modern Therapeutics with the help of cyclodextrins

Md Imteyaz
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315748@isfcp.org

Background: Many active pharmaceutical ingredients (APIs) exhibit low oral bioavailability due to poor aqueous solubility, chemical instability, and inadequate intestinal absorption. Cyclodextrin-based drug delivery systems have emerged as promising approaches to overcome these limitations and improve the therapeutic performance of poorly soluble drugs.

Methods: Cyclodextrins can form inclusion complexes by incorporating suitable drug molecules within their hydrophobic cavity. This approach can improve aqueous solubility, protect labile drugs from degradation, modify dissolution characteristics, and facilitate controlled drug release. It is particularly useful for poorly soluble BCS Class IV drugs and various nutraceutical compounds with limited intestinal absorption.

Results and Discussion: Cyclodextrin-based nanosponges provide a porous and versatile platform for drug encapsulation and controlled release. Similarly, cyclodextrin nanofibers offer polymer-free drug delivery systems with potential advantages in solubility enhancement and bioavailability. These systems may also reduce drug-related toxicity and undesirable side effects. Various analytical techniques, including spectroscopic, thermal, and structural methods, are useful for confirming inclusion complex formation and evaluating their physicochemical properties.

Conclusion: Cyclodextrin-based inclusion complexes, nanosponges, and nanofibers represent promising drug delivery platforms for improving solubility, stability, bioavailability, and therapeutic efficacy. Their potential applications in pharmaceuticals and nutraceuticals make them valuable approaches for the development of safer and more effective formulations.

Keywords: *Nano sponges; Bioavailability; Modern Therapeutics; Cyclodextrin; Nanofibers.*

P-01/F/009 POSTER · OFFLINE

β-Cyclodextrin-Based Functional Materials for PFAS Remediation: A Comparative Evaluation

Aakanksha Singla*, Dr. Nitin Verma
Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: aakanksha1001.mpharmchem25@chitkarauniversity.edu.in

Introduction: PFASs are persistent pollutants found in aquatic environments and requires efficient, recyclable and practically applicable remediation strategies. B-Cyclodextrin (β-CD) because of its hydrophobic cavity, host-guest interaction ability and tunable nature, has recently emerged as a novel system for PFAS adsorption.

Aim & Objectives: The main objective of this study was comparative analysis of four functional materials based on β-cyclodextrin for PFAS removal, paying particular attention to the structure of materials and their adsorption properties.

Methods: Four representative published studies involving β-CD covalent organic frameworks (COFs), tunable porous β-CD polymers, a β-CD/alginate/multi-walled carbon nanotube (MWCNT) hybrid hydrogel, and a macroporous cyclodextrin monolith were systematically compared using their reported experimental conditions and performance parameters.

Results: β-CD-COFs showed very fast adsorption and equilibrium was reached within 2 min. The adsorption capacities were 0.33-1.51 mmol/g for different Perfluoroalkanesulfonates. The tunable porous β-CD polymer was able to remove almost 100% of eight anionic PFASs at 1 μg/L each with only 1 mg/L of adsorbent. The hybrid hydrogel removed 91.6% of PFOS under optimized batch conditions, and the macroporous cyclodextrin monolith provided continuous-flow treatment of 150 L of PFAS-spiked water with 47 mg sorbent and can be regenerated for subsequent treatment.

Summary & Conclusion: The comparisons suggest that the pore structure, β-CD functionalization, composition and morphology of the materials play an important role in the removal of PFAS. In summary, all of the above studies demonstrate the use of β-CD-based functional materials as an effective tool in developing a robust approach towards the remediation of PFAS. The comparison would help in selecting the right materials in the future.

Keywords: *β-cyclodextrin; PFAS; adsorption; functional materials; water remediation; cyclodextrin monolith*

P-01/F/010 POSTER · OFFLINE

Cyclodextrin-Based Drug Delivery: Improving Solubility, Stability and Bioavailability

Phulvijay*, Lav Goyal
ISF College of Pharmacy, Moga - 142001, Punjab, India

Cyclodextrin (CD) is cyclic oligosaccharides derived from starch and are widely used today in pharmaceutical drug delivery. Their unique structure consists of a hydrophilic outer surface and a relatively hydrophobic inner cavity, allowing them to form inclusion complexes with suitable drug molecules. Many therapeutic drugs have poor aqueous solubility, low stability, unpleasant taste, or limited bioavailability, which can reduce their therapeutic effectiveness. Cyclodextrin-based drug delivery systems provide a useful approach to overcome these limitations. By forming inclusion complexes, cyclodextrin can improve the apparent solubility and dissolution of poorly water-soluble drugs and protect drug molecules from environmental degradation. They may also improve drug stability, reduce irritation, mask unpleasant odor or taste, and support-controlled drug release. Commonly studied cyclodextrin include α-cyclodextrin, β-cyclodextrin, γ-cyclodextrin, and modified derivatives such as hydroxypropyl-β-cyclodextrin and sulfobutyl ether-β-cyclodextrin. Different cyclodextrin can be selected according to the size, structure, and physicochemical properties of the drug. Cyclodextrin complexes can be incorporated into tablets, capsules, oral liquids, nasal preparations, ophthalmic formulations, and other drug delivery systems to improve patient acceptability and therapeutic performance. Their ability to enhance the pharmaceutical performance of drugs has increased their importance in formulation development. This poster clearly highlights the basic structure and mechanism of cyclodextrin, methods of drug inclusion, major pharmaceutical applications, and their advantages in improving drug delivery. Cyclodextrin-based systems therefore represent a simple and versatile strategy for enhancing the performance of challenging drug molecules.

Keywords: *Cyclodextrin, Inclusion complex, Drug delivery system, Solubility enhancement, Bioavailability.*

P-01/F/011 POSTER · OFFLINE

Cyclodextrins in Skin Applications: From Molecular Architecture to Formulation Performance and Safety

Piyush Gupta*, Lovekesh Singh
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: risingyoungster.9878@gmail.com

Cyclodextrins (CDs) have proven to be useful and highly efficient encapsulating platforms to overcome significant formulation problems with active ingredients, especially botanical ingredients, in cosmetic/dermatologic formulations. This review critically examines the interactions of CD molecular architecture, host–guest complexation, skin-barrier interactions, formulation performance and safety. Native and modified CDs differ in their structural properties, which affect their solubility, complexation, release and skin compatibility, and the hydrophobic cavity of the CDs can accommodate poorly water soluble and chemically unstable bioactives. Botanical phenolic acids, flavonoids and polyphenols, essential oils, terpenoids, and complex plant extracts have shown that when used appropriately, they can enhance dispersion, physicochemical stability, controlled release, and in selected formulations, skin retention and/or penetration. The delivery of the guests via the skin is, however, not completely controlled by complexation and depends on the type of CD, the nature of the guest molecule, the ratio of CD/guest, the stability of the complex, the method of preparation, the composition of the vehicle and the intended depth of delivery. Irritation, sensitization, phototoxicity, barrier integrity and exposure conditions, especially in the case of membrane active derivatives, are also factors to be taken into account in the assessment of safety. Furthermore, the review identifies methodological variability among the available studies and points to the necessity of having a standardized characterization, quantitative formulation evaluation, clinically relevant safety evaluation and validated skin models. As a whole, CDs are not panaceas, but nonetheless they are means to formulate rationally in order to produce stable, effective and skin compatible next generation cosmetic and dermatologic products.

Keywords: *Cyclodextrins; Skin penetration; Molecular encapsulation; Botanical extracts; Dermocosmetics.*

P-01/F/012 POSTER · OFFLINE

Emerging Applications of Artificial Intelligence and Quality by Design in Cyclodextrin-Based Drug Delivery

Abhijeet Kumar*, Komal
Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2439392@isfcp.org

Cyclodextrin (CD)-based drug delivery systems offer significant advantages for improving the solubility, stability, bioavailability and controlled release of poorly water-soluble drugs through host–guest complexation. However, formulation development can be complex because of multiple interacting formulation and process variables. Artificial Intelligence (AI) and Quality by Design (QbD) provide emerging approaches for systematic formulation optimization, prediction and quality improvement. To explore the applications of AI and QbD in the design, development and optimization of cyclodextrin-based drug delivery systems, with emphasis on formulation prediction, process optimization, quality attributes and enhanced therapeutic performance. Recent literature on CD-based drug delivery, machine learning, predictive modelling, Design of Experiments (DoE), risk assessment and QbD principles was evaluated. Applications of AI for predicting drug–CD interactions, formulation characteristics and optimizing critical material and process parameters were assessed. Integration of AI and QbD is expected to facilitate data-driven formulation optimization, prediction of critical quality attributes, reduction of experimental trials and improved reproducibility. These approaches may support efficient development of CD complexes, nanoparticles and other advanced CD-based delivery systems.AI-integrated QbD represents a promising strategy for transforming cyclodextrin-based drug delivery from empirical development toward predictive, systematic and patient-oriented formulation design. Further validation, standardized datasets and regulatory integration are required for broader pharmaceutical translation.

Keywords: *Cyclodextrin, Artificial Intelligence, Quality by Design, Machine Learning, Drug Delivery, Formulation Optimization*

P-01/F/013 POSTER · OFFLINE

From γ-Cyclodextrin to Sugammadex: Rational Molecular Design and Host–Guest Recognition of Rocuronium

Manash Jyoti Sharma
School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan, India

manashthapalia88@gmail.com

Introduction: Cyclodextrins have emerged as versatile molecular hosts capable of forming inclusion complexes with hydrophobic drug molecules. Sugammadex represents a landmark application of this concept, being a chemically modified γ-cyclodextrin specifically engineered to encapsulate steroidal neuromuscular blocking agents, particularly rocuronium. To review the rational molecular design of sugammadex from γ-cyclodextrin and elucidate the structural and physicochemical basis of its selective host–guest recognition of rocuronium. Relevant literature was identified through PubMed, Scopus, Web of Science and Google Scholar using combinations of the terms “sugammadex”, “γ-cyclodextrin”, “rocuronium”, “inclusion complex”, “host–guest interaction” and “molecular recognition”. Literature addressing cyclodextrin modification, structure–activity relationships, molecular interactions, complexation and clinical translation was critically reviewed. Evidence indicates that rational modification of γ-cyclodextrin introduced anionic carboxylate groups around the hydrophobic cavity, improving aqueous solubility and affinity for rocuronium. Sugammadex forms a highly stable 1:1 host–guest complex through complementary hydrophobic and electrostatic interactions, sequestering rocuronium and reducing its free concentration at the neuromuscular junction. Recent computational studies using molecular dynamics and free-energy approaches further support the structural and energetic basis of this complexation and demonstrate the potential of computational modelling for cyclodextrin design. The literature establishes sugammadex as a successful example of structure-guided cyclodextrin modification, where molecular recognition translates directly into therapeutic action. Sugammadex exemplifies the successful translation of rational cyclodextrin engineering and supramolecular host–guest recognition into a clinically effective therapeutic strategy. Understanding its molecular design may provide a framework for developing next-generation cyclodextrin-based therapeutic systems.

Keywords: *Sugammadex; γ-cyclodextrin; rocuronium; inclusion complex; host–guest recognition; molecular design*

P-01/F/014 POSTER · OFFLINE

Cyclodextrin-Based Drug Delivery Systems: Applications in Colon Cancer Therapy

Anushka
ISF college of pharmacy, Moga, Punjab, India
Email: choudharyanushka4310@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides with a hydrophilic outer surface and a hydrophobic inner cavity, enabling them to form inclusion complexes with a wide range of poorly water-soluble drugs. This property has made them valuable excipients in pharmaceutical formulation, improving drug solubility, stability, and bioavailability while reducing toxicity and side effects. In recent years, cyclodextrin-based carriers have gained particular attention in oncology, where site-specific and controlled drug release remain major challenges.For colon cancer treatment specifically, cyclodextrins offer a promising platform for colon-targeted drug delivery: their resistance to digestion by gastric and small intestinal enzymes, combined with their susceptibility to fermentation by colonic microbiota, allows for selective drug release at the tumor site while minimizing systemic exposure and off-target toxicity. Chemically modified cyclodextrins and cyclodextrin-polymer conjugates have been used to encapsulate chemotherapeutic agents such as 5-fluorouracil, curcumin, and irinotecan, enhancing their solubility, mucoadhesion, and cellular uptake in colonic tissue. Additionally, cyclodextrin nanoparticles and hydrogels have been explored for combination therapy and stimuli-responsive release triggered by pH or enzymatic conditions unique to the colon.This highlights the physicochemical basis of cyclodextrin inclusion complexation, summarizes current strategies for colon-targeted delivery, and discusses their potential to improve therapeutic outcomes, reduce dose-limiting side effects, and enhance patient compliance in colon cancer treatment. Continued research into cyclodextrin derivatization and formulation optimization may further advance their clinical translation as effective colon cancer drug delivery vehicles.

Keywords: *cyclodextrin, drug delivery, colon cancer, inclusion complex, targeted therapy, nanocarrier*

P-01/F/015 POSTER · OFFLINE

Cyclodextrin-Based Delivery Systems for Insulin and Pancreatic β-Cell Therapy in Diabetes

Md Kamil Reza
Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: mdk595666@gmail.com

Diabetes mellitus (DM) is a major global health challenge characterized by chronic hyperglycemia and associated microvascular and macrovascular complications. Conventional insulin therapy, particularly repeated subcutaneous injections, may cause pain, poor patient compliance, variable absorption, and inconvenience. Therefore, novel delivery approaches are required to improve therapeutic efficacy and patient quality of life. Cyclodextrins (CDs) are cyclic oligosaccharides with a hydrophilic outer surface and a hydrophobic inner cavity, enabling them to form inclusion complexes with therapeutic molecules. Their unique properties make them promising carriers for insulin delivery. CDs can improve insulin stability, solubility, protection from enzymatic degradation, and controlled release. Various CD-based systems have been explored for oral, nasal, buccal, and other mucosal routes. Furthermore, cyclodextrin-based nanoparticles and mucoadhesive carriers may enhance insulin absorption across biological barriers. Their potential application in pancreatic b-cell or islet delivery also provides an emerging approach for cell-based diabetes therapy. Research findings suggest that cyclodextrin-based delivery systems can enhance insulin stability and delivery efficiency, improve bioavailability, and support better glycemic control. Nanoparticle-based formulations may protect insulin from degradation and facilitate sustained or targeted delivery. CD-based carriers may also provide a protective environment for pancreatic b-cells or islets, potentially improving their delivery and therapeutic survival. Cyclodextrin-based delivery systems represent a promising strategy for advancing insulin and pancreatic b-cell therapy in diabetes. By addressing limitations of conventional insulin administration and supporting innovative cell-based approaches, CDs may improve therapeutic outcomes. However, further studies are required to establish their long-term safety, efficacy, scalability, and clinical applicability.

Keywords: *cyclodexin, insulin, diabetes Miletus, controlled release, nanoparticles*

P-01/F/016 POSTER · OFFLINE

Cyclodextrin and its Non-Formulary Uses

Abul Kalam*, Lav Goyal
ISF College of Pharmacy, Moga – 142001, Punjab, India
Email: abulkalam77911@gmail.com

Cyclodextrin (CDs are cyclic oligosaccharides produced from starch by the action of the cyclodextrin glycosyltransferase enzyme. They consist of glucose units linked by α-(1→4) glycosidic bonds. Cyclodextrin have a unique truncated-cone structure with a hydrophilic outer surface and a relatively hydrophobic inner cavity, enabling them to form inclusion complexes with a wide range of molecules. Because of these distinctive physicochemical properties, cyclodextrin have been extensively utilized as pharmaceutical excipients to improve the solubility, stability, bioavailability, and delivery of poorly water-soluble compounds. However, their applications extend considerably beyond conventional pharmaceutical formulations. This poster highlights the diverse non-formulary applications of cyclodextrin across industrial, environmental, agricultural, textile, and biotechnological fields. Cyclodextrin have been used for flavor stabilization, odor masking, cholesterol removal, and enhanced fragrance stability. Their ability to encapsulate and selectively interact with various compounds makes them useful for the removal of organic pollutants and toxic substances from water and soil. In agriculture, cyclodextrin can improve the stability, solubility, and controlled release of active substances, thereby supporting more efficient utilization of agricultural chemicals. They also have applications in the textile industry, where their inclusion-complex-forming ability can facilitate the incorporation and controlled release of functional substances. Furthermore, cyclodextrin have gained importance in biotechnology because of their biodegradability, low toxicity, and molecular recognition properties. These versatile characteristics continue to broaden the applications of cyclodextrin beyond pharmaceutical formulations, demonstrating their significance across multiple fields.

Keywords: *Cyclodextrin; Inclusion complexes; Industrial uses; Non-Formulary applications*

P-01/F/017 POSTER · OFFLINE

Computational Investigation of Cholesterol and 7-Ketocholesterol Complexation with Functionalized β-Cyclodextrins: Binding Thermodynamics and Conformational Dynamics

Anshul*, Dr. Tarun Kumar, Keshav Dhiman, Dr. Vinay Pandit
Department of Pharmaceutics, Laureate institute of Pharmacy, Kathog. Jawalamukhi, Distt Kangra (HP) 176031.
Email: anshulroy2005@gmail.com

Functionalized cyclodextrins serve as critical supramolecular carriers in pharmaceutical formulation, enhancing the solubility and stability of poorly water-soluble bioactive agents. Despite their therapeutic versatility, precise experimental determination of host guest binding thermodynamics remains technically demanding. Advanced molecular modelling provides an ideal complementary framework to capture atomistic dynamics and free-energy landscapes. This study aimed to characterize the molecular interactions, thermodynamic stability, and conformational kinetics of 1:1 inclusion complex formed between two key sterols (cholesterol and 7-ketocholesterol) and four modified beta derivatives featuring varied substitution patterns. Enhanced conformational sampling was conducted using guided meta dynamics simulations coupled with Potential of Mean Force (PMF) calculations. Methodological robustness was confirmed through quadruplicate independent trajectories for each complex and multi-technique post-processing evaluations. Comparative free-energy profiles were generated between full-cavity sampling and localized wide-rim cavity sampling. Simulations revealed a consistent conformational preference across all stable complexes, characterized by the sterol aliphatic tail projecting outward from the wider secondary rim of the cyclodextrin. The type, density, and spatial distribution of chemical modifications on the beta host exerted a definite influence on binding affinity. Significantly, restricting enhanced sampling to the wider cavity entrance generated binding free-energy values statistically equivalent to full-cavity mapping, while substantially decreasing computational convergence time and variance.

Keywords: *Computational Pharmaceutics, Metadynamics, Potential of Mean Force, Inclusion Complex, Sterol Delivery.*

P-01/F/018 POSTER · OFFLINE

Cyclodextrin-Based Controlled Drug Delivery: An AI-Assisted Approach

Anurag Dhiman* Archana Choudhary, Anchal Guleria, Vinay Pandit, Mahender Singh Ashawat
Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog
Email: anurag2562002@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides which can form host-guest inclusion complexes with drug molecules, and because of this, drug stability, solubility and absorption improved and also help in controlling drug release. CD-based systems like inclusion complexes, nanosponge, hydrogels and polymer conjugates can be used for immediate, sustained and targeted release. CD-based polymers can especially provide more regulated and prolonged release. We aim to use AI-assisted methods for rational design of cyclodextrin-based controlled drug delivery systems by combining machine learning with molecular modelling, so that CD-guest complexation can be predicted and formulation selection can be guided. Machine learning models were trained using molecular descriptors and experimental conditions to predict complexation free energy, supported by in silico affinity determination. The workflow combined Machine learning prediction, molecular dynamics and physiologically based absorption modelling. One study achieved A ternary andrographolide-CD formulation showed 2.2-fold and 5.3-fold higher drug release than commercial pills and crude drug. Other systems, including β-CD nanosponge hydrogels, resveratrol-CD microspheres and silymarin-β-CD complexes, also showed sustained drug release, indicating their usefulness for maintaining drug release over a longer period. Overall, AI-assisted modelling can help in developing CD-based systems with more tailored and prolonged drug release while reducing the experimental burden also provide a predictive and efficient way for rational design.

Keywords: *Cyclodextrins, controlled drug delivery, artificial intelligence, machine learning, molecular modelling*

P-01/F/019 POSTER · OFFLINE

Design, Characterization and Evaluation of Cyclodextrin Nanosponges for Enhanced Solubility and Controlled Drug Release

Aditya Rana*, Dr. Tarun Kumar, Keshav Dhiman, Dr. Vinay Pandit
Department of Pharmaceutics, Laureate institute of Pharmacy, Kathog. Jawalamukhi, Distt Kangra (HP) 176031.
Email: adityarana2904@gmail.com

In oral drug delivery, low water solubility and poor intestinal membrane transport frequently limit therapeutic efficacy. Cyclodextrin-based nano sponges (CDNSs) hyper-cross-linked polymeric networks composed of cyclodextrin units and interstitial nanochannels overcome native cyclodextrin limitations by improving the drug loading, chemical stability and release control. This study analyses the structural and physicochemical parameters that governs drug loading efficiency, aqueous solubility, and release kinetics in CDNS drug delivery platforms. Comparative analytical data like DLS, PXRD, DSC, FT-IR, NMR, phase solubility, and In-vitro dissolution models were evaluated across diverse drug CDNS complexes to establish structure property relationships. High-intensity homogenization technique was used in synthesis, particularly ultrasound-assisted processing that yields smaller, highly crystalline nano sponges with increased surface area and encapsulation efficiency. The molar cross-linking ratio (1: n) directly controls matrix rigidity, an optimal ratio (typically 1:4) maximizes drug solubilization and binding efficiency. Elevating cross-linking density transitions drug release behaviour was evaluated by means of Fickian diffusion model (Higuchi kinetics). Cross-linking density, binding-site accessibility, and chemical composition constitute the central framework controlling CDNS performance, confirming their versatility as tailor-made nanocarriers for targeted therapeutics.

Keywords: *cyclodextrin nano sponges (CDNS), drug delivery systems, inclusion complexation, solubility enhancement, release kinetics.*

P-01/F/020 POSTER · OFFLINE

Pharmaceutical Applications of Cyclodextrins: From Inclusion Complexation and Solubility Enhancement to Advanced Nanocarriers

Sudhanshu*, Dr. Tarun Kumar, Keshav Dhiman, Dr. Vinay Pandit

Department of Pharmaceutics, Laureate institute of Pharmacy, Kathog. Jawalamukhi, Distt Kangra (HP) 176031.
Email: sudhanshuchoudhary8580@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides containing alpha 1,4-linked glucose units characterized by a hydrophilic exterior and a hydrophobic inner cavity capable of forming host guest inclusion complexes via non-covalent physical interactions. Poor water solubility severely limits the therapeutic bioavailability of approximately 40% of approved drugs and 90% of developmental compounds. Inclusion complexation significantly enhances aqueous solubility, protects sensitive drugs against thermal and photolytic degradation, and optimizes key pharmacokinetic parameters such as C max and AUC. These complexes are successfully utilized across oral, parenteral, ophthalmic, pulmonary, and topical dosage forms to accelerate dissolution, enable controlled drug release, and attenuate local and systemic toxicities. Furthermore, advanced CD nanocarriers, nano sponges, and stimuli-responsive delivery systems facilitate targeted chemotherapy, non-viral gene delivery, and cellular cholesterol clearance in neurodegenerative disorders (e.g., Niemann–Pick disease type C and Alzheimer's), cardiovascular conditions, and infectious diseases. Overall, cyclodextrins serve as versatile supramolecular platforms that overcome critical biopharmaceutical bottleneck , paving the way for advanced nanomedicine and precision therapeutics.

Keywords: *Cyclodextrins (CD), inclusion complexes, drug delivery systems, solubility enhancement, bioavailability, nanomedicine.*

P-01/F/021 POSTER · OFFLINE

Artificial Intelligence-Enabled Approaches for Optimizing Cyclodextrin-Based Drug Delivery Systems: Emerging Opportunities and Future Perspectives

Shourya Chauhan

Department of Pharmaceutics, Sri Sai College of Pharmacy, Badhani, Pathankot, Punjab, India
Email: shouryachauhan77@gmail.com

Cyclodextrins are widely used pharmaceutical excipients capable of forming inclusion complexes with poorly water-soluble drugs and improving their solubility, stability, bioavailability, and drug-delivery characteristics. However, the development and optimization of cyclodextrin-based drug delivery systems involves multiple formulation and process variables, making conventional trial-and-error approaches time-consuming and resource-intensive. Artificial intelligence (AI) and machine learning (ML) have emerged as promising tools for predicting formulation behaviour, identifying critical variables, establishing structure–property relationships, and accelerating pharmaceutical development. The present work discusses the emerging role of AI-enabled approaches in the design and optimization of cyclodextrin-based drug delivery systems. Particular emphasis is placed on the prediction of drug–cyclodextrin interactions, complexation efficiency, solubility enhancement, formulation optimization, and selection of suitable cyclodextrin derivatives. Integration of AI and ML with Quality by Design (QbD) principles may facilitate the identification of critical material attributes and critical process parameters while reducing experimental workload. AI-assisted predictive modelling can further support data-driven decision-making and improve the development of optimized and patient-centric drug delivery systems. The convergence of cyclodextrin science with AI, predictive modelling, and QbD therefore represents a promising strategy for accelerating pharmaceutical formulation development. Such interdisciplinary approaches may contribute to more efficient development of innovative cyclodextrin-based drug delivery systems and next-generation healthcare technologies.

Keywords: *Cyclodextrins; Artificial Intelligence; Machine Learning; Drug Delivery; Predictive Modelling; Formulation Optimization; Quality by Design.*

P-01/F/022 POSTER · OFFLINE

Cyclodextrin-Based Nanoparticles for Enhanced Solubility and Bioavailability of Poorly Water- Soluble Drugs

Arushi Sharma

Department of Pharmaceutics, Sri Sai College of Pharmacy, Badhani, Pathankot, Punjab, India
Email: sharmaarushi1605@gmail.com

A large number of newly discovered drug molecules exhibit low water solubility, which may lead to inadequate dissolution, variable absorption, poor bioavailability and consequently reduced therapeutic efficacy. Poor aqueous solubility remains a major challenge in pharmaceutical formulation, driving the need for efficient, patient-friendly enhancement strategies. Cyclodextrins (CDs), with their hydrophilic exterior and hydrophobic inner cavity, are well-suited pharmaceutical excipients capable of forming inclusion complexes with poorly water-soluble drugs, thereby improving solubility, dissolution rate, stability, and overall performance. This work proposes cyclodextrin-based nanoparticles (CD-NPs) as a nanoscale strategy that merges the molecular complexation capacity of CDs with nanotechnology's benefits, aiming for enhanced drug loading, improved dissolution, controlled release, and better biological interaction. The resulting nanoparticles will be characterized for particle size, polydispersity index, zeta potential, morphology, drug loading, encapsulation efficiency, and stability, while drug–CD interactions will be examined using FTIR, DSC, and related solid-state techniques. Quality by Design (QbD) principles, supported by Design of Experiments (DoE) and response-surface methodology, will guide systematic optimization of formulation and process variables. Artificial intelligence and machine learning may further aid in predicting variable effects and identifying optimal compositions. In-vitro solubility and release studies, along with pharmacokinetic evaluation where relevant, will assess improvements over the pure drug. Together, this integrated approach offers a modern route toward more efficient, reproducible, and effective drug-delivery formulations.

Keywords: *Cyclodextrins; Solubility enhancement; Bioavailability; Nanotechnology; Artificial Intelligence; Machine Learning; Quality by Design; Drug delivery.*

P-01/F/023 POSTER · OFFLINE

Harnessing Sulfobutyl ether-β-cyclodextrin for NIR-responsive spatiotemporal delivery of diosgenin via a Zn^{2+}-coordinated Metal-Organic Framework for the treatment of Psoriasis

Hrishikesh Khude[1], Rohan Pai[1], Pravin Shende[1,2]

[1]Shobhaben Pratapbhai Patel School of Pharmacy & Technology Management, SVKM's NMIMS, V.L. Mehta Road, Vile Parle (W), Mumbai- 400056, India.
[2]National Institute of Pharmaceutical Education and Research (NIPER), S.A.S Nagar, Mohali, Punjab, India.
Email: hrishikeshkhude@yahoo.in

Introduction: The cyclodextrin-based drug delivery systems offer opportunities to address solubility, incorporation, and release limitations of hydrophobic therapeutics. However, achieving localized and externally regulated delivery remains challenging. Diosgenin, a hydrophobic steroidal sapogenin with therapeutic potential in psoriasis, requires an advanced delivery platform to improve dermal availability.

Aim & Objectives: This study aimed to develop a sulfobutyl ether-β-cyclodextrin (SBE-β-CD)-enabled hierarchical delivery system for enhanced dermal delivery and near-infrared (NIR)-regulated release of diosgenin.

Methods: A diosgenin-zinc oxide (Dios-ZnO) nanoconjugate was incorporated into a Zn^{2+}-coordinated SBE-β-CD metal–organic framework (Dios-ZnO@MOF) and formulated as an Eudragit RS100 film-forming spray. This formulation was characterized by ATR-FTIR, PXRD, DSC, FEG SEM, in vitro drug release, ex vivo skin permeation, NIR-responsive release, and in vivo dermal pharmacokinetics were evaluated. Furthermore, the therapeutic efficacy was assessed in an IMQ-induced psoriasis-like mouse model.

Results: The incorporation of diosgenin-zinc oxide nanoconjugate into the SBE-β-CD-based MOF system enhanced diosgenin release and skin permeation by 3.8–5.1-fold compared with the plain formulation. NIR irradiation further accelerated drug release, demonstrating externally regulated temporal control. For in vivo, Dios-ZnO@MOF film-forming spray with NIR improved psoriasis-associated pathological changes by 60% compared with disease control. NIR irradiation produced a dermal diosgenin Cmax of 1758.20 ± 96.74 ng/g and a skin-to-plasma exposure ratio of 11.46 ± 0.83.

Conclusion: The SBE-β-CD-MOF system enabled hierarchical platform for enhanced dermal diosgenin availability and supported NIR-regulated delivery, highlighting the potential of cyclodextrin-based systems for advanced topical drug delivery.

Keywords: *Sulfobutyl ether-β-cyclodextrin; Cyclodextrin-based drug delivery; Diosgenin; Metal-organic framework; Near-infrared-responsive delivery; Psoriasis*

P-01/F/024 POSTER · OFFLINE

Multifunctional cyclodextrin based nanocomposites for dual targeted and esterase responsive cancer therapy

Aditya Sharma*, Dev Raj, Vinay Pandit, M.S. Ashawat,
Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog, Himachal Pradesh, India
Email: sharmaa1494@gmail.com

Introduction: Globally, malignancy claims nearly 10 million lives annually, establishing itself as a critical healthcare crisis. Modern oncological chemotherapy encounters substantial impediments encompassing inadequate specificity toward tumor cells (resulting in nearly 30% therapeutic arrival at target sites), pronounced organ damage including myocardial, hepatic, and renal toxicity, emergence of treatment-resistant cancer phenotypes, and swift pharmacological elimination necessitating repeated dosing protocols. Cyclodextrins, classified as cyclic saccharide structures, possess a distinctive amphiphilic configuration featuring a water-attracting exterior combined with a water-repelling inner chamber facilitating superior pharmaceutical encapsulation capacity.

Aim & Objectives: This study is based on innovative cyclodextrin mediated nanostructures as sophisticated drug carriers for malignancy management, determine the efficiency of their recognition mechanisms, quantify their capacity to eliminate cancer cell populations, and establish toxicological profiles utilizing laboratory model systems.

Methods: Relevant literature on cyclodextrin nanocarriers, dual targeting strategies, esterase responsive system, tumor microenvironment responsive delivery and anticancer application was reviewed. The reported formulation approaches, targeting ligands, responsive linkers, drug loading mechanism, and therapeutics outcomes were comparatively assessed.

Results: The reviewed studies indicate that cyclodextrin based nanocomposites can improve the aqueous solubility and protection of poorly soluble anticancer agents, Incorporation of two targeting mechanism may promote selective interaction with tumor associated receptors, while esterase sensitive linkers can facilitate drug release after cellular internalization.

Conclusion: Dual-targeted and esterase-responsive cyclodextrin-based nanocomposites offer a multifunctional approach for site-specific and controlled anticancer drug delivery. Further in-vivo studies, toxicity evaluation, optimization of targeting ligands, and long-term stability studies are required before their potential clinical application can be fully established.

Keywords: *Cyclodextrin, Nanocomposites, Dual-targeting, Cancer therapy, Drug delivery.*

P-01/F/025 POSTER · OFFLINE

Cyclodextrins as Multifunctional Supramolecular Carriers for Ocular Drug Delivery

Akshat*, Dev Raj, Vinay Pandit, M.S. Ashawat
Department of Pharmaceutics, Laureate Institute of Pharmacy Kathog, Himachal Pradesh, India
Email: akshatkumar82001@gmail.com

Introduction: Ocular drug delivery is challenging because of tear drainage, blinking, corneal barriers, and limited precorneal residence time, resulting in poor drug bioavailability. Cyclodextrins (CDs) are multifunctional supramolecular carriers that can improve the solubility, stability, permeability, and delivery of ophthalmic drugs.

Aim & Objectives: This review aims to explore the potential of cyclodextrins as versatile carriers for ocular drug delivery and to summarize their mechanisms, advantages, limitations, and recent formulation approaches.

Methods: Relevant scientific literature on cyclodextrin-based ocular drug delivery systems was reviewed, with emphasis on inclusion complexation, drug solubilization, ocular permeation, sustained release, and incorporation of CDs into advanced delivery platforms.

Results: Studies demonstrate that CDs can enhance the aqueous solubility and stability of poorly water-soluble drugs through host–guest inclusion complexation. They can improve drug availability at the ocular surface and reduce irritation associated with certain formulations. Modified CDs and CD-based systems, including nanoparticles, hydrogels, liposomes, and in situ gels, further provide opportunities for prolonged residence time, controlled release, and improved therapeutic efficacy.

Conclusion: CD-based supramolecular systems represent a promising strategy for improving ocular drug bioavailability and therapeutic performance. Further research is required to establish long-term ocular safety, optimize formulation characteristics, and facilitate clinical translation.

Keywords: *Cyclodextrins; Supramolecular carriers; Ocular drug delivery; Inclusion complexation; Controlled release; Bioavailability.*

P-01/F/026 POSTER · OFFLINE

Beyond Drug Solubilization: Exploring the Cyclodextrin–Gut Microbiota Axis in Oral Drug Delivery

Jashanpreet Kaur
ISF college of Pharmacy, Moga-142001, Punjab, India
Email: jashanpritsidhuz1@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides widely used in pharmaceutical formulations to improve the aqueous solubility, stability, dissolution, and bioavailability of poorly water-soluble drugs. Traditionally, their role has primarily been considered from a formulation perspective, particularly through the formation of inclusion complexes with drug molecules. However, following oral administration, cyclodextrin - drug complexes encounter the gastrointestinal environment and the diverse microbial ecosystem of the gut, suggesting a broader biological role that remains comparatively underexplored.

The gut microbiota can interact with cyclodextrins through microbial utilization and degradation, potentially influencing the intestinal environment and the fate of orally administered formulations. These interactions may contribute to the production or modulation of microbial metabolites, including short-chain fatty acids (SCFAs), which are important mediators of intestinal and host metabolic functions. Furthermore, changes in the intestinal environment and microbial activity may influence drug disposition, including drug release, metabolism, and ultimately therapeutic response.

Understanding the cyclodextrin - gut microbiota interface may therefore provide a new perspective on the design and performance of oral drug-delivery systems. The interaction may also have broader implications for metabolic health through microbial metabolites and pathways involved in intestinal and metabolic homeostasis. This review explores the emerging relationship between cyclodextrins, gut microbiota, and oral drug delivery, highlighting current knowledge, potential mechanisms, research gaps, and future opportunities for developing microbiome-responsive cyclodextrin-based formulations.

Keywords: *Cyclodextrin, Oligosaccharide, inclusion complex*

P-01/F/027 POSTER · OFFLINE

pH-Responsive β-Cyclodextrin-Based Nanocarriers for Tumor icroenvironment-Triggered Doxorubicin Release in Breast Cancer: Design Rationale and Evidence from Recent Literature

Bhorsnehil Tarak
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: bhorsnehiltarak@gmail.com

Doxorubicin (DOX) remains a first-line chemotherapeutic for breast cancer, but its clinical utility is limited by poor tumor selectivity, cardiotoxicity, and drug efflux via P-glycoprotein-mediated multidrug resistance (MDR). A defining feature of solid tumors is their acidic extracellular microenvironment; the tumor microenvironment sits at roughly pH 6.5, dropping further to pH 4.5–6.5 in late endosomes and lysosomes, compared with the near-neutral pH 7.4 of normal extracellular tissue. This pH gradient can be exploited as an internal trigger for site-specific drug release. β-Cyclodextrin (β-CD), a cyclic oligosaccharide with a hydrophobic cavity and hydrophilic exterior, is increasingly used as a versatile platform that leverages host–guest interactions to build sophisticated, pH-triggered drug delivery systems for cancer therapy.

Keywords: *Doxorubicin, Chemotherapy, Brest Cancer, tumor*

P-01/F/028 POSTER · OFFLINE

Cyclodextrin-Enabled Targeted Drug Delivery: A Versatile Approach for Site-Specific Therapy

Vinit Kumar Singh*, Lav Goyal
ISF College of Pharmacy, Moga-142001, Punjab, India
Email: vinitkumarsingh1155@gmail.com

Targeted drug delivery is an important area of pharmaceutical research that aims to deliver therapeutic agents preferentially to specific tissues or cells while minimizing unwanted effects on healthy tissues. Cyclodextrin is a versatile pharmaceutical carrier that have attracted increasing attention in targeted drug delivery because of their ability to interact with drug molecules and functionalize their external surface. These characteristics allow cyclodextrin-based systems to be incorporated into advanced delivery platforms designed for controlled and site-specific drug administration. This poster explores the potential of cyclodextrin in targeted drug delivery, with emphasis on their role in developing innovative pharmaceutical formulations. Cyclodextrin can be chemically modified or combined with polymers, nanoparticles, liposomes, hydrogels, and other drug delivery systems to achieve improved drug incorporation and controlled release. Their derivatives can also be engineered with functional groups or targeting ligands that facilitate interaction with specific biological environments. Such systems have been investigated for delivering anticancer, anti-inflammatory, antimicrobial, and neurological drugs. Cyclodextrin-based nanocarriers may provide opportunities for delivering drugs through different routes, including oral, ocular, nasal, topical, and parenteral administration. In cancer therapy, functionalized cyclodextrin systems have particularly gained interest for improving drug localization and reducing systemic exposure. Additionally, stimuli-responsive cyclodextrin formulations can be designed to release their drug payload in response to environmental factors such as pH, enzymes, temperature, or cellular conditions. Despite their potential, challenges including formulation complexity, scalability, safety, targeting efficiency, and regulatory considerations remain. Overall, cyclodextrin-based targeted delivery systems represent a promising platform for developing more precise and patient-oriented pharmaceutical therapies.

Keywords: *cyclodextrin, targeted drug delivery, nanocarriers, controlled release, drug targeting, pharmaceutical technology.*

P-01/F/029 POSTER · OFFLINE

AI-Assisted Virtual Screening of Cyclodextrin Formulations Using AutoDock

Komal Kumari*, Archana Chaudhary, Pratibha Chaudhary, Vinay Pandit, Mahender Singh Ashawat
Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog
Email: jaryalkomal9@gmail.com

Introduction: Cyclodextrins improve the solubility, dissolution, stability, and bioavailability of poorly water-soluble drugs. Conventional selection of suitable cyclodextrins requires extensive experimental screening and may be time-consuming and costly.

Aim & Objectives: To explore an Artificial Intelligence (AI)-assisted molecular docking approach using AutoDock for virtual screening and rational selection of suitable drug–cyclodextrin combinations.

Methods: Three-dimensional structures of the selected drug and cyclodextrins will be prepared and subjected to molecular docking using AutoDock. Docking scores and binding poses will be evaluated based on hydrogen bonding, hydrophobic interactions, van der Waals forces, and drug positioning within the cyclodextrin cavity. Molecular descriptors, physicochemical properties, and reported experimental data may be integrated with docking results for AI/Machine Learning-based ranking of promising candidates.

Results: The proposed computational workflow is expected to identify drug–cyclodextrin combinations with favourable predicted interactions and prioritize candidates for experimental evaluation, thereby reducing formulation trials and material requirements.

Summary: Integration of AI with AutoDock-based virtual screening provides a systematic approach for early-stage cyclodextrin selection and formulation development.

Conclusion: AI-assisted molecular docking may accelerate the development of cyclodextrin inclusion complexes; however, computational predictions require experimental confirmation through phase-solubility, dissolution, FTIR, DSC, and other suitable studies.

Keywords: *Artificial Intelligence, AutoDock, Molecular Docking, Virtual Screening, Cyclodextrin, Solubility Enhancement.*

P-01/F/030 POSTER · OFFLINE

Cyclodextrin in Orphan Drug Development: Therapeutic and Delivery Applications in Niemann-Pick Disease Type C1 and NTRK-Fusion Tumours

Ananya Dikshit*, Rajshree Rathore, Komal Sharma, Meenakshi Bharkatiya
Bhupal Noble's Institute of Pharmaceutical Sciences, Bhupal Noble's University, Udaipur, Rajasthan
Email: ananyadikshit19@gmail.com

Cyclodextrins belong to a broader family of oligosaccharides, composed of a hydrophilic exterior and hydrophobic inner cavity. Their relevance in the pharmaceutical industry is that they are complexing and solubilizing agents that increase a drug's bioavailability and overall stability. Among other cyclodextrins, β-cyclodextrins are widely used as pharmaceutical excipients. The first cyclodextrin-based pharmaceutical product was approved in Japan in 1976, laying the foundation for advanced therapeutics and drug development approaches that incorporate cyclodextrins as an active pharmaceutical ingredient in Orphan drugs. Orphan drugs are pharmaceutical products specifically developed for the treatment, prevention, and mitigation of rare diseases. Rare diseases are those that affect a limited number of individuals, generally defined as a fewer than 1 in 1250 in the US. Niemann Pick disease Type C is an autosomal rare disease characterised by the accumulation of unesterified cholesterol in perinuclear vesicles (lysosomes). The discovery of systemic administration of hydroxypropyl-beta cyclodextrin (HPβPD) in NPC-induced mice could help release trapped cholesterol from lysosomes, normalize cholesterol levels in the liver, and prolong life, leading to expanded access use in NPC. Preclinical studies have further confirmed the role of hydroxypropyl-β-cyclodextrin in cholesterol metabolism and homeostasis in peripheral tissues, including the liver, as well as in the central nervous system (CNS), supporting the concept of reducing intracellular cholesterol by reducing the size of lysosomes; that can help prolong the lives of children and adults suffering from NPC. A distinct approach of cyclodextrin in rare diseases as a pharmaceutical excipient is seen in NTRK fusion. The NTRK gene can induce carcinoma in rare tumour types including secretory breast carcinoma and congenital infantile fibrosarcoma. Larotrectinib (VITRAKVI), a highly selective tropomyosin receptor kinase (TRK) inhibitor, is indicated for the treatment of adult and pediatric patients with solid tumors. Its oral solution incorporates hydroxypropyl-beta cyclodextrin (HPβPD) as a pharmaceutical excipient, enabling a stable, palatable, age-appropriate dosage for individuals affected by NTRK-Fusion malignancies. Together, these two cases illustrate cyclodextrin's dual capacity in orphan drug development, positioning cyclodextrin as a valuable and versatile compound.

Keywords: *cyclodextrin, orphan drug development, niemann-pick type C disease, NTRK fusion cancer, active pharmaceutical ingredient (API), hydroxypropyl- β- cyclodex trin (excipient).*

P-01/F/031 POSTER · OFFLINE

Cyclodextrin-Engineered Nanocarriers for Controlled and Targeted Drug Delivery: Emerging Translational Approaches

Manoranjan Kumar Tanti*, Mohammad Azahruddin
Department of Pharmaceutics, ISF College of Pharmacy and Research, Rattian Road, Ghal Kalan, Moga, 142001, Punjab, India.
Email: manoranjankrb@gmail.com

Introduction: Cyclodextrins (CDs), which are cyclical oligosaccharides, can develop inclusion complexes by interacting with insoluble drugs. These compounds can be employed in conjugation with carbon-based carrier structures like nanoparticles or liposomes to boost the solubility and stability of such drugs while controlling release, implying that cyclodextrin nanocarrier systems can be good candidates in the field of drug delivery.

Aim: To investigate the possibility of using cyclodextrin-engineered nanocarriers for targeted and regulated therapeutic drug delivery.

Objective: To boost drugs stability and solubility by utilizing cyclodextrins. To ensure prolonged and controlled release of the medicine. To increase drug localization. To improve efficacy and reduce system toxicity.

Methods: Recent research on cyclodextrin-based nanocarriers was assessed using a literature-based methodology. A variety of formulations, drug-loading techniques, targeting tactics, release mechanisms, and therapeutic applications were examined.

Result: According to research works, these nanocarriers can improve the solubility, absorption, stability, and loading capacity of medicines. Also, they provide regulated drug release through the means of both passive and active targeting. At present, methods include biodegradable polymers, ligands targeting, and the systems that respond to stimuli.

Summary: Cyclodextrin-engineered nanocarriers provide better drug delivery performance by combining the benefits of nanotechnology with the solubilizing qualities of cyclodextrins.

Conclusion: Cyclodextrin-based nanocarriers are a promising way to achieve safer, controlled, and targeted drug delivery in the field of translational medicine. More efforts are needed for the optimization of these carriers, their toxicity assessment, scale-up, and clinical trials before they can be effectively used in medicine.

Keywords: *Cyclodextrin, nanocarriers, targeted drug delivery, solubility, controlled release.*

P-01/F/032 POSTER · OFFLINE

Cyclodextrins in Brain Drug Delivery: Linking BBB Transport Mechanisms to Therapeutic Outcomes

Nitish Kumar Yadav*, Shreya Sharma
[1]*Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab*
Email: 2315760@isfcp.org

Introduction: The blood–brain barrier (BBB) remains a major challenge in the treatment of central nervous system (CNS) disorders by limiting the delivery of therapeutic agents to the brain. Cyclodextrins (CDs), a class of cyclic oligosaccharides widely used in pharmaceutical formulations, are traditionally employed for enhancing drug solubility, stability, and bioavailability. Recent studies indicate suggests that cyclodextrins exhibit functions beyond excipient functions, facilitating BBB transport and brain-targeted drug delivery. This review discusses/ evaluates how cyclodextrin structure influences transport mechanisms and therapeutic outcomes, offering insights into the rational design of CNS drug delivery systems.

Methodology: Relevant literature was systematically reviewed, focusing on cyclodextrin chemistry, inclusion complexation, BBB transport pathways, functionalized cyclodextrins, and cyclodextrin-based nanocarriers. Experimental and translational studies were carefully analysed to investigate the relationship between cyclodextrin architecture, transport behaviour, and therapeutic performance.

Results Summary: Cyclodextrins improve brain delivery by improving drug solubilization, interactions with biological membranes, receptor-mediated transcytosis, endocytic uptake, and nano-enabled delivery approaches. BBB transport efficiency is influenced by cyclodextrin cavity size, chemical modification, surface functionalization, and carrier design. Preclinical studies indicate their potential in neurodegenerative disorders, lysosomal storage diseases, and brain tumors. Furthermore, available evidence supports a structure-transport-therapy framework in which cyclodextrin physicochemical properties influence BBB transport characteristics and contribute to therapeutic outcomes.

Conclusion: Cyclodextrins have emerged as versatile carriers for brain-targeted drug delivery. Understanding the relationship between cyclodextrin structure, BBB transport mechanisms, and therapeutic outcomes may support the development of safer and more effective advanced CNS therapeutics.

Keywords: *Cyclodextrins; Blood–Brain Barrier; Brain Drug Delivery; CNS Disorders; Neurodegenerative Diseases; Nanocarriers.*

P-01/F/033 POSTER · OFFLINE

AI-Driven Theranostic Microneedles: Supramolecular Cyclodextrin Networks for Continuous Biosensing and Precision Pharmacotherapy

Rounak Jaiswal* , Dharmender Singh , Dr. Amrish Kumar, Dr. Bhoomika Chaudhary
Charak School of Pharmacy, Chaudhary Charan Singh University, Meerut, U.P, India – 250004
Email: docrounakjaiswal@gmail.com

Introduction: Narrow therapeutic index drugs require continuous monitoring to prevent fatal organ toxicity and clinical failure. Conventional venous blood draws create severe diagnostic delays that prevent timely dosage adjustment.

Aim & Objectives: To evaluate a closed-loop theranostic microneedle system using cyclodextrin nanosponge for simultaneous real-time biosensing and artificial intelligence (AI)-regulated transdermal drug delivery.

Methods: Literature on cyclodextrin host-guest inclusion, electrochemical skin biosensors, stimuli-responsive hydrogels, and edge machine-learning pharmacokinetic algorithms was critically analyzed.

Results: Crosslinked β-cyclodextrin nanosponges functionalized on conductive microneedles capture drug molecules inside their hydrophobic cavities. For established clinical benchmarks methotrexate, vancomycin, and doxorubicin, this supramolecular architecture is reported to repel skin protein fouling and achieve sensitive electrochemical detection below 5 nM. In parallel, cyclodextrin nanosponges embedded in smart hydrogels hold high drug payloads, preventing baseline leakage. Extending this platform to newly approved targeted drugs facing strict therapeutic margins, specifically belumosudil (for graft-versus-host disease) and deuruxolitinib (for severe alopecia areata), could enable direct transdermal dosing that bypasses toxic oral peaks. An on-device AI algorithm processes raw biosensor signals, cancels biological noise, and triggers micro-voltage pulses (<0.6 V) to deliver precise, on-demand micro-doses.

Summary: The theranostic microneedle device integrates biosensing with adaptive delivery across established benchmarks (methotrexate, vancomycin, doxorubicin) and emerging therapies (belumosudil, deuruxolitinib).

Conclusion: Theranostic microneedles powered by cyclodextrins and AI can reduce phlebotomy delays, offering an autonomous, minimally invasive platform for personalized precision medicine.

Keywords: *Theranostic Microneedles, Cyclodextrin Nanosponges, Electrochemical Biosensors, Closed-Loop Dosing, Artificial Intelligence, Targeted Therapeutics.*

P-01/F/034 POSTER · OFFLINE

Cyclodextrins in the Digital Era: Bringing Molecular Modeling and QbD Together for Smarter Drug Delivery

Srishti Sharma[1], Shivam Thakur[1], Shivam Rathore[1]
[1]*Gautam College of Pharmacy, Hamirpur (H.P) – 177001*
Email: sharmasrishti9039@gmail.com

Cyclodextrins are ring-shaped molecules that are widely used in pharmaceutical research to improve the performance of poorly water-soluble drugs. Their unique structure contains a water-loving outer surface and a relatively water-repelling inner cavity, which allows them to hold suitable drug molecules and form inclusion complexes. This can improve drug solubility, dissolution, stability, and sometimes bioavailability. However, developing cyclodextrin-based formulations often involves repeated laboratory trials to find the right type and amount of cyclodextrin and the best formulation conditions. New digital technologies can help make this process more systematic and efficient. Artificial intelligence (AI) and machine learning (ML) can analyze existing pharmaceutical data and help to identify patterns between drug properties, cyclodextrin characteristics, and formulation performance. Molecular modeling can also help visualize and understand how a drug may interact with the cyclodextrin cavity before extensive laboratory testing. Quality by Design (QbD) adds another important part to this approach by helping researchers identify the factors that have the greatest effect on formulation quality and optimize them in a planned manner. Combining cyclodextrin technology with AI-assisted analysis, molecular modeling, and QbD could reduce unnecessary trial-and-error and support more rational formulation development. The poster explores the idea that how some newcoming factors can work together to transform conventional cyclodextrin research into a more predictive, efficient, and smarter approach to drug delivery, while highlighting their potential for future pharmaceutical development.

Keywords: *Cyclodextrins, Bioavailability, Artificial intelligence (AI), Molecular Modeling, Quality by Design (QbD).*

P-01/F/035 POSTER · OFFLINE

Cyclodextrin-Based Self-Healing Medicines: Emerging Strategies for Targeted Drug Delivery and Tissue Regeneration

Sakshi
ISF College of Pharmacy, Moga, Punjab, India-142001
Email: sakshi9917420390@gmail.com

Tissue injury and degenerative disorders remain major therapeutic challenges because conventional pharmacotherapy primarily manages symptoms rather than restoring damaged tissue. Cyclodextrin (CDs), cyclic oligosaccharides capable of forming host–guest inclusion complexes, have emerged as versatile pharmaceutical tools for improving drug solubility, stability, bioavailability, and controlled release. This study evaluates the potential of Cyclodextrin-based drug-delivery platforms as enabling technologies for targeted tissue regeneration and nextgeneration "self-healing" medicines. Recent literature on native and chemically modified Cyclodextrin, inclusion complexes, Nano carriers, hydrogels, and biomaterial-assisted delivery systems was critically reviewed, with emphasis on their ability to enhance the delivery of regenerative therapeutics and modulate local biological responses. Evidence from preclinical and formulation studies indicates that Cyclodextrin-based systems can improve the physicochemical properties of poorly water-soluble agents and facilitate localized, sustained, or stimulus-responsive delivery. Integration with nanoparticles, hydrogels, and tissue-engineering scaffolds may enhance delivery of growth factors, anti-inflammatory agents, nucleic acids, and other bioactive molecules involved in cell proliferation, differentiation, angiogenesis, and extracellular-matrix remodeling. These strategies show promise for skin, bone, cardiac, neural, and other tissue-repair applications. Cyclodextrin-enabled delivery systems offer a promising bridge between advanced drug delivery and regenerative medicine. Their capacity to improve therapeutic availability while enabling localized and controlled release may support a shift from conventional disease management toward functional tissue restoration.

Keywords: *Cyclodextrin; inclusion complexes; targeted drug delivery; regenerative medicine; tissue regeneration; nanotechnology.*

P-01/F/036 POSTER · OFFLINE

Development Of An Affordable Cyclodextrin-Based Pediatric Controlled-Release Drug Delivery System For A Poorly Water-Soluble Drug

Bhan Singh Yadav, Dr. Vijay Nigam, Dr. Prashant Gupta
Daksh Pharmcy College, Chhatarpur, (M.P.), Pin: 471001, India
Email: bhansinghsips2016@gmail.com

Pediatric oral drug delivery remains a critical unmet challenge in pharmaceutical development, owing to pronounced age-related physiological variability, limited access to age-appropriate dosage forms, poor palatability, dose inflexibility, swallowing difficulties, and uncertainties surrounding excipient acceptability. These limitations are particularly consequential for poorly water-soluble drugs, for which inadequate dissolution, inconsistent gastrointestinal performance, and variable drug exposure may compromise therapeutic reliability. Multiparticulate dosage forms have consequently attracted considerable interest as pediatric delivery platforms because they can enable flexible dose administration, facilitate swallowing, and support adaptation to developmental requirements. Nevertheless, the simultaneous achievement of effective taste masking, adequate drug dissolution, controlled release, dose accuracy, and patient acceptability remains a substantial formulation challenge.

Cyclodextrins (CDs) offer a versatile pharmaceutical excipient platform for addressing aqueous-solubility limitations through host–guest inclusion complexation. In addition to improving apparent solubility, appropriately selected CDs may enhance chemical stability and contribute to taste-masking performance. However, their incorporation into pediatric formulations necessitates rigorous evaluation of excipient safety, age-dependent pharmacokinetics, dose exposure, regulatory acceptability, and potential effects on formulation performance. Emerging cyclodextrin–polymer ternary systems may further enhance complexation efficiency, improve drug-release control, and facilitate the development of multifunctional delivery systems for poorly soluble drugs.

The proposed research will therefore investigate a cyclodextrin–polymer-based controlled-release multiparticulate oral dosage-form platform for a selected poorly water-soluble drug intended for pediatric administration. A Quality by Design (QbD) framework will be employed to define the target product profile, identify critical material attributes and critical process parameters, and elucidate their influence on critical quality attributes through a systematic Design of Experiments strategy. Artificial intelligence and machine-learning methodologies will subsequently be explored to support formulation prediction, process optimization, and recognition of complex formulation–performance relationships. Their implementation will be governed by the principles of dataset adequacy, model validation, interpretability, reproducibility, and experimental verification.

Keywords: *Cyclodextrin; Pediatric Drug Delivery; Poorly Water-Soluble Drugs; Controlled Release; Polymer-Based Drug Delivery; Multiparticulate Dosage Form; Taste Masking; Dose Flexibility; Quality by Design; Design of Experiments; Artificial Intelligence; Machine Learning; Formulation Optimization; Translational Pharmaceutics.*

P-01/F/037 POSTER · OFFLINE

Green Synthesis and Quality by Design-Guided Engineering of Hybrid Cyclodextrin Nanosponges for Drug Delivery Applications

Ayush Parker*, Rishi Paliwal

Nanomedicine and Bioengineering Research Laboratory, Department of Pharmacy, Indira Gandhi National Tribal University, Amarkantak - 484887, Madhya Pradesh, India

Email: parker.ayush@gmail.com

Introduction: Cyclodextrin nanosponges are hyper-crosslinked carbohydrate networks capable of entrapping therapeutic molecules via inclusion and non-inclusion mechanisms. Engineering hybrid cyclodextrin nanosponges combining distinct carbohydrate building blocks offers tailored microenvironments, pore networks and transport properties for drug delivery.

Aim & Objectives: To engineer hybrid cyclodextrin nanosponges via green polycondensation by integrating in silico host-guest modelling with systematic Quality by Design (QbD) optimization.

Methods: Molecular docking was performed to investigate in silico host-guest binding energy, affinity and inclusion geometry. A QTPP and CQAs were established. Formulation and process variables were mapped using an Ishikawa diagram, and high-risk parameters were prioritized by the Risk Priority Number (RPN) scoring. Significant factors were screened using a minimum-run screening design and optimized via a Box-Behnken response surface design. Characterization included particle size, PDI, zeta potential, SEM, TEM, PXRD, DSC and drug loading.

Results: In silico simulations confirmed favourable host-guest complexation. RPN scoring effectively highlighted critical material attributes and process parameters. The statistical design space defined optimal operating conditions, yielding hybrid nanosponges with desired nanometric size, low PDI, and optimal zeta potential. SEM and TEM revealed uniform porous morphology, while PXRD and DSC confirmed amorphization. The optimized hybrid matrix demonstrated superior encapsulation efficiency and enhanced solubility.

Summary & Conclusion: Combining in silico predictive modelling with a structured QbD risk-assessment framework (QTPP, Ishikawa, RPN, screening design and optimization design) proved robust for developing hybrid cyclodextrin nanosponges, providing a versatile platform for drug delivery.

Keywords: *Hybrid nanosponges, Cyclodextrin, Quality by Design, Green synthesis, Drug delivery.*

P-01/F/038 POSTER · OFFLINE

Systematic Optimization of Cyclodextrin-Based Nanosponges: A Review from a QbD Perspective

Dheeraj Sharma*, Rishi Paliwal

Nanomedicine and Bioengineering Research Laboratory, Department of Pharmacy, Indira Gandhi National Tribal University, Amarkantak - 484887, Madhya Pradesh, India

Email: abhishekdheeru33@gamil.com

Cyclodextrin-based nanosponges (CDNSs) have gained increasing attention as multifunctional systems for drug delivery due to their porosity, versatility, and ability to enhance solubility, stability, and bioavailability, and to enable controlled release of therapeutics. However, the development of such systems involves multiple material and process variables that can significantly impact key quality attributes (CQAs), we need a science-based design and optimization approach. This review aims to assess the formulation, optimization, characterization, and pharmaceutical applications of cyclodextrin-based nanosponges from a Quality by Design (QbD) perspective. Following the PRISMA guidelines, a comprehensive literature search was conducted to identify relevant articles on the preparation and optimization of CDNS. The included works were analyzed in depth to identify information on cyclodextrin type, crosslinking agent, drug/polymer ratio, crosslinking ratio, reaction conditions, preparation techniques, and other critical material attributes (CMAs) and critical process parameters (CPPs), as well as their impact on CQAs such as particle size, polydispersity index, surface charge, morphology, drug loading, entrapment efficiency, drug release, and stability. Special attention was paid to the application of risk assessment, Design of Experiments (DoE), and formulation optimization strategies in the development of robust and reproducible CDNS formulations. In addition, the review discusses the current challenges in the characterization of CDNS, residual solvents, scale-up, reproducibility, regulatory aspects, and clinical translation of cyclodextrin-based nanosponges. By integrating the evidence derived from the PRISMA-based literature search with the principles of QbD, this review provides an insight into the formulation variables affecting the properties of CDNS and contributes to a better understanding of the relationship between formulation and process factors, as well as product quality.

Keywords: *Cyclodextrin nanosponges; Quality by Design; PRISMA; Design of Experiments; Formulation optimization; Drug delivery.*

P-01/F/039 POSTER · OFFLINE

Role of Cyclodextrins in Enhancing Drug Solubility and Bioavailability

Badal Agarwal[1]

[1]*Student, School of Pharmaceutical Sciences, Jaipur National University, Jagatpura, Jaipur, Rajasthan, India*
Email: badalagarwal6375@gmail.com

Introduction: Poor aqueous solubility remains one of the major challenges in the development of pharmaceutical drugs, particularly for compounds belonging to the Biopharmaceutics Classification System (BCS) Class II. Limited solubility can result in inadequate dissolution and consequently reduced and variable oral bioavailability. Cyclodextrins are cyclic oligosaccharides capable of forming reversible inclusion complexes with suitable drug molecules and have emerged as important pharmaceutical excipients for overcoming solubility-related limitations.

Aim: To review the role of cyclodextrins in improving the aqueous solubility, dissolution, and bioavailability of poorly water-soluble drugs and to highlight their applications in modern drug-delivery systems.

Method: Cyclodextrins possess a hydrophilic exterior and a relatively hydrophobic central cavity, allowing them to accommodate appropriately sized drug molecules through non-covalent host–guest interactions. The naturally occurring α-, β-, and γ-cyclodextrins differ primarily in their cavity dimensions, influencing their ability to complex with different drug molecules. Complex formation can increase the apparent aqueous solubility and dissolution rate of poorly soluble drugs and may additionally provide protection against certain forms of chemical or physical degradation. Derivatives such as hydroxypropyl-β-cyclodextrin and sulfobutylether-β-cyclodextrin have expanded pharmaceutical applications due to their enhanced aqueous solubility and improved formulation characteristics. Cyclodextrin-based formulations have been investigated across oral, parenteral, ophthalmic, nasal, and other drug-delivery routes.

Summary: Cyclodextrin-mediated inclusion complexation represents a versatile formulation strategy for addressing poor aqueous solubility. By modifying the physicochemical environment of drug molecules, cyclodextrins can facilitate improved dissolution and, where dissolution is rate-limiting, potentially enhance drug absorption and systemic exposure.

Conclusion: Cyclodextrins have considerable potential as pharmaceutical excipients for improving the biopharmaceutical performance of poorly water-soluble drugs. Rational selection of cyclodextrin type, drug–cyclodextrin compatibility, and formulation conditions is essential for achieving effective complexation and clinically meaningful improvements in drug delivery.

Keywords: *Cyclodextrins; Inclusion complexation; Drug solubility; Dissolution; Bioavailability; β-Cyclodextrin; Drug delivery.*

P-01/F/040 POSTER · OFFLINE

Cyclodextrin-Based Drug Delivery And Applications

Vikash Dwivedi

Laxmi Narayan College Of Pharmacy Bhopal, India
Email: dwivedivikash681@gmail.com

Introduction: Cyclodextrins (CDs) are cyclic oligosaccharides distinguished by a hydrophilic exterior anda relatively hydrophobic central cavity, enabling non-covalent host–guest complexation with diversetherapeutic molecules. This supramolecular property provides a powerful strategy for overcomingcritical formulation barriers, particularly poor aqueous solubility, chemical instability and limitedbioavailability.

Aim & Objectives: To critically evaluate the pharmaceutical potential of cyclodextrin-based systems andelucidate how structural modification and advanced formulation strategies can enhance drugsolubilization, stability, controlled release, targeting and therapeutic performance.

Methods: A focused literature-based analysis was undertaken using peer-reviewed pharmaceutical andbiomedical research, review literature and recent advances in cyclodextrin-enabled delivery platforms,including inclusion complexes, chemically modified cyclodextrins, cyclodextrin polymers, nanocarriers,hydrogels and supramolecular assemblies.

Results: Evidence demonstrates that cyclodextrin complexation can substantially modify thephysicochemical and biopharmaceutical properties of drug molecules. Derivatives such ashydroxypropyl-β-cyclodextrin and sulfobutylether-β-cyclodextrin have expanded pharmaceutical utilitythrough improved complexation and safety profiles. Advanced cyclodextrin architectures further enablecontrolled, stimuli-responsive and site-specific delivery, with emerging applications in anticancertherapy, gene delivery, nucleic-acid therapeutics and combination therapy.

Summary & Conclusion: Cyclodextrins have evolved from conventional solubilizing excipients intoversatile supramolecular drug-delivery platforms. Their tunable chemistry, biocompatibility andmultifunctionality position them as promising tools for precision pharmaceutical development,although translational challenges involving formulation optimization, safety, scalability and clinicalvalidation remain.

Keywords: *Cyclodextrins; Drug Delivery; Inclusion Complexes; Bioavailability; Targeted Delivery;Nanocarriers*

P-01/F/041 POSTER · OFFLINE

Advancement of Cyclodextrin-Based Drug Delivery Systems Through Artificial Intelligence and Quality by Design

Dr. Rumita Kumawat[1*] and Dr. Meenakshi Bharkatiya[2]

[1]*Assistant Professor, Venkateshwar Institute of Pharmacy, Sai Trirupati university, Umarda, Udaipur, Rajasthan, India*
[2]*Associate Professor, B. N. Institute of Pharmaceutical Sciences, B.N. University, Udaipur Rajasthan, India*
Email: 1990.riddhi@gmail.com

Cyclodextrins have emerged as versatile pharmaceutical excipients capable of improving the aqueous solubility, dissolution, stability, bioavailability, and overall therapeutic performance of poorly water-soluble drugs. Their ability to form inclusion complexes with drug molecules has led to their extensive application in the development of innovative drug delivery systems. However, optimization of cyclodextrin-based formulations involves multiple interacting variables related to drug–cyclodextrin compatibility, formulation composition, processing conditions, and critical quality attributes. The integration of Quality by Design (QbD) and Artificial Intelligence (AI) offers a promising approach to address these challenges and accelerate formulation development. QbD provides a systematic framework for identifying critical material attributes, critical process parameters, and critical quality attributes, while design of experiments and mathematical modeling facilitate systematic formulation optimization. Emerging AI and machine-learning approaches can further enhance this process by predicting drug–cyclodextrin interactions, complexation efficiency, solubility enhancement, dissolution behavior, and formulation performance using experimental and computational data. The combination of AI-driven prediction with QbD-based experimental design has the potential to reduce formulation development time, minimize experimental trials, improve product quality, and support personalized and patient-centric drug delivery. This review highlights recent advances in cyclodextrin-based drug delivery, the principles of QbD, and emerging applications of AI and machine learning in formulation optimization. It also discusses current challenges, including data availability, model interpretability, validation, regulatory considerations, and the need for interdisciplinary collaboration. Integrating cyclodextrin science with AI and QbD may provide a powerful pathway toward faster, smarter, sustainable, and next-generation pharmaceutical drug delivery systems.

Keywords: *Cyclodextrins; Drug delivery; Artificial intelligence; Machine learning; Quality by Design; Formulation optimization.*

P-01/F/042 POSTER · OFFLINE

AI-Enabled Development of Smart Cyclodextrin Nanocarriers for Targeted Drug Delivery

Manju Choudhary*, Archana Chaudhary, Vinay Pandit, Mahendar Singh Ashawat

Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog
Email: mc4068368@gmail.com

Introduction: Cyclodextrins (CDs) are cyclic oligosaccharides having a hydrophobic cavity, so they can help in improving drug solubility, stability and also controlled release. Their chemically modified and polymeric forms can be made into smart nanocarriers for targeted drug delivery. AI-assisted optimization of CD structure, drug inclusion, surface functionalization, and formulation parameters facilitates systematic formulation development, enhances predictive accuracy, and supports precise control of drug release and targeting.

Aim and Objectives: We aim to explore how artificial intelligence (AI) and machine learning (ML) can be used for the design and optimization of smart CD nanocarriers for controlled and targeted drug delivery.

Methods: In this review, recent studies on AI/ML-assisted CD nanocarrier development were considered, mainly covering molecular docking, molecular dynamics, quantitative structure–property relationship (QSPR/QSAR) models, formulation optimization, generative methods and physiologically based pharmacokinetic (PBPK) modeling.

Results: AI/ML methods can help to predict host–guest binding affinity, inclusion-complex stability, encapsulation efficiency, particle size, zeta potential and drug-release behaviour. These methods can also help optimize CD substitution, surface ligands and formulation variables for stimuli-responsive and target-specific release. AI with PBPK and mechanistic models can further help in predicting biodistribution, clearance and therapeutic performance.

Summary and Conclusion: AI-guided CD nanocarrier design can reduce experimental screening, accelerate formulation development, and improve the prediction and control of drug release and targeting. The integration of AI with mechanistic modeling can support more precise optimization of nanocarrier properties and enhance the efficiency of smart drug-delivery development.

Keywords: *Cyclodextrins; Artificial Intelligence; Machine Learning; Smart Nanocarriers; Controlled Drug Release; Targeted Drug Delivery.*

O-01/N/001 ORAL · ONLINE

Overcoming Bioavailability Barriers: Cyclodextrin Inclusion Complexes for Antidepressant Therapy in Major Depressive Disorder (MDD)

Gurditta[1]
[1]*Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, (Ropar) Punjab*
Email: gurditta213@gmail.com

More than 350 million people are suffering from Major depressive disorder (MDD), yet current treatment plan face significant limitations that include poor aqueous solubility, low oral bioavailability, sporadic absorption, and delayed therapeutic onset. Antidepressants exhibiting the first-pass metabolism require high doses to achieve therapeutic CNS concentrations, leading to adverse effects and poor patient compliance. Cyclodextrins (CDs), cyclic oligosaccharides with hydrophobic cavities and hydrophilic exteriors, offer a fruitful strategy to conquer these pharmaceutical challenges through inclusion chelating. A systematic review conducted on different formulations focusing on cyclodextrin-antidepressant inclusion complexes, physicochemical characterization, structural evaluation, pharmacokinetic evaluation, and preclinical/clinical study in depression models. Cyclodextrin chelation significantly enhances antidepressant performance through different mechanisms: (1) 10- to 100-fold increment in aqueous solubility of poorly soluble drugs like SSRIs, SNRIs, and tricyclic antidepressants; (2) protection from oxidative and photolytic degradation; (3) dissolution rates enhanced and enabling faster onset of action; (4) first-pass metabolism is reduced and improving gastrointestinal absorption; Preclinical studies show improved behavioral response and reduced effective doses in depression models. A Cyclodextrin complex has more enough ways to increase the bioavailability with different mode of actions. Future work can optimize the cyclodextrin derivatives for selected CNS delivery system and advance promising candidates through clinical evaluation in MDD patients.

Keywords: *Cyclodextrins, Antidepressants, Major depressive disorder, Bioavailability, Inclusion complexes, Drug delivery.*

O-01/N/002 ORAL · ONLINE

Machine Learning-Assisted Molecular Modeling of Cyclodextrin Inclusion Complexes for Enhanced Solubility of Poorly Water-Soluble Drugs

Ansh Dadwal[1], **Ms. Navdeep Kaur**[1]
ASBASJSM College of Pharmacy, Bela, Punjab, India
Email: anshdadwalrajput@gmail.com

Poor aqueous solubility remains a major bottleneck in modern drug development, limiting the bioavailability and clinical performance of a large proportion of new chemical entities. Cyclodextrin (CD)-based inclusion complexation is a well-established strategy to address this challenge, but conventional experimental screening of drug–CD combinations is time-consuming and resource-intensive. Objective This study aims to combine machine learning (ML) with molecular modeling to rationally predict and design CD inclusion complexes for poorly water-soluble drugs, directly aligning with the shift toward AI-enabled, Quality-by-Design approaches in next-generation pharmaceutical development. Methods Computational molecular docking will be used to evaluate host–guest fit between poorly water-soluble drug candidates and α-, β-, and γ-cyclodextrin cavities, while ML models will correlate physicochemical drug descriptors with predicted complex stability and solubility enhancement. Top-ranked complexes identified computationally will be prepared using standard techniques such as the kneading method, with stability and solubility improvement subsequently confirmed through phase-solubility studies and dissolution testing. Conclusion & Future Healthcare Impact By coupling predictive computational screening with targeted experimental validation, this framework aims to substantially reduce formulation development timelines while improving the reliability of CD carrier selection. The approach offers a scalable, data-driven pathway toward designing affordable, custom drug-delivery carriers — supporting safer, more effective, and more accessible next-generation healthcare.

Keywords: *Cyclodextrin Complexes, Machine Learning, Molecular Docking, Solubility Enhancement, Drug Design.*

O-01/N/003 ORAL · ONLINE

Platform-Based Formulation Development of BCS Class IV Drugs Using β-Cyclodextrin–Lecithin–Bioenhancer Matrix: Application to Mebendazole

Attahir Saad Ayuba*, Mihir K. Raval, Vijaykumar K. Parmar

Department of Pharmaceutical Sciences, Sardar Patel University, Vallabh Vidyanagar, Anand, Gujarat, India

Email: attahirsaad@spuvvn.edu

Background: Mebendazole a benzimidazole anthelmintic, is widely recognized for its efficacy against intestinal helminths, mebendazole exhibits poor aqueous solubility and oral bioavailability of less than 10%, which substantially limits its systemic therapeutic applications, including its emerging role in cancer therapy. This study aimed to develop a β-cyclodextrin–lecithin hybrid solid dispersion incorporating curcumin as a multifunctional bioenhancer to improve the physicochemical properties and dissolution performance of mebendazole.

Methods: Solid dispersions were prepared by the solvent evaporation method and characterized using Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), powder X-ray diffraction (PXRD), phase-solubility analysis, and in vitro dissolution studies.

Results: Phase-solubility analysis demonstrated a concentration-dependent increase in the apparent solubility of mebendazole in the presence of β-cyclodextrin. FTIR analysis indicated intermolecular interactions between mebendazole and the carrier matrix, while DSC revealed altered thermal behavior following formulation. PXRD showed a marked reduction in the intensity of the characteristic crystalline peaks of mebendazole, indicating reduced crystallinity and molecular dispersion within the β-cyclodextrin–lecithin hybrid matrix. The optimized solid dispersion exhibited rapid dissolution, achieving 100% drug release within 15–30 min.

Conclusion: The β-cyclodextrin–lecithin–curcumin hybrid solid dispersion effectively enhanced the dissolution characteristics of mebendazole. This multifunctional hybrid platform represents a promising formulation strategy for improving the oral delivery of BCS Class IV drugs. Ongoing permeability studies and future evaluation using hydroxypropyl-β-cyclodextrin will further assess the performance and translational potential of the proposed delivery platform.

Keywords: *Mebendazole; β-cyclodextrin; Solid dispersion; Hybrid drug delivery platform; Curcumin; Lecithin; BCS Class IV drugs.*

O-01/N/004 ORAL · ONLINE

Sulfobutylether-β-Cyclodextrin–Piperine Assisted Amorphous Solid Dispersion of Curcumin: Enhanced Solubility and Oral Bioavailability

Subhash Deshmane*, Aditya Shinde, Shyamsundar Pancholi

SVKM's NMIMS, School of Pharmacy and Technology Management, Shirpur Campus. M. S. India

Email: subdeshmane@yahoo.co.in

Sulfobutylether beta-cyclodextrin (SBECD) is an FDA-approved pharmaceutical solubilizer having a hydrophilic outer surface and a lipophilic interior, allowing for the formation of inclusion complexes with poorly soluble medicines. Curcumin has two polar phenyl rings connected by two hydroxyl and ortho-methoxy groups. Curcumin's phenyl rings are axially connected by an aliphatic chain (C7), rendering it insoluble in water. Piperine, a strong pungent alkaloid derived from Piper nigrum and Piper longum, has gained popularity as a natural bioavailability booster. Phase solubility research was carried out using SBECD concentrations of 5, 10, 20, 30, 40, and 50%. In the current investigation, solid dispersions of curcumin and piperine were produced using SBECD as a carrier in varying ratios via solvent evaporation. Curcumin solubility increased from 19.32 µg/ml to 183.12 µg/ml concentration. The DSC thermogram shows the creation of an amorphous solid dispersion, which may help increase curcumin solubility, dissolution rate, and bioavailability. The lack of well-defined peaks detected by the X-ray diffractometer implies diminished molecular order and crystalline lattice breakdown. SEM analysis of the optimized batch reveals the absence of well-defined crystalline structures of curcumin, indicating a significant morphological modification of curcumin after incorporation into the cyclodextrin-based carrier matrix. Curcumin-piperazne solid dispersions have the most promising effect on bioavailability, with Cmax=53.08 µg/ml, AUC0-t=0.312 µg·h/mL, and t1/2=4.5. The study concluded that the SBECD carrier forms a molecular compound with curcumin in solid dispersions, and piperine inhibits intestinal and hepatic glucuronidation, lowering curcumin's presystemic metabolism.

Keywords: *Bioavailability, Sulfobutylether beta-cyclodextrin, Solubility, Curcumin, piperine, solid dispersions.*

O-01/N/005 ORAL · ONLINE

Formulation and Evaluation of a Chronotherapeutic Tablet-In-Tablet of Telmisartan and Amlodipine

Sangeeta Saraswat[1], Dr. Anju Goyal[2]
Faculty of Pharmacy, Bhupal Nobles' University, Udaipur
Email: sangeetasaraswat36@gmail.com

Background: Hypertension is one of the major risk factors for cardiovascular morbidity and mortality and is characterized by significant circadian variations in blood pressure. The early morning surge in blood pressure is associated with an increased incidence of cardiovascular events, highlighting the importance of synchronizing antihypertensive drug delivery with the biological rhythm of the disease. Conventional drug delivery systems may not provide adequate temporal control over drug release and, therefore, may be suboptimal for chronotherapy. The present research is aimed at the formulation and evaluation of a chronotherapeutic tablet-in-tablet delivery system containing Telmisartan and Amlodipine for time programmed antihypertensive drug delivery. The proposed system is designed to incorporate a predetermined lag phase followed by drug release, with the objective of providing drug availability during the early morning period when the risk of elevated blood pressure and cardiovascular complications is comparatively higher.

Methods: Reformulation studies will be performed to characterize the physicochemical properties of the selected drugs and to establish their compatibility with the proposed excipients. Subsequently, a tablet-in-tablet formulation will be developed using suitable formulation approaches and release-retarding polymers to achieve the desired lag time and drug-release profile. The prepared formulations will be evaluated for pre-compression and post compression characteristics, drug content uniformity, in-vitro drug release, lag time, release kinetics, and stability. Based on the predetermined formulation criteria, an optimized formulation will be selected.

Conclusion: The developed chronotherapeutic tablet-in-tablet system is expected to provide controlled and temporally synchronized delivery of Telmisartan and Amlodipine, thereby offering a potential approach for improving the management of hypertension in accordance with its circadian pattern. This formulation strategy may contribute to enhanced therapeutic effectiveness, improved patient compliance, and better control of early morning blood pressure fluctuations.

Keywords: *Chronotherapy, Tablet-in-tablet, Telmisartan, Amlodipine, Hypertension, Pulsatile drug delivery, Circadian rhythm, Lag time.*

O-01/N/006 ORAL · ONLINE

Cyclodextrin-Assisted Solubility Enhancement and Gellan Gum Based Ocular In-Situ Gel for Improved Drug Delivery

Khushi Deora*, Dr. Ashish Kumar Parashar[1]
Lloyd Institute of Management and Technology, Plot No 11, Knowledge Park II, Greater Noida, Uttar Pradesh 201310
Email: khushistm003@gmail.com

Poor aqueous solubility is one of the major challenges in developing effective ophthalmic in-situ gel formulations. Since these systems are predominantly aqueous-based and administered in small volumes, adequate drug solubility is essential for efficient drug release and ocular absorption. The present study focused on developing a cyclodextrin-assisted ocular in-situ gel formulation for improving the delivery of a poorly water-soluble drug. Hydroxypropyl-β-cyclodextrin (HβCD) was employed as a solubility-enhancing agent to improve the aqueous availability of the drug, while low-acyl gellan gum was selected as an ion-activated in-situ gelling polymer. The formulation was designed to form a gel rapidly upon contact with ions present in lacrimal fluid, thereby improving formulation retention on the ocular surface. The effect of cyclodextrin concentration on drug release and the gelation behaviour of the formulation was investigated using rheological analysis coupled with drug-release assessment. The formulation demonstrated rapid gel formation following exposure to simulated lacrimal fluid, indicating that the presence of the cyclodextrin-based drug complex did not interfere significantly with the gelation process. Drug release was dependent on the concentration of HβCD, with approximately 97% release observed at 10% HβCD, whereas increasing its concentration to 20% resulted in approximately 79% release. Ex-vivo evaluation using porcine cornea demonstrated approximately 55% permeation within 300 min, compared with 37% from a conventional non-gelling formulation. Overall, the findings indicate that combining cyclodextrin-mediated solubility enhancement with gellan gum-based ion-activated in-situ gelation can be a promising strategy for improving drug release, ocular residence, and corneal permeation of poorly water-soluble drugs.

Keywords: *Cyclodextrin; Gellan gum; Ocular drug delivery; In-situ gel; Solubility enhancement; Ion-activated gelation; Corneal permeation; Sustained drug release.*

O-01/N/007 ORAL · ONLINE

Pharmacokinetic and Therapeutic Applications of Cyclodextrin-Based Drug Delivery in Veterinary Medicine: A Review and Future Prospects

Abdulaziz Musa Kwalli
Bayero University Kano
Email: amkwalli.vpt@buk.edu.ng

The effectiveness of a veterinary medicine depends not only on the pharmacological activity of the active ingredient but also on how effectively the drug can be formulated, absorbed and delivered to the animal. Poor aqueous solubility remains an important formulation problem for many therapeutic compounds and can contribute to slow dissolution, variable absorption and reduced or inconsistent systemic exposure. Cyclodextrins are cyclic oligosaccharides that can form reversible inclusion complexes with suitable drug molecules and have consequently attracted interest as pharmaceutical carriers for poorly water-soluble compounds. This review examines the pharmacokinetic and therapeutic applications of cyclodextrin-based drug delivery in veterinary medicine, with emphasis on experimental evidence from dogs, sheep and other animal models. Available studies indicate that cyclodextrin complexation can improve apparent drug solubility and, for selected compounds, enhance systemic exposure or modify pharmacokinetic parameters such as maximum plasma concentration, time to maximum concentration and bioavailability. However, the response is not uniform. Studies in sheep demonstrate that a substantial increase in aqueous solubility does not necessarily translate into a corresponding improvement in systemic exposure, highlighting the importance of species-specific gastrointestinal physiology. In dogs, cyclodextrin-based formulations have demonstrated promising pharmacokinetic effects for compounds including florfenicol and curcumin, while other studies have shown more modest effects depending on the formulation. Cyclodextrins may therefore be useful not simply as solubility enhancers but as formulation tools capable of influencing drug disposition and therapeutic performance. Safety, route of administration, dose, cyclodextrin derivative and species remain important considerations. Future applications may involve controlled-release formulations, nanocarriers, targeted delivery systems and advanced molecular therapeutics. Further veterinary research should focus on linking formulation improvements with clinically meaningful pharmacokinetic and therapeutic outcomes.

Keywords: *Cyclodextrins; Veterinary Medicine; Drug Delivery; Pharmacokinetics; Bioavailability; Nanocarriers.*

O-01/N/008 ORAL · ONLINE

Role of Cyclodextrins as Functional Excipients in Pharmaceutical Formulations: Current Status and Future Horizons

Amaresh Prusty
Department of Pharmaceutics, School of Pharmaceutical Sciences-II. Siksha 'O' Anusandhan. Phulnakhara. Bhubaneswar, Odisha, India. 751030.
Email: amareshprusty@gmail.com

The development of modern drug delivery systems faces severe challenges as 40% of marketed drugs and up to 90% of newly discovered drug molecules fall under Classes II and IV of the BCS, showing poor aqueous solubility, low bioavailability, and chemical instability of emerging active pharmaceutical ingredients (APIs). Cyclodextrins (CDs) are cyclic oligosaccharides, pharmaceutical excipients composed of α-(1,4)-linked gluco pyranose units (GPU) with a unique hydrophilic exterior and hydrophobic cavity, that can form inclusion complexes with poorly soluble drugs, improving their pharmacokinetic profiles and therapeutic efficacy, and are capable of overcoming the above formulation challenges by protecting API moieties against hydrolysis, oxidation, and photolysis. In recent times, their role as excipients in different types of dosage formulations has included oral, ophthalmic, parenteral, and topical applications, as well as their emerging use in target-specific nanomedicine, non-oral delivery routes, gene delivery, and treatment of neurodegenerative, cardiovascular, and infectious diseases, along with use in target-specific nanomedicine and non-oral delivery routes due to their drug entrapment capabilities, pharmacokinetic impact, safety profile, and novel emerging applications. CD based nanoparticles offer promising pathways for cancer therapy, chronic disease management, and personalized medicine. Different types of CD include α-CD with 6 GPU and an internal cavity diameter of 4.7 – 5.3 A0 which is used for encapsulation of low molecular weight drugs. Whereas β and γ-CDs form have 7 and 8 GPU respectively. Besides these forms, chemically modified CD derivatives such as HP-β-CD (2-hydroxypropyl-β-Cd) and SBE-β-CD (sulfobutylether-β-CD) are also used as excipients in pharmaceutical formulations. Continued exploration of novel derivatives and polymer-grafted CD systems will play a pivotal role in overcoming complex drug delivery hurdles in next-generation therapies.

Keywords: *Cyclodextrins; Inclusion Complexes; Excipients; Solubility Enhancement; Bioavailability; Hydroxypropyl-β-cyclodextrin; Drug Delivery Systems.*

O-01/N/009 ORAL · ONLINE

Formulation And Evaluation of Cyclodextrin Based Nanosponges for Dissolution Improvement of Cilostazol

***Ashok Neelkanth Mahajan, Ahir Binal, Naazneen Surti, Swati Kurkoti**

**Indukaka Ipcowala College of Pharmacy, The Charutar Vidya Mandal University (CVMU), New VV Nagar, Anand, Gujarat, 388120, India*
Email: apmcashok@gmail.com

Cilostazol (CZ) is an antiplatelet agent approved by USFDA. However incomplete absorption of CZ from tablets in human is due to its poor water solubility. Hence the objective of present investigation was to synthesize, characterize the cyclodextrin (BCD) based nanosponges(NS) and to improve the solubility and dissolution characteristics of CZ by formulating into cyclodextrin based NS. NS were prepared by ultrasound assisted synthesis method. CZ loaded NS were characterized by FTIR, X-ray diffraction, DSC and SEM, phase solubility and solution interaction studies. Phase solubility studies confirmed the enhanced solubilization ability of NS over the plain beta cyclodextrin molecule. The solution state interaction studies, FTIR, DSC and X-ray diffraction studies confirmed the formation of an inclusion complex between CZ & NS. CZ loaded NS formulation having the ratio of 1:3 showed 90% drug release in 60 minutes as compared to plain CZ powder. This study concluded that cyclodextrin based nanosponges can be an effective method to improve the dissolution characteristic of poorly soluble BCS class II drug CZ.

Keywords: *Cli0stazol, Nano sponges, Cyclodextrin*

O-01/N/010 ORAL · ONLINE

QbD-Guided Development of Tretinoin-Loaded β-Cyclodextrin Nanosponges: Integrating Molecular Docking and Design-of-Experiments for Next-Generation Topical Delivery

Kiran Tamboli and Dr. Neha Dand*

Department of Pharmaceutics, Bharati Vidyapeeth's College of Pharmacy, Navi Mumbai, Maharashtra, India - 400614.

Tretinoin is an effective topical retinoid for acne management; however, its poor aqueous solubility, limited stability, and irritation potential can compromise therapeutic performance and patient compliance. Cyclodextrin-based nanosponges offer a multifunctional platform capable of combining host–guest complexation with a cross-linked, nanoporous delivery matrix for improved drug solubilisation and controlled release. This study aimed to develop tretinoin-loaded β-cyclodextrin nanosponges using a quality-by-design (QbD) strategy supported by molecular modelling and design of-experiments-based optimization. Phase-solubility studies were performed using β-cyclodextrin and hydroxypropyl-β-cyclodextrin to establish the drug–cyclodextrin interaction and stoichiometry. Molecular docking was used to predict the orientation and affinity of tretinoin within the β cyclodextrin cavity. Diphenyl carbonate was selected as the cross-linker based on carbonate-bond formation. Blank nanosponges were prepared by melt and interfacial polymerization methods. A Box Behnken design was employed to evaluate the effects of cyclodextrin concentration, cross-linker concentration, and reaction time on percentage yield and carbonate-bond formation, thereby establishing a QbD-based design space. Software-assisted optimization was used to identify suitable formulation and process conditions. Tretinoin formed a 1:1 inclusion complex with both cyclodextrin systems. The apparent stability constants were 805 M^{-1} for β-cyclodextrin and 825 M^{-1} for hydroxypropyl-β-cyclodextrin. Molecular docking demonstrated favourable drug–cyclodextrin interaction, with a binding energy of −4.5 kcal/mol. The optimized nanosponge system showed a drug loading efficiency of 62.34 ± 2.54% and an entrapment efficiency of 77.48 ± 3.47%. Spectroscopic and thermal characterization supported carbonate cross-linking and successful incorporation of tretinoin into the cyclodextrin nanosponge matrix. The study demonstrates how molecular modelling and QbD driven experimental optimization can accelerate the rational development of cyclodextrin nanosponges for poorly soluble topical drugs. This integrated workflow provides a scientifically robust foundation for future AI-enabled predictive modelling, formulation digitalization, and data-driven development of cyclodextrin-based healthcare technologies.

Keywords: *Cyclodextrin Nanosponges, Tretinoin; β-cyclodextrin, Molecular Docking, Quality by Design, Box Behnken design, Topical Drug Delivery, AI-Enabled Formulation Development.*

O-01/N/011 ORAL · ONLINE

Acoustic Engineering of Cyclodextrin Nanosponges for Molecular Dispersion and Pharmacokinetic Reprogramming of a BCS Class IV drug

***Mr. Nilkamal Waghmare and Dr. Neha Dand**
Bharati Vidyapeeth's College of Pharmacy, Navi Mumbai, Maharashtra – 400614, India.
Email: nilkamal.waghmare@bvcop.in

Furosemide, a BCS Class IV drug, suffers from poor solubility and erratic oral bioavailability, necessitating the development of an efficient delivery system. The present study reports the rational design and evaluation of βcyclodextrin-based nanosponges for enhancing the biopharmaceutical performance of furosemide. Phasesolubility analysis confirmed favourable host–guest interactions, which guided nanosponge synthesis via diphenyl carbonate crosslinking under optimised sonochemical conditions using a Box–Behnken design. The optimised formulation exhibited a particle size of 593.56 ± 7.43 nm, polydispersity index of 0.289, and zeta potential of −17.46 ± 1.06 mV, along with high drug loading (56 ± 2.05%) and entrapment efficiency (72.6 ± 1.69%). Spectroscopic (FTIR) and thermal (DSC) analyses confirmed non covalent inclusion and amorphisation of furosemide within the nanosponge matrix, while PXRD and SEM revealed loss of crystallinity and formation of a porous polymeric architecture. The nanosponge system significantly enhanced saturation solubility and exhibited sustained in vitro drug release, following first-order kinetics. In vivo pharmacokinetic evaluation in Wistar rats demonstrated a marked improvement in systemic exposure, with a ~7-fold increase in AUC, prolonged Tmax (~7.9 h), extended half-life (~5.7 h), and significantly increased mean residence time (~15.8 h), along with reduced clearance. Notably, enhanced bioavailability was maintained even at lower doses, indicating improved dose efficiency. These findings establish that cyclodextrin nanosponges act as a structurally engineered carrier capable of transforming the pharmacokinetic behaviour of furosemide, offering a promising strategy for improving the delivery of poorly soluble drugs.

Keywords: *BCS Class, Nano sponges, Solubility enhancement*

O-01/N/012 ORAL · ONLINE

AI-Driven Design of Cyclodextrin-Based Drug Delivery Systems: Integrating Molecular Modelling and QbD for Predictive Formulation Optimization

Kashish Lohar*, Dr. Sanjesh Rathi
School of Pharmacy, Rai University, Ahmedabad, Gujrat, India
Email: kashish.lohar1405@gmail.com

Cyclodextrins (CDs) are multi-purpose pharmaceutical excipients which are capable of improving the solubility, stability, bioavailability and controlled release of drugs via host- guest complexation. However, the traditional approach to the formulation of CDs is empirical, which involves screening different types of CDs, drug CD ratios, and processing conditions and is time-consuming and labor-intensive. Artificial intelligence (AI), molecular modeling, and Quality by Design (QbD) provide a new chance to change this trial-and-error strategy into a predictive formulation strategy. The molecular modeling techniques like molecular docking and molecular dynamics simulation can reveal the mechanism of interaction between drug and CD, and provide molecular descriptors related to complex stability. Together with experimental formulation information, these descriptors can be used to help develop machine-learning models that can predict various outcomes, including complexation efficiency, solubility enhancement, dissolution, drug loading, stability, and release. The combination with QbD can support a systematic identification of critical material attributes (CMAs), critical process parameters (CPPs), and critical quality attributes (CQAs) and support the generation of a predictive design space and formulation optimization. This approach would help to decrease the number of experimental iterations, speed up the selection of CDs, increase the formulation reproducibility and enable a better understanding of the drug CD systems. In conclusion, the integration of AI, molecular modeling, and QbD holds promise for the future as a powerful tool for the development of next-generation cyclodextrin-based drug delivery systems, offering the potential for more efficient and predictive processes.

Keywords: *Cyclodextrins, Artificial Intelligence, Molecular Modelling, Quality by Design, Drug Delivery*

O-01/N/013 ORAL · ONLINE

Intranasal delivery of Cannabidiol via Sulfobutylether-Beta-Cyclodextrin inclusion complexes in a Thermosensitive Hydrogel matrix for enhanced nose-to-brain bioavailability

Pawar Lalit Mohanlal*, Komal Sharma
Bhupal Nobles' Institute of Pharmaceutical Science's, Udaipur, Rajasthan.
Email: lalitpawar9769@gmail.com

Background: Cannabidiol (CBD), a plant-based compound that might help with brain-related conditions, has some challenges. It dissolves poorly in water, has extensive first-pass hepatic metabolism, and has limited blood-brain barrier permeability when administered systemically. Delivering CBD directly to the brain through the nose could bypass these issues by using the nose-to-brain pathway, which involves the smell and nerve pathway. However, the nasal lining can clear out oily drugs like CBD too quickly, limiting how long they stay there.

Objective: To create, improve and test a special mix that includes CBD and sulfobutylether-beta-cyclodextrin (SBE-β-CD). This mix will be part of a gel that changes from liquid to gel at body temperature, helping CBD stay in the nose longer and reach the brain more effectively.

Methodology: We'll make the CBD-SBE-β-CD mix using a method called solvent evaporation and freeze-drying. We'll check its properties with tests like phase-solubility analysis, FTIR, and DSC. The gel will be made by mixing certain types of polymers, like Pluronic F127 and F68, with others that help it stick to the nasal lining, like HPMC or Carbopol. We'll test the gel's properties, including the temperature at which it turns into a gel (around 30-35°C), its pH, thickness, how evenly CBD is spread throughout, and how it releases CBD over time through a special membrane. We'll also test how well CBD moves through nasal tissue from animal samples and check its effects on blood and brain tissue from animal samples and check its effects on blood and brain tissue in mice using a special testing method called UPLC-MS/MS.

Expected results: Using SBE-β-CD should greatly increase how well CBD dissolves in water. We expect the best gel formulation to change from liquid to gel quickly at body temperature (around 32-34°C) and stick well to the nasal lining to stay longer. In lab tests, we expect the CBD to come out in two stages: a quick initial release followed by a slower, longer-lasting release over 8-12 hours. We also expect higher levels of CBD in the brain, better targeting efficiency, and better absorption than when given as a nasal spray or by mouth, with no serious side effects on the nasal tissues.

Significance: This new SBE-β-CD-based gel system could solve key problems with CBD delivery, helping provide a non-invasive, easy-to-use, brain-targeting treatment for difficult-to-treat conditions like epilepsy, brain inflammation, and neurodegenerative diseases.

Keywords: *Cyclodextrin; Inclusion Complex; Drug Delivery; Cannabidiol; Sulfobutylether-Beta-Cyclodextrin.*

O-01/N/014 ORAL · ONLINE

Cyclodextrin-Engineered Nanoplatforms: From Smart Drug Delivery to Precision Theranostics

Pranav
Manipal College of Pharmaceutical Sciences, MAHE, Manipal
Email: pranavvlogs96@gmail.com

Nanoparticle-based drug delivery systems have emerged as versatile platforms for improving therapeutic performance; however, challenges related to drug loading, aqueous solubility, formulation stability, bioavailability, site-specific delivery, and controlled drug release continue to limit their broader pharmaceutical application. Cyclodextrins (CDs), owing to their unique host–guest complexation ability, biocompatibility, and amenability to chemical modification, offer a promising strategy for overcoming these limitations. Present work highlights the evolving role of natural and chemically modified cyclodextrins in the design and functional optimization of nanoparticulate drug delivery systems. CD incorporation can enhance drug loading and entrapment efficiency, improve solubility, dissolution, permeability and bioavailability, stabilize nanocarriers, and facilitate sustained, controlled, pH-responsive and site-specific drug release. Functionalized CD nanoparticles additionally demonstrate potential for mucoadhesive delivery, intracellular transport, nucleic-acid delivery, brain targeting and cancer-directed therapy. Their structural versatility enables integration with polymeric, magnetic, metallic and other nanosystems, providing opportunities for multifunctional platforms. Of particular interest is the emerging theragnostic potential of CD-based nanoplatforms, in which therapeutic delivery can be integrated with imaging, diagnosis and treatment monitoring through stimuli-responsive and targeted systems. Despite these advances, optimization of CD structure, nanoparticle composition, preparation methods, safety, pharmacokinetic behaviour and translational scalability remains essential. Overall, cyclodextrin engineering represents a promising approach for developing tailor-made nanomedicines with improved pharmaceutical performance and multifunctionality, potentially bridging conventional drug delivery with precision therapeutics and theranostics.

Keywords: *Cyclodextrins; Cyclodextrin nanoparticles; Nanomedicine; Drug delivery; Drug loading; Bioavailability; Targeted delivery; Controlled release; Stimuli-responsive systems; Theranostics.*

O-01/N/015 ORAL · ONLINE

Enhancement of Solubility of Ibuprofen Using β-Cyclodextrin: A Comparative Study

Vikas, Mr. Sandeep Shankar Pandey*
Department of Pharmacy, Shiv Bali Singh College of Pharmacy, Malwan, Fatehpur, Uttar Pradesh, India

Ibuprofen is a widely used non-steroidal anti-inflammatory drug (NSAID) for the management of pain, inflammation, and fever. However, its poor aqueous solubility can limit its dissolution and may affect its oral drug delivery. Cyclodextrins are cyclic oligosaccharides capable of forming inclusion complexes with poorly water-soluble drugs and are therefore widely investigated for solubility enhancement. The present study focuses on the use of β-cyclodextrin to improve the aqueous solubility of ibuprofen through the formation of an inclusion complex. The ibuprofen–β-cyclodextrin complex can be prepared using a suitable complexation method and compared with pure ibuprofen. The prepared complex may be evaluated for solubility enhancement and relevant physicochemical characteristics. A comparative assessment of pure ibuprofen and the β-cyclodextrin complex is expected to demonstrate the effect of complex formation on the aqueous solubility of the drug. This approach may provide a simple and effective strategy for improving the dissolution characteristics of poorly water-soluble drugs and may have potential applications in pharmaceutical formulation development.

Keywords: *β-Cyclodextrin; Ibuprofen; Solubility Enhancement; Inclusion Complex; Drug Delivery; Dissolution.*

O-01/N/016 ORAL · ONLINE

Improved Drug Delivery in Combination Therapy Cyclodextrin Carriers

Ritik Rajput*, Poonam Arora, Sandeep Arora
Amity Institute of Pharmacy, Amity University, Mohali, Punjab
Email: ritikrajputdahri@gmail.com

Cyclodextrin are the compounds which are used in pharmaceutical drug delivery because of their ability to improve solubility, stability and drug transport. They also chemically modified with wide range of molecules to increase such properties. They are used for advanced therapeutic application because of their flexible chemical structure and ability to get incorporated into different delivery system. Cyclodextrin are used by incorporating into hydrogel, nanoparticle and cationic polymer to reduce the toxicity which is associated due to the cationic polymer. The interaction of the host-guest lead to the controlled-release system. Cyclodextrin used in the combination therapy and have ability to accommodate small molecule and integrated with system that carry nucleic acid and other therapeutic agent and capable of giving multiple treatment through common platform.

Effective delivery of chemotherapeutics aims to maximize exposure to tumor cells while minimizing exposure to healthy tissues. Paclitaxel is small molecule chemotherapeutic drug which undergoes host/guest interactions with CD, and has been successfully co-delivered with genetic cargo thereby decreasing the toxicity to normal cells and increasing the effectiveness. Doxorubicin is a very common chemotherapeutic which has been co-delivered with p53 gene via host/guest interactions with CD.

In addition to chemotherapeutics, gene therapies are also co-delivered with immunotherapies. Immunotherapeutics can be small molecules (immunomodulators, cytokines), proteins (antibodies, checkpoint inhibitors), or even cell-based therapies. Many of these molecule types have stability or solubility concerns, and are limited in their efficacy when administered in free drug form. The modularity of CD, as well as its ability to complex with guest molecules of multiple types, shows promise for use in immunotherapy applications.

As we continue to move towards combinatorial and personalized treatments, it is important that the treatment systems we design make allowances for this direction. CD can fulfill many roles in delivery systems, making it an important addition to platforms that require modularity.

O-01/N/017 ORAL · ONLINE

Cyclodextrin-Complexed Cyclosporine A Nanowafers for Oil- and Surfactant-Free Management of Dry Eye Disease

Pinal Chaudhari[1], Vivek M. Ghate[2], Madhavan Nampoothiri[3], Shaila A. Lewis[2]

[1]*Amity Institute of Pharmacy, Amity University Punjab, India*

[2]*Yenepoya Technology Incubator, Yenepoya (Deemed to be University), University Road, Deralakatte, Mangalore-575018, Karnataka, India*

[3]*Department of Pharmacology, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education, Madhavnagar, Manipal – 576104, Karnataka, India*

[4]*Department of Pharmaceutics, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education, Madhavnagar, Manipal – 576104, Karnataka, India*

Objective: Cyclosporine A (CsA) is widely used to treat dry eye disease (DED), and ocular morbidity is on the rise and is a growing concern globally. However, several drug and formulation challenges such as poor drug solubility, short pre-corneal residence time, and poor patient compliance have limited the ocular bioavailability of CsA to <5%. A CsA cyclodextrin-based ternary complex loaded dissolvable nano drug reservoir films were developed to overcome these limitations and efficiently manage DED.

Methods: Drug-loaded nano-reservoir films were fabricated via lithography using silicone and PDMS molds. Different physicochemical characterizations were performed to confirm the formation of stable CsA-cyclodextrin-based ternary complexes. The formation of nanoreservoirs on the films was confirmed using SEM and AFM. The optimized CsA-complex-loaded nano-reservoir films were evaluated for in vitro drug release, ex vivo corneal permeation, and in vivo precorneal retention. Preclinical efficacy studies were performed to assess the efficacy of CsA-complex-loaded nano-reservoirs in an experimental dry-eye mouse model.

Results: Physicochemical characterization confirmed the formation of a stable complex and the improved solubility of CsA. In vitro release and ex vivo permeation studies indicated a controlled drug release and improved permeation, respectively. Furthermore, tear volume measurement and corneal damage assessment using slit-lamp imaging suggested decreased dry eye symptoms, significantly increasing tear volume in the drug-loaded nano-reservoir-treated group. Moreover, histopathological studies corroborated the tear volume and slit-lamp imaging results, with reduced inflammation and neovascularization.

Conclusion: The poorly water-soluble drug with cyclodextrin complex incorporated nano reservoir films presents a potential alternative for managing various ocular diseases.

Keywords: *Cyclosporine A, Ocular drug delivery, cyclodextrin, Controlled drug delivery, Ternary complex.*

O-01/N/018 ORAL · ONLINE

Cyclodextrin-Based Drug Delivery Systems for Improving the Biopharmaceutical Properties of Anti-Rheumatic Drugs

Swati Chaudhry[1], Dr. Praveen Kumar Dixit[2],

[1]*Department of Pharmacology, KIET School of Pharmacy Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Uttar Pradesh, India*

[2]*Associate Professor, Department of Pharmacology, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Uttar Pradesh, India*

Email: praveen.dixit@kiet.edu

Rheumatoid arthritis is a chronic inflammatory disorder that often requires long term pharmacological management. However, the therapeutic performance of commonly used anti rheumatic drugs can be limited by poor aqueous solubility, inadequate dissolution, variable oral absorption and dose-related adverse effects. Cyclodextrins (CDs) are pharmaceuticals carriers that form non-covalent inclusion complexes with drug molecules, thereby modifying their physiochemical and pharmacokinetic properties. This review explores the pharmacological and biopharmaceuticals relevance of cyclodextrin- based systems for selected anti rheumatic drugs with particular emphasis on methotrexate and meloxicam. Available evidence suggests that β- and γ-cyclodextrins can improve the aqueous solubility and dissolution of Meloxicam, whereas methotrexate has been explored in CD- based hydrogels, nanosponges, niosomes, and ternary systems containing hydrophilic polymers. Such approaches may enhance drug dissolution, absorption and stability, potentially improving oral drug performance and therapeutic response. The review also discusses commonly used preparation and characterisation techniques for evaluating drugs-cyclodextrin interactions. Overall, cyclodextrin-based drug delivery systems offer a potential approach for addressing formulation related limitations that may influence the pharmacological performance of selected anti-rheumatics drugs. However, most available evidence remains preclinical, and further research is needed to establish their pharmacokinetic behaviour and clinical relevance in rheumatoid arthritis therapy. Safety, reproducibility, scalability and regulatory considerations also need to be addressed before wider clinical translation

Keywords: *Rheumatoid arthritis; Cyclodextrin; methotrexate; meloxicam; drug delivery; pharmacokinetics; bioavailability.*

O-01/N/019 ORAL · ONLINE

A Cyclodextrin-Based Intranasal Humanin Carrier as a Preclinical Concept for Mitochondrial Protection in ALS

Mansi Rajput

School of Pharmaceutical Sciences, Department of Pharmacology, Chhatrapati Shahu Ji Maharaj University, G739+56H, Kanpur University, Kanpur, Uttar Pradesh 208024

Email: mansirajput0099@gmail.com

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disorder in which mitochondrial malfunction, oxidative stress, apoptosis, and neuroinflammation drive motor-neuron degeneration. Mitochondria-focused treatment is an active research direction in ALS, and the mitochondria-preserving peptide P110 previously slowed disease progression in a murine model. Humanin, a mitochondria-derived peptide encoded within the MT-RNR2 region, activates cytoprotective signaling through AKT, ERK1/2, and STAT3 and shows antioxidant and anti-apoptotic effects in preclinical models of neurodegeneration and cellular stress. However, peptide therapeutics face enzymatic degradation, poor stability, and limited CNS penetration across the blood-brain and blood-spinal cord barriers. Therefore, propose a cyclodextrin-based intranasal nanoformulation designed to stabilise Humanin, enhance nasal uptake, and raise its CNS exposure. Humanin will be complexed with hydroxypropyl- or sulfobutylether-beta-cyclodextrin and loaded into mucoadhesive chitosan nanocarriers. Particle size, polydispersity, zeta potential, encapsulation efficiency, peptide integrity and release will be measured. In ALS-relevant models, barrier transport, uptake, mitochondrial membrane potential, ATP, reactive oxygen species, apoptosis, inflammatory markers and motor-neuron survival will be compared with free Humanin, blank carrier and vehicle controls. This hypothesizes that the cyclodextrin-assisted carrier will outperform free peptide by reducing oxidative stress and apoptosis while supporting mitochondrial health and motor-neuron survival, providing a rationale for experimental validation.

Keywords: *Amyotrophic lateral sclerosis, Humanin, Cyclodextrin, Mitochondria, Neuroprotective.*

O-01/N/020 ORAL · ONLINE

Cyclodextrin-Assisted In Situ Gel for Enhanced Ocular Delivery of Lifitegrast

Aarya Menkudale, Abhijith K Shaji and Shaila Angela Lewis*

Department of Pharmaceutics, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education, Manipal, Karnataka, India, 576104

Email: s.lewis@manipal.edu

Lifitegrast (LFT), an anti-inflammatory agent used in the management of dry eye disease, has limited aqueous solubility and rapid precorneal clearance, which can limit its ocular delivery. Cyclodextrin complexation offers a promising strategy for improving drug solubility, while integration with an in situ gel can enhance ocular residence and sustain drug release. This study aimed to develop a hydroxypropyl-β-cyclodextrin (HP-β-CD)-based inclusion complex of LFT and incorporate it into a thermoresponsive ocular in situ gel. Molecular docking and phasesolubility studies were performed to screen cyclodextrins and characterize LFT-CD interactions. The selected complex was prepared by freeze-drying using polyvinyl alcohol (PVA) as a ternary agent and characterized by FTIR, DSC, XRD and 1H-NMR. The inclusion complex was incorporated into a Poloxamer 407/188-chitosan in situ gel and optimized using Box-Behnken design. The optimized formulation was evaluated for rheological behaviour, drug release, cytocompatibility and ex vivo corneal permeation. HP-β-CD demonstrated a strong molecular interaction with LFT (Glide score: -5.703 kcal/mol) and superior complexation (Kc: 1340 M^{-1}). LFT solubility increased from 0.0515 mg/mL to 1.530 mg/mL with HP-β-CD and to 2.679 mg/mL in the ternary system. The optimized gel exhibited a solgel transition at 34.45°C and pronounced shear-thinning behaviour. Controlled drug release reached 91.42% over 24 h, following Higuchi kinetics with Fickian diffusion. Ex vivo permeation demonstrated a flux of 151.49 μg/cm^2·h. The integrated LFT-HP-β-CD-PVA in situ gel effectively combined cyclodextrin-mediated solubility enhancement with thermoresponsive sustained delivery, demonstrating potential as an advanced ocular delivery platform for dry eye therapy.

Keywords: *Lifitegrast, Hydroxypropyl-β-cyclodextrin, Inclusion complex, In situ gel, Ocular drug delivery, Dry eye disease.*

O-01/N/021 ORAL · ONLINE

Cyclodextrin-Based Drug Delivery System and Applications

Anirudh Chandel
Department of Pharmaceutical Chemistry, ASBASJSM College of Pharmacy, Bela (Ropar), Punjab, India
Email: anuchandel097@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides composed of glucose units that possess a hydrophilic outer surface and a relatively hydrophobic inner cavity. Due to this unique structure, cyclodextrins can form inclusion complexes with poorly water-soluble drugs and improve their aqueous solubility, stability, dissolution rate, and bioavailability. Cyclodextrin-based drug delivery systems have therefore gained significant importance in pharmaceutical research. Different types of cyclodextrins, particularly α-, β-, and γ-cyclodextrins, along with their derivatives such as hydroxypropyl-β-cyclodextrin and sulfobutyl ether-βcyclodextrin, are used to enhance drug delivery. These systems can be incorporated into tablets, capsules, liquid formulations, nanoparticles, hydrogels, and other advanced drug delivery platforms. Cyclodextrins have applications in oral, ocular, nasal, dermal, parenteral, and targeted drug delivery. They can also help reduce drug irritation and improve the stability of sensitive drug molecules. However, limitations such as drug–cyclodextrin compatibility, dose limitations, toxicity concerns at high concentrations, and formulation cost must be considered. Overall, cyclodextrin-based drug delivery represents a versatile and promising approach for improving the therapeutic performance of poorly soluble and unstable drugs.

Keywords: *Cyclodextrins, poorly water-soluble drugs, inclusion complex, solubility, stability, bioavailability, drug delivery.*

O-01/N/022 ORAL · ONLINE

Role of Cyclodextrins in Enhancing Solubility, Stability and Bioavailability of Poorly Water-Soluble Drugs

Ashutosh kumar
Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: ashu117644@gmail.com

Background: Cyclodextrins are cyclic oligosaccharides widely used in pharmaceutical formulations because of their ability to form inclusion complexes with drug molecules. Their hydrophilic exterior and hydrophobic cavity can improve the physicochemical and biopharmaceutical properties of poorly water-soluble and unstable drugs.

Objective: To review the role of cyclodextrins in enhancing the solubility, stability, dissolution, and bioavailability of poorly water-soluble drugs and to highlight their potential in pharmaceutical formulations.

Results: Enhanced Solubility and Dissolution: Cyclodextrins form inclusion complexes with poorly water-soluble drugs, increasing their apparent aqueous solubility and dissolution rate. Improved Bioavailability: Enhanced dissolution and protection of drug molecules can improve drug absorption and systemic bioavailability. Improved Drug Stability: Cyclodextrins protect drug molecules from hydrolysis, oxidation, photodegradation, and other environmental factors, thereby improving stability. Improved Drug Performance: Complexation can enhance the physicochemical properties of drugs and support their effective incorporation into different dosage forms.Patient Acceptability: Cyclodextrins can mask unpleasant taste and odour of drugs, improving the acceptability of pharmaceutical formulations.

Conclusion: Cyclodextrins offer a promising approach for improving the solubility, stability, and bioavailability of poorly water-soluble drugs. Their ability to form inclusion complexes can enhance dissolution, protect drug molecules from degradation, and improve absorption. Continued research on modified cyclodextrins and advanced delivery systems may further expand their application in pharmaceutical development.

Keywords: *Cyclodextrins, poorly water-soluble drugs, inclusion complex, solubility, stability, bioavailability, drug delivery.*

O-01/N/023 ORAL · ONLINE

Role of Cyclodextrins in Drug Solubility, Stability and Bioavailability

Rajat Kumar*, Amit Chaudhary, Neha Kanojia
Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: rajat1013.mpharm26@chitkarauniversity.edu.in

Background: Cyclodextrins (CDs) are cyclic oligosaccharides consisting of α-1,4-linked glucose subunits which have a hydrophilic outer surface and a relatively hydrophobic central cavity. The unique architecture of CDs renders them capable of inclusion complexes formation with different drugs and thus provides an excellent platform for addressing the challenges associated with poorly water-soluble and unstable drugs.

CDs can enhance the solubility and stability of compounds and help them in absorption, thus increasing their bioavailability.

Objective: Objectives of this review are to explore the role of Cyclodextrins in increasing the solubility, stability and bioavailability of drugs and to discuss their mechanism of action, the different types of CDs and their applications in drug delivery

Result:

• Solubility Enhancement: CDs have a marked effect in increasing the aqueous solubility of poorly water-soluble drugs through their interaction with them to form stable complexes, which results in increased dissolution rate.

• Stability Improvement: CDs protect drugs against chemically or physically induced instability as well as enzymatically-mediated degradation, which results in increased shelf life of the drug and preservation of the active agent.

• Bioavailability Increase: By increasing the solubility and chemical and physical stability of drugs, CDs result in increased absorption and systemic availability of drugs, hence, improving bioavailability.

Conclusion: CDs are a useful and effective drug carrier which improve solubility, stability and bioavailability of drugs. Ability of CD to include lipophilic molecules in its cavity coupled with their non-toxicity, biocompatibility and safety profile give them great scope as pharmaceutical excipients. Further novel formulations and characterization techniques provide opportunities for further explorations of CDs in targeted drug delivery system.

Keywords: *Cyclodextrins, solubility, stability, bioavailability, Inclusion complex, drug delivery.*

O-01/N/024 ORAL · ONLINE

Ai-Assisted Predictive Selection Of Cyclodextrins For Drug Inclusion Complexation

Juhi Kumari
Department of Pharmaceutics, Chitkara University, Baddi, Himachal Pradesh
Email: kjuhi347@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides widely explored as pharmaceutical excipients for enhancing the performance of poorly water-soluble drugs. Their unique architecture, consisting of a hydrophilic outer surface and a relatively hydrophobic internal cavity, enables them to form reversible inclusion complexes with suitable drug molecules. Such complexation can improve apparent aqueous solubility, dissolution, stability, taste, and in some cases the bioavailability of drug substances. However, selection of the most appropriate cyclodextrin is not straightforward, as it depends on several molecular and formulation-related factors, including molecular size and shape, hydrophobicity, polarity, functional groups, cavity compatibility, pH, temperature, and complexation strength. This concept proposes an Artificial Intelligence (AI)-assisted predictive platform for rational selection of suitable cyclodextrins for drug molecules. By integrating molecular descriptors such as molecular weight, LogP, hydrogen-bonding characteristics, topological polar surface area, molecular dimensions, and experimentally reported complexation or solubility data, a machine-learning model could estimate the compatibility of a drug with different cyclodextrin types and derivatives, including a-, b-, g-cyclodextrin and selected modified cyclodextrins. The platform could further provide a comparative suitability score, predicted complexation tendency, and potential solubility enhancement, while Explainable AI approaches could identify the molecular features contributing to the prediction. Such an approach has the potential to shift cyclodextrin selection from a predominantly trial-and-error process toward a data-driven and rational formulation strategy. Integration with molecular docking and subsequent experimental validation using techniques such as phase-solubility analysis, FTIR, DSC, PXRD, or NMR could further strengthen the predictive framework. Overall, AI-assisted cyclodextrin selection represents a promising interdisciplinary approach connecting drug delivery, pharmaceutical formulation, computational science, and artificial intelligence, with potential applications in the early-stage development and optimization of inclusion-complex-based drug delivery systems.

Keywords: *Cyclodextrins, Drug Delivery, Inclusion Complex, Artificial Intelligence,*

O-01/N/025 ORAL · ONLINE

β-Cyclodextrin versus β-Cyclodextrin Nanosponges: Alternative Carriers for Sustainable Herbicide Formulations

Gaetano Caputoa, Martina Dragonea, Margarita Pérez-Jimenezb, Miriam Romero-Muñozb ,José Manuel López-Nicolásc, Rosa Iacovinoa* and Adrián Matencioc*

a. Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, Caserta, Italy
b. Department of Plant Biotechnology, Genomics and Breeding, Murcian Institute of Agricultural and Environmental Research and Development (IMIDA), Spain
*c. Departamento de Bioquímica y Biología Molecular-A, Facultad de Biología, Universidad de Murcia–Regional Campus of International Excellence "Campus Mare Nostrum", E-30100 Murcia, Spain * Co-senior authorship*
Email: gaetano.caputo@unicampania.it

In a world characterized by increased use of agrochemicals to meet a growing demand for agricultural productivity, the development of environmentally applicable formulations requires delivery systems capable of enhancing the performance of substances such as herbicides, while minimizing their harmful effects on non-target organisms. In this context, molecular docking analysis has proven that β-cyclodextrin (β-CD) 2- a cyclic oligosaccharide with hydrophobic inner cavity and hydrophilic outer surface - can include Chlorpropham (CLO) and Propanil (PRO), anti-weed herbicides used on potato and rice crops. β-CD complexation also demonstrated, through UV analysis, a protective effect against CLO and PRO degradation since these molecules are chemically unstable, especially in presence of the light. On other hand, the same compounds are insoluble in water. for this reason, we explore the formation of alternative complexes using β-CD polymers called nanosponges (β-CD –NS)3, three-dimensionally networked formations that could act as release systems capable of increasing loading capacity and allowing for more controlled release. Characterization of polymer complexes was carried out using thermogravimetric analysis (TGA) and Fourier Transformed (FT-IR) spectroscopy; their activity on plants and their capacity to release the guest molecule were also evaluated, in order to compare them with cyclodextrin complexes, also highlighting the advantages and limitations of each system and contributing to the design of safer and more environmentally friendly agrochemical formulations. Overall, this study provides a comparison between β-CD and β-CD – NS as herbicides delivery systems: future experiments will clarify respective advantages of each formulation facilitating development of more sustainable agrochemical formulations

Keywords: *β-cyclodextrin, nanosponges, herbicides, delivery systems*

O-01/N/026 ORAL · ONLINE

Cyclodextrins as Versatile Excipients in Modern Drug Delivery Systems: A Comprehensive Review

Priya*, Amit Chaudhary, Divya Dheer

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: priya1009.mpharm26@chitkarauniversity.edu.in

Background: Poor aqueous solubility and low oral bioavailability remain major challenges in pharmaceutical development, with over 40% of marketed drugs and nearly 90% of pipeline candidates categorized as BCS Class II or IV molecules. Cyclodextrins (CDs)—cyclic oligosaccharides composed of glucopyranose units—have emerged as crucial functional excipients that form reversible host-guest inclusion complexes with hydrophobic drug molecules, thereby enhancing solubility, stability, and membrane permeability.

Objective: Purpose of this review is to evaluate the clinical utility, chemical modifications, molecular inclusion mechanisms, and pharmaceutical applications of cyclodextrin-based formulations across modern drug delivery platforms.

Results:

Solubility Enhancement: Parent cyclodextrins (α-, β-, and γ-CD) and derivatives such as Hydroxypropyl-β-CD (HP-β-CD) markedly increase the dissolution rate and bioavailability of poorly water-soluble APIs.

Stability & Safety: Complexation shields sensitive drug molecules from oxidative and photolytic degradation while mitigating local gastrointestinal and mucosal irritation.

Advanced Nano-Carriers: Cross-linked cyclodextrin nanosponges, dynamic hydrogels, and polymeric micelles enable precise, controlled, and targeted therapeutic delivery.

Route Versatility: CD platforms successfully optimize pharmacokinetic profiles across oral, parenteral, ocular, nasal, transdermal, and targeted oncological delivery systems.

Conclusion: Cyclodextrins served as versatile and biocompatible excipients essential for modern drug formulation strategies. By overcoming critical biopharmaceutical hurdles, cyclodextrin-based delivery platforms significantly accelerate the translation of challenging molecules into clinically viable therapeutic products.

Keywords: *Cyclodextrin, host-guest inclusion, drug delivery, bioavailability, HP-β-CD, nanosponges, solubility enhancement, pharmaceutics.*

O-01/N/027 ORAL · ONLINE

Cyclodextrin-Based Nanocarriers for Enhanced Delivery of Poorly Water-Soluble Drugs

Lavina Raj* Amit chaudhary, Aruna Sharma

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: lavina1007.mpharm26@chitkarauniversity.edu.in

Background: Poor aqueous solubility presents a significant obstacle in the development of many therapeutic agents and can lead to slow dissolution, variable absorption and decreased oral bioavailability. Cyclodextrins are cyclic oligosaccharides capable of forming inclusion complexes with poorly water-soluble drugs, thus enhancing apparent solubility and dissolution characteristics. Incorporating cyclodextrins into nanocarrier systems opens up new opportunities for improving drug loading, protection, stability and delivery.

Objective: To review the potential of cyclodextrin-based nanocarriers for enhancing the solubility, dissolution, bioavailability, stability and targeted delivery of poorly water-soluble drugs.

Results: Cyclodextrin based nanocarriers have the potential to enhance drug solubilization via host-guest complexation and provide nanosize-based benefits including increased surface area, interaction with biological barriers and so on. These systems can improve dissolution and absorption, protect drugs from degradation and enable sustained or target specific drug delivery. Different nanocarriers approaches like cyclodextrin nanoparticles, polymeric systems, liposomal formulations and hybrid nanocarriers can be designed to optimize drug encapsulation and delivery. Their performance is governed by cyclodextrin type, drug-cyclodextrin compatibility, formulation composition, particle characteristics and preparation technique. These systems have the potential to overcome biopharmaceutical limitations associated with poorly soluble drugs.

Conclusion: Cyclodextrins based nanocarriers is a promising formulation strategy for enhancing the delivery of poorly water-soluble drugs. By improving the solubilizing ability of cyclodextrins and the nanocarrier based benefits, these systems can potentially enhance drug dissolution, bioavailability, and stability and controlled or target specific drug delivery. Appropriate formulation design and characterization is of paramount importance in realizing the translational value of these systems as safe, effective and clinically useful drug delivery platforms.

Keywords: *Cyclodextrins, nanocarriers, poorly water-soluble drugs, solubility enhancement, drug delivery, bioavailability, inclusion complexation, controlled release.*

P-01/N/001 POSTER · ONLINE

Development and Evaluation of Curcumin-Loaded β-Cyclodextrin Nanosponges for Enhanced Wound Healing

Anshika Saxena, Vivek Puri
[1]*Chitkara School of Pharmacy, Chitkara University, Himachal Pradesh 174103, India*
Email: anshikasaxena0903@gmail.com

Background: Wound healing is a complex biological process that requires coordinated control of inflammation, oxidative stress, microbial contamination, tissue regeneration, and remodeling. Conventional topical formulations frequently face challenges such as poor drug solubility, limited stability, short retention at the wound site, and inadequate skin penetration. β-Cyclodextrin (β-CD) nanosponges are porous, three-dimensional cross-linked systems that can enhance the solubility and stability of poorly water-soluble compounds while enabling controlled and sustained drug release. Curcumin, a naturally occurring polyphenolic compound, possesses notable antioxidant, anti-inflammatory, and antimicrobial activities, making it a promising candidate for wound management. However, its therapeutic application is restricted by its poor aqueous solubility and limited stability, which can reduce its effective topical delivery.

Objective: The present study focuses on the development and optimization of curcumin-loaded β-cyclodextrin nanosponges as a topical nanocarrier to enhance curcumin delivery and promote effective wound healing.

Methods: β-CD nanosponges will be prepared by cross-linking β-CD with a suitable crosslinker, followed by incorporation of curcumin into the nanosponge network. Formulations will be optimized by varying the β-CD-to-crosslinker and drug-to-nanosponge ratios. The optimized CUR-β-CDNS formulations will be evaluated for key physicochemical characteristics, including particle size, polydispersity index, zeta potential, entrapment efficiency, and surface morphology, along with FTIR, DSC, and XRD analyses. In vitro drug release and release kinetics, stability, and cytocompatibility studies will also be conducted. The optimized nanosponges will then be incorporated into an appropriate topical hydrogel and evaluated for pH, viscosity, spread ability, drug content, ex vivo skin permeation, and wound-healing efficacy.

Findings: Based on existing literature, CUR-β-CDNS is anticipated to enhance the solubility and physicochemical stability of curcumin while facilitating sustained and controlled drug release. Incorporation of the optimized nanosponges into a topical hydrogel may further improve formulation retention at the wound site, skin permeation, and local drug availability. The developed formulation is also expected to exhibit good cytocompatibility and promote wound closure by combining the antioxidant and anti-inflammatory effects of curcumin with the controlled drug-delivery properties of β-cyclodextrin nanosponges.

Conclusion: The proposed CUR-β-CDNS hydrogel represents a promising nanotechnology-based topical system for wound management. By combining the drug-hosting capacity of β-CD nanosponges with the wound-healing potential of curcumin, the formulation may overcome important limitations of conventional topical delivery and provide a stable, controlled, and localized therapeutic approach.

Keywords: *β-Cyclodextrin; Nanosponges; Curcumin; Wound healing; Topical drug delivery; Hydrogel.*

P-01/N/002 POSTER · ONLINE

Efavirenz Inclusion Complexation via Sulfobutyl Ether β-Cyclodextrin: A Strategy for Enhancing Solubility and Dissolution.

Hitesh Kumar*, Dr. Akashdeep Singh, Dr. Amrinder Singh
Chitkara College of Pharmacy, Chitkara University
Email: hitesh1216.ccp25@chitkara.edu.in

Efavirenz (EFZ) is a poorly water-soluble antiretroviral drug belonging to BCS Class II, exhibiting low oral bioavailability due to limited dissolution. The present study aims to enhance the solubility and dissolution rate of EFZ through the formation of a binary inclusion complex with Sulfobutyl ether β-cyclodextrin (SBE-β-CD) using the solvent evaporation method. Phase solubility analysis demonstrated an AL-type profile, indicating the formation of a stable 1:1 inclusion complex with improved apparent stability constant. The prepared complexes were characterized using FTIR, DSC, and XRD studies, confirming successful inclusion and partial amorphization of the drug. Morphological evaluation revealed the formation of irregular, porous particles, suggesting enhanced surface area. Saturation solubility studies showed a significant increase in EFZ solubility compared to the pure drug. In vitro dissolution studies exhibited a markedly improved release profile from the inclusion complex, achieving rapid and higher drug release than untreated EFZ. The enhancement in solubility and dissolution may be attributed to improved wettability, reduced crystallinity, and molecular encapsulation within the cyclodextrin cavity. The findings suggest that SBE-β-CD-based inclusion complexation via solvent evaporation is a promising strategy for improving the biopharmaceutical performance of EFZ.

Keywords: *Inclusion Complex, Antiretroviral, Effavirenz, Solubility enhancement, Cyclodextrin*

P-01/N/003 POSTER · ONLINE

Preparation and Characterization of Clopidogrel Bisulfate hydroxypropyl-b-Cyclodextrin Mixed Inclusion Complex for Improved Intestinal Solubility and Anti-Thrombotic Efficacy

Aditya Garg*, Akashdeep Singh, Debarshi Kar Mahapatra
Chitkara College of Pharmacy, Chitkara University, Rajpura 140401, Punjab, India
Email: aditya1003.ccp25@chitkara.edu.in

The study aimed to increase the intestinal solubility and absorption of orally bioavailable clopidogrel-bisulphate (CPB) by complexing with hydroxypropyl-b-cyclodextrin (HCD) to form a binary inclusion complex that was stabilized by Tween 80 (T80) resulting into mixed inclusion complex. The results of phase solubility studies and molecular docking of CPB with b-cyclodextrin (b-CD) and HCD suggested higher solubility and binding energy of the stable CPB: HCD complex in the presence of T80 as compared to the CPB: b-CD com plex. The D-Optimal mixture design was used to optimize the formulation containing the CPB: HCD: T80 mixed inclusion complex. The results suggest the enhanced stability of the CPB: HCD inclusion complex in the presence of T80. The spectral attributes confirmed the inclusion complexation and pointed out the central position of CPB in a hydrophilic cavity of HCD. Further, the prepared soft gelatin capsule successfully confirmed the importance of obliterating the intestinal precipitation associated problem of CPB through an in vitro release study. The anticoagulant activity in rabbits confirmed that soft gelatin capsules showed 1.2 folds and 1.3 folds increase in clotting time, 1.2fold and 1.5 folds increase in bleeding time when compared to marketed formulation and pure drug, respectively. Conclusively, soft gelatin capsules exhibit the potential to enhance the oral bioavailability of CPB, leading to a reduction of the dose and dose-related side effects.

Keywords: *Cyclodextrin, Clopidogrel bisulphate, Inclusion complex,*

P-01/N/004 POSTER · ONLINE

Molecular Docking in Modern Drug Discovery: From virtual screening to Mechanistic insights into ligand–target interactions

Ekamjot Kaur
I.K.Gujral Punjab Technical University, Ludhiana, Punjab, India
Email: aekamjot832@gmail.com

Molecular docking has become an integral computational strategy in modern drug discovery, providing a rational framework for exploring ligand–target interactions and accelerating the identification of promising therapeutic candidates. From its early application in structure-based drug design to its current integration with virtual screening, molecular dynamics, artificial intelligence, and machine learning approaches, molecular docking has evolved into a versatile tool for both compound prioritization and mechanistic investigation. Virtual screening enables the rapid evaluation of large chemical libraries against selected biological targets, allowing potential hit compounds to be identified on the basis of predicted binding modes and affinity. Beyond screening, docking provides valuable structural insights into ligand recognition, including hydrogen bonding, hydrophobic interactions, π–π interactions, electrostatic forces, and key active-site residues responsible for molecular recognition. These interaction profiles can support lead optimization, selectivity prediction, target validation, and the development of structure–activity relationships. However, conventional docking approaches have limitations related to protein flexibility, solvent effects, scoring-function accuracy, and the dynamic nature of ligand–target interactions. Integration with molecular dynamics simulations, free-energy calculations, and AI-driven predictive models can overcome some of these limitations and provide a more comprehensive understanding of binding mechanisms. Thus, molecular docking serves not merely as a virtual screening technique but as a valuable platform for translating computational predictions into mechanistic insights, ultimately supporting the rational design and optimization of safer and more effective therapeutic agents.

Keywords: *Molecular docking, Ligand, Modern Drug Discovery, Virtual Screening*

P-01/N/005 POSTER · ONLINE

Artificial Intelligence and QbD-Driven Optimization of Cyclodextrin Inclusion Complexes for Ayurvedic Bioactives: A Next-Gen Translation Review

Amandeep Kaur
GHG Khalsa College of Pharmacy, Gurusar Sadhar -141104, Punjab, India
Email: amandeepkaur030404@gmail.com

Traditional Ayurvedic bioactives (e.g., Curcumin, Resveratrol) face significant biomedical limitations due to poor aqueous solubility and low systemic bioavailability. While Cyclodextrin (CD) inclusion complexes offer a proven solution, conventional formulation methods rely heavily on resource-intensive trial-and-error approaches. This review presents a high-impact paradigm shift by evaluating the integration of Artificial Intelligence (AI), Machine Learning (ML), and Quality-by-Design (QbD) principles in optimizing smart herbal drug delivery networks. We analyze how computational molecular docking and molecular dynamics (MD) simulations predict host-guest binding affinities and thermodynamic stability before wet-lab synthesis. Concurrently, implementing QbD methodologies—including Critical Quality Attributes (CQAs) and Design of Experiments (DoE)—maps out the precise formulation design space to maximize drug loading and controlled release kinetics. This review compiles data on smart, stimuli-responsive CD nanocarriers that exhibit enhanced absorption and safety profiles. Ultimately, fusing digital informatics with ancient Ayurveda provides a cost-effective, high-precision roadmap for next-generation natural therapeutics, aligning perfectly with the digital evolution of modern healthcare.

Keywords: *Cycloextrains, Artificial Intelligence, Quality by Design (QbD), Ayurvedic Bioactive, Molecular Modelling.*

P-01/N/006 POSTER · ONLINE

Impact of Cyclodextrin-Based Inclusion Complexes on the Bioavailability of Anticancer Drugs

Divyaraj Singh Chundawat*, Kamal Singh Rathore
Bhupal Nobles' College of Pharmacy, Udaipur, Rajasthan, India
Email: divyararjsinghraj@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides composed of glucose units connected through α-1,4-glycosidic linkages. The naturally occurring types are α-, β- and γ-cyclodextrin, which contain six, seven, and eight glucose units, respectively. These molecules have a water-loving (hydrophilic) outer surface and a water-repelling (hydrophobic) inner space, enabling them to form reversible inclusion complexes with suitable drug molecules. This interaction helps poorly water-soluble drugs mix better with water, leading to improved solubility, faster dissolution, and better stability. These properties make cyclodextrins particularly valuable for formulating anticancer agents that have poor aqueous solubility and limited oral absorption. Various anticancer drugs have been studied using cyclodextrin-based systems. For example, paclitaxel is a strong anticancer drug but has very low solubility in water and presents significant challenges for oral administration. Complexation with β-cyclodextrin derivatives, particularly hydroxypropyl-β-cyclodextrin, followed by incorporation into polymeric nanoparticles, has been reported to substantially increase oral drug exposure. Studies show this method can lead to oral bioavailability of over 80%. Similarly, camptothecin is a potent topoisomerase-I inhibitor with poor aqueous solubility whose active form is unstable. When incorporated into nanoparticles made with hydroxypropyl-β-cyclodextrin, this formulation produced sustained plasma concentrations and achieved about seven times more oral bioavailability than the standard version in lab tests. However, cyclodextrin complexation doesn't always improve bioavailability. The effectiveness depends on factors like drug-cyclodextrin affinity, complex stability, drug release, intestinal permeability, formulation characteristics, and the mechanism responsible for poor absorption. Therefore, cyclodextrins should be considered as formulation tools that can enhance anticancer drug bioavailability under appropriate conditions rather than as universal bioavailability enhancers.

Keywords: *cyclodextrin; drug bioavailability; nanoparticles; inclusion complex; solubility; drug delivery.*

P-01/N/007 POSTER · ONLINE

Cyclodextrins As Solubility Enhancers for Poorly Water-Soluble Drugs: An Ai-Assisted Perspective

Minakshi[1]*, Jashanpreet Kaur
Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela
Email: jpreetkaur42@gmail.com

Introduction: Poor water solubility is a common problem in the development of many pharmaceutical drugs. Low-solubility drugs can dissolve slowly, which can lead to poor or inconsistent absorption. Because cyclodextrins can interact with drug molecules and form inclusion complexes that may enhance their apparent water solubility and dissolution, they have drawn interest as potential pharmaceutical excipients.

Aim and Objectives: The purpose of this review is to explain how cyclodextrins can make poorly water-soluble medications more soluble and to talk about how AI can help with the development of cyclodextrin-based formulations.

Methods: In order to comprehend the fundamental mechanism of cyclodextrin-mediated solubility enhancement, drug-cyclodextrin inclusion complex formation, and new uses of artificial intelligence in pharmaceutical formulation, pertinent literature was taken into consideration.

Results: By integrating them into their hydrophobic cavity and preserving interaction with the surrounding aqueous media, cyclodextrins can enhance the aqueous behavior of appropriate poorly soluble medications. Analyzing medication and cyclodextrin properties, finding appropriate combinations, and assisting with formulation variable optimization are all possible with AI-assisted methods.

Summary: AI-combined with cyclodextrin-based solubility enhancement may decrease needless experimental trials and offer a more methodical approach to formulation development.

Conclusion: A promising approach to creating effective drug delivery systems for medications that are poorly soluble in water is the combination of cyclodextrin technology and artificial intelligence.

Keywords: *Cyclodextrins, Solubility enhancement, poorly water-soluble drugs, Inclusion complex, Artificial intelligence, Drug delivery*

P-01/N/008 POSTER · ONLINE

Spray-Dried Amorphous Inclusion Complex of Sorafenib Tosylate with SBE-β-CD: A Novel Strategy for Enhanced Solubility, Dissolution and Bioavailability

Manya Khera* and Akashdeep Singh
Chitkara College of Pharmacy, Rajpura, Punjab, India.
Email: kheramanya2005@gmail.com

Sorafenib Tosylate (SFB) is a BCS Class II multi-kinase inhibitor used in the treatment of advanced hepatocellular carcinoma and renal cell carcinoma; however, its clinical performance is limited by extremely low aqueous solubility (0.00152 mg/mL), poor dissolution, and variable oral bioavailability. The present invention describes a spray-dried amorphous binary inclusion complex of SFB with sulfobutylether-β-cyclodextrin (SBE-β-CD) to enhance solubility, dissolution, and pharmacokinetic performance. Phase solubility and Job's plot studies established a 1:1 drug-to-carrier stoichiometry, with SBE-β-CD demonstrating favourable complexation characteristics, particularly at physiologically relevant pH conditions. The complex was prepared using a co-solvent spray-drying process under optimized conditions and compared with physical mixing, kneading, and solvent evaporation methods. The spray-dried complex exhibited approximately 36-fold, 71-fold, and 34.5-fold increases in solubility in water, pH 1.2, and pH 6.8 media, respectively. ATR-FTIR, XRD, DSC, and SEM analyses confirmed strong drug–carrier interactions, loss of crystallinity, amorphous transformation, and formation of a distinct spherical morphology. In vitro dissolution studies demonstrated 50.05 ± 1.88% drug release, approximately 25-fold higher than pure SFB. Pharmacokinetic evaluation in Wistar rats further demonstrated enhanced systemic exposure, with a Cmax of 2.534 µg/mL, AUC_{0-72} of 38.82 µg·h/mL, and relative bioavailability of 280.38%. Thus, the spray-dried SFB:SBE-β-CD inclusion complex provides a scalable and industry-compatible formulation strategy for improving the biopharmaceutical performance of poorly water-soluble SFB.

ISF ANALYTICAL LABORATORY (ISFAL)®

Quality & Safety Solutions in Timely Manner

APPROVED BY STATE DRUG CONTROL AUTHORITY, PUNJAB



ABOUT ISFAL

ISF Analytical Laboratory (ISFAL) is a specialized, well-equipped quality-driven laboratory of ISF College of Pharmacy, Moga, established to provide reliable, accurate and cost-effective analytical testing services to pharmaceutical, nutraceutical, herbal and allied industries. We follow good laboratory practices with a strong focus on quality, integrity, confidentiality and customer satisfaction.

- Accurate Results
- Quality Assurance
- Advanced Instrumentation
- Experienced Team
- Cost-Effective Solutions
- Confidentiality & Integrity

OUR TESTING SERVICES

INSTRUMENTAL ASSAYS

- HPLC (PDA Detector)
- UV/Vis Spectrophotometry
- FTIR
- Fluorimetric Assay
- GLC Assay by GC-FID
- TLC
- Karl Fischer (Water Content)
- DSC (Differential Scanning Calorimetry)
- FACS (Flow Cytometry)

TITRIMETRIC ASSAYS

- Aqueous Titration
- Argentometric Titration
- Complexometric Titration
- Non-aqueous Titration
- Potentiometric Titration

LIMIT TESTS

- Arsenic
- Chloride
- Heavy Metals
- Iron
- Lead

OTHER TESTS

- Related Substances (HPLC/TLC)
- Fatty Acid Composition (By GC)
- Ethanol Content (By Distillation/GC)
- Uniformity of Content
- Identification Tests (Chemical, FTIR, HPLC)
- Loss on Drying (LOD)
- Loss on Ignition (Ash Value)
- Disintegration Time
- Disintegration Test
- Average Weight & Net Content (Desage Forms)
- Boiling/Distilling Range & Density/ Bulk Density
- Melting Point/Range, Refractive Index
- Clarity & Colour of Solution
- Solubility Testing
- Viscosity (Brookfield/Ostwald)

PRODUCTS WE ANALYSE

- Pharmaceutical Raw Materials
- Pharmaceutical Finished Products
- Nutraceuticals & Dietary Supplements
- Cosmetic Products
- Synthetic Food Colours
- Soaps & Detergents
- Herbal Drugs & Extracts
- Water & Waste Water
- Other Chemical Entities

SOPHISTICATED ANALYTICAL INSTRUMENTS AT ISFAL


HPLC (Waters & Agilent)


UV-Vis Spectrophotometer (Perkin Elmer)


FTIR Spectrometer (Thermo)


GC with Headspace (Shimadzu)


Fluorescence Spectrophotometer (Perkin Elmer)


Dissolution Testing Apparatus (Lab India)


DSC (Mettler Toledo)


Karl Fischer Auto-Titrator (Mettler Toledo)


pH Meter (Mettler Toledo)


Stability Chamber (Lab India)


FACS (Flow Cytometer)


Viscometer (Brookfield)

INDUSTRIES WE SERVE

- Pharmaceutical Industries
- Nutraceutical Companies
- Cosmetic Industries
- Soaps & Detergents
- Food & Beverages
- Herbal & Natural Products
- Water & Waste Water Analysis
- Research & Academic Institutes

Analytical Laboratory (ISFAL)
College of Pharmacy, GT Road, Ghal Kalan,
Moga – 142 001, Punjab, India

+91 98788 82520
(Dr. R.K. Rawal, Co-ordinator)

isfal@isfcp.org
www.isfcp.org/ISFAL.aspx

ISF COLLEGE OF PHARMACY & RESEARCH

Rattian Road, Moga-142001 (Punjab) India
Approved by: PCI & Govt. of Punjab
Affiliated to: MRSPTU, Bathinda, Punjab



YOUR FUTURE IN PHARMACY STARTS HERE

B.Pharm
Bachelor of Pharmacy

B.Pharm
Lateral Entry

EXPLORE OUR LABORATORIES



Prof. (Dr.) R.K Narang
Principal | 9878696688

HELPLINE
+91 75770-00063 | +91 75770-00064

CATEGORY 2 | 144 ABSTRACTS

Pharmacology & Drug Discovery

Bureau for Health & Education Status Upliftment

Bureau for Health and Education Status Upliftment



Experimental Pharmacology Software

Broad Coverage of PCI Recommended Soft. Modules

AICTE — Listed with SOS Tools - E Content

MINISTRY OF EDUCATION — Listed with NEAT Portal - MOE Listed - AI Adaptive Learning Portal

Listed with WEB - LINK - IPS

NMC — Adheres with NMC - Guidelines

BUREAU FOR HEALTH & EDUCATION STATUS UPLIFTMENT

(CONSTITUTIONALLY ENTITLED AS- HEALTH EDUCATION BUREAU)

55/20, Rajat Path, Mansarovar, Jaipur-302020, Rajasthan, India

Mob:- 07976447983, 09636348191, 0141-2783681

E Mail : support@heb-nic.in Website: www.heb-nic.in

O-02/F/001 ORAL · OFFLINE

Computational Chemistry in Biological Systems and Emerging Opportunities for Machine Learning

Mehdi Irani*

Department of Chemistry, University of Kurdistan, Sanandaj, 66177-15175, Iran
Email: m.irani@uok.ac.ir

Computational chemistry has become an essential tool for understanding the structure, dynamics, and reactivity of biological systems at the molecular level. Advances in computing power have enabled increasingly realistic simulations of complex biochemical processes. In this presentation, I aim to demonstrate how computational chemistry can be applied to address key problems in biological systems and to discuss emerging opportunities for integrating machine learning into molecular modeling and drug discovery. We employ Quantum mechanical (QM), molecular mechanical (MM), and hybrid quantum mechanical/molecular mechanical (QM/MM) methods to investigate enzyme catalysis, enantioselectivity, redox processes, and protein–ligand interactions. Representative case studies from our recent research were used to illustrate these applications. Our computational analyses provided mechanistic insights into enzyme selectivity and catalytic function, improved the understanding of reaction pathways, enabled benchmarking of redox-potential calculations for iron–sulfur proteins, and supported the rational design of bioactive compounds. Emerging machine-learning approaches were found to complement traditional computational methods by accelerating structure prediction, data analysis, and molecular design. The presented studies highlighted the versatility of multiscale computational methods in addressing diverse biological problems. In summary, Computational Chemistry has evolved into a central component of modern biological research. The integration of machine learning with established QM, MM, and QM/MM approaches offers new opportunities for improving accuracy, efficiency, and predictive capability in the study of biological systems.

Keywords: *Computational chemistry; machine learning; QM/MM; enzyme catalysis; enantioselectivity; redox potentials; drug design; molecular modeling*

O-02/F/002 ORAL · OFFLINE

Pharmacological approach using syringic acid in fluid percussion traumatic brain injury model of experimental rats: Targeting p38 MAPK signaling

Manav Prashar* and Shamsher Singh Bajwa

Department of Pharmacology, ISF College Of Pharmacy, Moga - 142001, Punjab, India
Email: manavprashar90@gmail.com

Long-term cognitive, physical, and emotional problems are frequently the outcome of traumatic brain injury, which is a major cause of disability and death globally. Long-term functional losses are made worse by a series of secondary injury mechanisms that are triggered by the injury, such as oxidative stress, neuroinflammation, and neuronal death. This study examines the neuroprotective potential of syringic acid, a naturally occurring polyphenolic molecule, against the pathophysiology of traumatic brain injury in wistar rats. Rats were given oral syringic acid at doses of 25, 50, and 100 mg/kg for 14 days after traumatic brain injury which was caused using a fluid percussion injury model. When compared to injured controls, behavioural tests such as grip strength, rotarod, morris water maze, and open field tests showed that gains in motor coordination and spatial memory were more pronounced at higher dosages. Syringic acid dramatically decreased lipid peroxidation and increased levels of endogenous antioxidants including glutathione and catalase, according to biochemical research. Neurochemical studies revealed that glutamate and gamma-aminobutyric acid levels had returned to normal. While ELISA-based analyses showed reduced pro-inflammatory cytokines (Tumor Necrosis Factor-alpha, Interleukin-1 beta, and Interleukin-6), immunohistochemistry showed reduced expression of the apoptotic marker p38 mitogen-activated protein kinase. Histopathological analysis revealed less cortical neuronal damage in syringic acid-treated groups, particularly at 100 mg/kg. These results imply that syringic acid may play a neuroprotective role in neurological dysfunction brought on by traumatic brain injury by regulating oxidative stress, inflammation, and apoptosis. Syringic acid's promise as a therapeutic option for traumatic brain injury is supported by its dose-dependent neuroprotective properties.

Keywords: *Traumatic brain injury, fluid percussion injury, syringic acid, secondary brain injury, Apoptosis, Inflammation, p38 MAPK*

O-02/F/003 ORAL · OFFLINE

Sericin alleviates pentylenetetrazole-kindling epilepsy and associated comorbidities via modulation of GABA-T enzyme and mitochondrial activity

Divyanshi*and Sania Grover

Department of Pharmacology, ISF College of Pharmacy and Research, Moga, 142001, Punjab, India
Email: divyanshi51019@gmail.com

Objective: To assess the effect of sericin against pentylenetetrazole (PTZ) kindling epilepsy and its associated comorbidities.

Methods: Epilepsy was induced with PTZ at the dose of 30 mg/kg I.P. on alternative days for 25 days in rats. Sericin was administered orally at the doses of 250, 500, and 1000 mg/kg for 35 days. The behavioural activities were performed using an elevated plus maze, forced swim test, and Morri's water maze test. A PTZ challenge test was conducted on day 32. On day 35, rats were sacrificed to perform oxidative stress, mitochondrial dysfunction, neuroinflammation, neurotransmitters, GABA-T activity, and histopathological analyses.

Results: Sericin at 500 and 1 000 mg/kg significantly reduced behavioural changes and neuroinflammatory cytokines, as well as improved oxidative stress, mitochondrial enzyme complex activity, neurotransmitter level, and GABA-T enzymatic activity ($P<0.05$). Moreover, sericin improved the neuronal survival altered by PTZ kindling in rat hippocampus.

Conclusions: Sericin mitigates epilepsy-associated secondary complications possibly by the modulation of mitochondrial enzyme complexes and GABA-T enzymatic activity.

Keywords: *Pentylenetetrazole; Sericin; GABA-T; Epilepsy; Anxiety; Cognitive impairment*

O-02/F/004 ORAL · OFFLINE

Cucurbitacin Derivatives (B, IIa, IIb, and E): Modulating Gut Dysbiosis and Inflammatory Pathways for Multi-Target Therapy of Ulcerative Colitis

Radha Devi*, Akshita Arora

ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2439469@isfcp.org

Ulcerative colitis (UC) is a colon-associated inflammatory bowel disease (IBD) that extends from rectum to complete colon characterized by ulceration, rectal bleeding, bloody diarrhoea, and abdominal pain, epithelial barrier disruption, gut dysbiosis, immune dysregulation and recurrent mucosal inflammation. Today, several clinical medications such as corticosteroids, aminosalicylates and immuno-modulators are available, but each one of them have their own side effects. Therefore, to overcome these limitations, we are moving toward herbal drug therapies. This review presents the emerging role of Cucurbitacin (Cu), a highly oxygenated tetracyclic triterpenoid compound found in a variety of Cucurbitaceae plants and known for its anti-inflammatory response. Unlike previous reviews which just focuses on single derivatives or isolated mechanisms, this review focuses on multi-target analysis of Cucurbitacin (Cu) derivatives-CuB, CuE, CuIIa, and CuIIb, their biosynthesis, structure–activity relationships (SAR), inflammatory pathway modulation, gut microbiota regulation, extracellular vesicle-associated microRNAs, and differentially expressed genes (DEGs). The preclinical evidences show that these derivatives of Cu have capability to treat UC, by inhibiting the Inflammatory pathways such as NLRP3 inflammasome, NF-κB, JAK2/STAT3, MAPK and EGFR, which results in decreasing the level of Inflammatory cytokines such as IL-6, IL-1β and TNF-α. They also upregulate the SCFAs producing beneficial bacteria and downregulates the harmful bacteria, thereby restoring epithelial integrity. Notably, Cu IIa is associated with alteration in composition of protein and microRNA in extracellular vesicles. All these factors help in the treatment of UC. Although preclinical findings are encouraging, the current evidence is largely restricted to DSS induced animal models and the clinical validation in humans is still lacking. Various challenges related to narrow therapeutic windows, poor bioavailability, and toxicity require resolution before clinical translation. This review finds these translational gaps and proposes targeted research directions including nano formulation strategies, pharmacokinetic profiling, and early-phase clinical evaluation.

Keywords: *Ulcerative colitis, Bowel disease, Inflammation, Curcurbitacin, Nanoformulation*

O-02/F/005 ORAL · OFFLINE

Neuroprotective potential of Betulinic acid against TIO2NP induced neurotoxicity in zebrafish

Shivam Yadav*

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: shivamnirankari143@gmail.com

Bacopa monnieri is the source of betulinic acid (BA), a naturally occurring triterpenoid. Although BA has been utilised as a neuroprotective drug, its molecular processes remain unclear. Thus, the goal of this work was to determine the exact mechanism by which BA protects zebrafish from neurotoxicity caused by titanium dioxide nanoparticles (TiO2NP). Therefore, our research findings demonstrated that a rigorous behavioural deficit in zebrafish was generated by a 10 µg/ml dose of TiO2NP. Additionally, biochemical examination showed that TiO2NP dramatically reduced GSH and SOD and raised MDA, AChE, TNF-α, IL-1β, and IL-6 levels, indicating that it causes oxidative stress and neuroinflammation. On the other hand, behavioural and biochemical abnormalities in the zebrafish brain were improved by BA at doses of 2.5, 5, and 10 mg/kg. Furthermore, in the zebrafish brain treated with TiO2NP, BA markedly increased the levels of DA, NE, 5-HT, and GABA while lowering glutamate levels. Our histological examination demonstrated that TiO2NP alters the brain's morphology. These alterations manifested as an increase in pyknotic neurons, which betulinic acid dose-dependently decreased. Similarly, BA increased the levels of HO-1 and NRF-2, which can lessen neuroinflammation and oxidative stress. Therefore, our research offers proof of the molecular mechanism behind betulinic acid's neuroprotective action. According to the results, BA is a good candidate for treating symptoms similar to AD.

Keywords: *AD-like symptoms; Betulinic acid; Neuroinflammation; Nrf-2/HO-1; Neurotransmitters.*

O-02/F/006 ORAL · OFFLINE

Glabridin Mitigates TiO2NP induced Cognitive deficit in Adult Zebrafish

Sandeep Kumar*, Sanchi Jain, Shamsher Singh

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: sk7853685@gmail.com

Glabridin is derived from the roots of Glycyrrhiza glabra and contains anti-oxidative and anti-inflammatory properties. We investigated the Glabridin's neuroprotective potential against the learning and memory deficits by activating Nrf2/HO-1 signalling in zebrafish treated with titanium dioxide nanoparticles (TiO2NP). Our finding indicate that taking Glabridin at doses of 12.5, 25, and 50 mg/kg/day for 7 days improved memory and decreased anxiety in the novel object test, T-maze, and novel diving tank. Glabridin therapy in TiO2NP-exposed zebrafish increased the GSH, CAT, SOD, and GPx activity and decreased the MDA levels, and suppressed the proinflammatory mediators such as TNF-α, IL-1β, and IL-6. In histopathological evaluation, Glabridin significantly reduced pycnotic neurons in TiO2NP-treated zebrafish brains. Furthermore, Glabridin increased Nrf2 and HO-1 levels, which leads to reduced oxidative stress and neuroinflammation and were reversed by ML385 treatment. ML385 as a probe molecule that specifically inhibits Nrf2 and block its downstream gene expression. Thus, these considerable outcomes provide new insights into the neuroprotective effects of glabridin.

Keywords: *Glabridin, Memory deficit, Nrf2/HO-1, Oxidative stress, Neuroinflammation*

O-02/F/007 ORAL · OFFLINE

Protective Role of Allicin Against Copper- and Aluminium-Induced Alzheimer's Disease-Like Pathology

Paras Deep*

ISF College of Pharmacy, Moga-142001, Punjab, India
Email: parasavalon@gmail.com

Introduction: Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive and memory impairment, oxidative stress, neuroinflammation, β-amyloid (Aβ) deposition, tau pathology, metal accumulation, and neurotransmitter dysfunction. Chronic exposure to aluminum and copper may contribute to AD-like neurological alterations.

Aim and Objectives: To investigate the neuroprotective effects of allicin against aluminum- and copper-induced AD-like pathology and associated cognitive and biochemical abnormalities.

Methods: Rats received aluminum chloride (200 mg/kg) and/or copper sulfate (0.5 mg/kg) orally for 28 days. Allicin (10 or 20 mg/kg) was administered intraperitoneally from day 7 to day 28. Cognitive performance was evaluated using the Morris water maze, probe trial, and novel object recognition test. Brain tissues were analyzed for inflammatory cytokines (IL-1β, IL-6, TNF-α), oxidative stress markers (lipid peroxidation, nitrite, glutathione), neurotransmitters, aluminum content, Na^+/K^+-ATPase activity, and Aβ(1–42) accumulation.

Results: Aluminum chloride and copper sulfate increased oxidative stress and proinflammatory cytokines, disrupted neurotransmitter levels, promoted Aβ(1–42) accumulation, altered Na^+/K^+-ATPase activity, and impaired learning and memory. Allicin produced dose-dependent neuroprotection, attenuating inflammatory and oxidative changes, improving antioxidant defenses and neurotransmitter balance, and reducing Aβ accumulation.

Conclusion: Allicin may protect against copper- and aluminum-induced AD-like pathology through antioxidant and anti-inflammatory mechanisms, normalization of neurotransmitter levels, suppression of neuroinflammation, and reduction of Aβ-related neurotoxicity.

Keywords: *Alzheimer's disease; Allicin; Aluminum; Copper; Oxidative stress; β-Amyloid*

O-02/F/008 ORAL · OFFLINE

Therapeutic Potential of Paeoniflorin and Vitamin B12 Against Ethidium Bromide-Induced Multiple Sclerosis-Like Pathology in the Intracerebropeduncle Model

Alina Ahmed*, Sidharth Mehan

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: alina.ahmed92422@gmail.com

This study examines the neuroprotective effects of paeoniflorin (PNN) on Multiple Sclerosis (MS) in an EBRO rat model. PNN targets critical molecular pathways involved in MS, such as the GDNF/GFRA1/RET/AKT/ERK1/2/GSK3-Beta signaling cascade, according to a comprehensive approach that includes in silico, in vitro and in vivo techniques. PNN (50 mg/kg, 100 mg/kg, p.o.) was effective as monotherapy and in combination with VB-12 (30 mg/kg, p.o.) in decreasing EBRO-induced neurodegeneration, demyelination, synaptic dysfunction, and neuroinflammation. Behavioural tests like the rotarod, beam crossing and Morris water maze demonstrated PNN's ability to improve motor coordination, spatial memory and cognitive function. Combining therapy with VB12 (30) improved outcomes, indicating synergistic therapeutic advantages. PNN100 lowers demyelination, inflammatory cytokines (TNF-α and IL-1β) and restores anti-inflammatory markers (IL-10) in brain homogenates, CSF and blood plasma, according to histological and molecular analyses. PNN restored excitatory-inhibitory balance by normalizing neurotransmitter imbalances such as increased glutamate and decreased GABA, dopamine, serotonin and acetylcholine levels. ELISA experiments verified PNN's capacity to alter apoptotic markers. Bax, Bcl-2 and Caspase-3 increase neurotrophic factors GDNF and GFRA1 while downregulating hyperactivated pathways such as AKT, ERK1/2 and GSK3-Beta. PNN significantly restored hematological parameters damaged by EBRO, suggesting anti-inflammatory and hematoprotective actions. This study is the first to show how PNN affects GDNF/GFRA1/RET/AKT/ERK1/2/GSK3-β pathway in MS. Its synergistic activity with VB12 demonstrates its promise as a treatment method. The study suggests new ways to enhance MS patient outcomes by targeting neurodegeneration, inflammation and immunological dysregulation.

Keywords: *Paeoniflorin, Vitamin B12, Multiple sclerosis, Ethidium bromide-induced demyelination, Neuroprotection, Neuroinflammation, Demyelination, GDNF/GFRA1/RET signaling, AKT/ERK1/2/GSK-β pathway, Neurodegeneration*

O-02/F/009 ORAL · OFFLINE

Genistein-mediated modulation of neuronal cAMP signaling and mitochondrial electron transport in experimental autism

Bhaskarjyoti Saha[1]*, Sidharth Mehan

[1]Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: bhaskarjyotisahaofficial@gmail.com

Autism is a multifactorial neurodevelopmental disorder associated with impaired social communication, repetitive behaviors, mitochondrial dysfunction, oxidative stress, neuroinflammation, and neurotransmitter imbalance. Propionic acid (PRPA), a gut microbiota-derived short-chain fatty acid, has been implicated in autism-like pathology through metabolic and neurochemical disturbances. This study investigated the neuroprotective potential of Genistein (GNT), an isoflavone, with emphasis on the AC/cAMP/CREB/PKA signaling pathway and mitochondrial electron chain (ETC) complexes. In silico analysis demonstrated strong binding affinity of GNT toward the selected targets. In a PRPA-induced rat model of autism, oral GNT (40 and 80 mg/kg) improved locomotor activity, neuromuscular coordination, and cognitive performance, as evidenced by behavioral assessments. GNT also restored PRPA-induced alterations in AC, cAMP, CREB, and PKA signaling and mitochondrial ETC complexes I-V. Furthermore, GNT attenuated neuroinflammation and apoptosis, normalized neurotransmitter levels, and improved hematological parameters. Histopathological evaluation revealed reduced neuronal damage and demyelination, with restoration of brain architecture and enhanced neurogenesis. Collectively, these findings suggest that GNT exerts neuroprotective effects in experimental autism through modulation of neuronal signaling, mitochondrial function, neuroinflammation, and neurotransmitter homeostasis, supporting its potential for further therapeutic investigation.

Keywords: *Autism, Genistein, Propionic acid, Neuroprotection, AC/cAMP/CREB/PKA signaling, Mitochondrial dysfunction, Electron transport chain, Neuroinflammation, Oxidative stress, Neurotransmitter imbalance, Neurogenesis, Apoptosis*

O-02/F/010 ORAL · OFFLINE

Multitarget Neuroprotective Effects of Sulforaphane Against Methylmercury-Induced ALS-Like Pathology: Mechanistic Insights into Neuroprotection and Systemic Recovery

Keshav Kumar*, Sidharth Mehan

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Email: keshav.insight7@gmail.com

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disorder with a motor neuron loss as a result of Oxidative stress, neuroinflammation and dysregulated survival signaling. The aim of this study was to assess the neuroprotective efficacy and safety of sulforaphane (SUFP) in a methylmercury ($MMHg^{+}$)-induced preclinical rat model of Compared with the other drugs, omaveloxolone (OVX) and dimethyl fumarate (DIMT). SUFP treatment (especially at 4 mg/kg), significantly enhanced antioxidant defense mechanisms via upregulation of Nrf2, HO-1, and SIRT1 and inhibition of pro inflammatory pathways. stress related signaling pathways such as p38 and JNK, apoptotic markers such as caspase-3 or Bax, and inflammatory cytokines such as IL-1β and TNF-α. p75NTR, PI3K/Akt and MAPKs. These molecular effects correlated with meaningful functional recovery, demonstrated by Increases in grip strength, locomotor activity, spatial memory and depressive-like behavior. Histopathological evaluation revealed a decrease in demyelination and preservation of neuronal architecture in cortical, hippocampal, and amygdala areas. and cerebellar regions. In addition to central neuroprotection, SUFP also had systemic effects by normalizing hepatic enzymes, promoting the healing of the integrity of the skeletal muscle, restoring the redox balance, stabilizing proteins associated with neurofilaments and myelin, correcting hematological alterations. SUFP was found to provide greater neuroprotection than A favorable safety profile compared to OVX, and although somewhat less effective than DIMT, had reduced systemic effects. toxicity. The molecular docking further confirmed SUFP interaction with Nrf2–Keap1 targets, adding support for its antioxidant and anti-inflammatory mechanisms. Together, these data indicate that SUFP is a poly-functional and well-tolerated therapeutic approach. Shown to be a candidate for an ALS trial and in need of continued translational and clinical evaluation.

Keywords: *Sulforaphane, Omaveloxolone, Dimethyl fumarate, Methylmercury-induced ALS, Neuroinflammation, Nrf2/HO-1/SIRT-1, P75NTR/PI3K/Akt/MAPKs, Pathways, Synaptic and neurochemical restoration*

O-02/F/011 ORAL · OFFLINE

Icariin and Tanshinone IIA Exert Multi-Target Therapeutic Effects via the SIRT1/Nrf2/HO-1 Pathway in Ethidium Bromide-Induced MS-Like Pathology

Manish Kumar*, Sidharth Mehan

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Email: kumarisarita231982@gmail.com

Multiple sclerosis (MS) is a chronic immune-mediated disorder of the central nervous system (CNS) associated with demyelination and neuronal damage. Its progression involves genetic, environmental, and immunological factors, particularly abnormal immune responses against the myelin sheath. In the present study, ethidium bromide (EtBr)-induced demyelination was used to establish an MS-like model in adult Wistar rats. A total of 88 rats were randomly divided into 11 groups (n = 8), and the experiment was conducted for 35 days. The study evaluated the neuroprotective potential of icariin (ICN), a bioactive compound derived from Epimedium, and tanshinone IIA (TNN), a major constituent of Salvia miltiorrhiza. Both compounds influence important neuroprotective pathways, including SIRT-1, Nrf2, and HO-1. ICN (15 and 30 mg/kg) and TNN (30 and 60 mg/kg) were administered orally, either individually or in combinations. Fingolimod (0.5 mg/kg/day) was also combined with ICN30 + TNN60. The results showed that combined treatments improved locomotor activity, neuromuscular coordination, and cognitive performance in MS-induced rats. Furthermore, treatment reduced inflammatory cytokines, pro-apoptotic markers, and demyelination while restoring GABA, glutamate, SOD, and catalase levels. Gross and histopathological examinations demonstrated reduced myelin damage and improved repair. The ICN, TNN, and fingolimod combination showed enhanced neuroprotective effects compared with monotherapy. Overall, these findings indicate that ICN and TNN may provide a multitarget therapeutic approach for reducing MS-like pathological changes, promoting neuroprotection, and supporting remyelination. Further investigations are necessary to validate their efficacy and underlying mechanisms.

Keywords: *Multiple sclerosis, SIRT-1/Nrf2/HO-1, Icariin, Tanshinone IIA, Demyelination, Neuroprotection, Fingolimod, Ethidium bromide*

O-02/F/012 ORAL · OFFLINE

Exploring the Neuroprotective Benefit of Caffeic Acid Phenethyl Ester in Methylmercury-Induced ALS-Like Conditions: An In -Silico Docking and In -Vivo Study

Pallvi*, Sidharth Mehan

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Email: pallvi0508@gmail.com

Amyotrophic Lateral sclerosis (ALS) is a progressive neurological condition characterized by the degeneration of motor neuron, oxidative stress and neuroinflammation. This research investigated the neuroprotective effect of caffeic acid phenethyl ester (CAPE) against neurotoxicity induced by MTME+5 with in a model that mimics ALS pathology. CAPE (administered orally at doses of 50 and 100 mg/kg) showed marked therapeutic benefits by enhancing both motor and cognitive functions reestablishing oxidative homeostasis, and reducing neuroinflammatory and apoptotic processes. Behavioural evaluation such as the open felid test, grip strength assessment, forced swim test, and Morris water maze, demonstrated CAPE's capability to restore motor coordination and cognitive abilities on a dose – dependent manner. Cellular and molecular investigations indicated that exposure to MTME+5 substantially disrupted the Klotho/ SIRT-1/ Nrf2/HO-1 antioxidant signaling pathway, led to an increase in pro -inflammatory cytokines (TNF-,IL-1) , and heightened level of apoptotic markers (Bax, caspase-3), while also reducing anti – inflammatory cytokine level (IL-10) and neuroprotective proteins. CAPE treatment showed remarkable efficacy in restoring various parameters, reducing oxidative stress, and enhancing antioxidant defenses, specifically SOD, CAT, and r-GSH. It also helped to normalize imbalances in key neurotransmitters such as acetylcholine, dopamine, GABA, serotonin, and glutamate, effectively alleviating excitotoxicity. Both histopathological and gross morphological analyses highlighted the ability of CAPE50 and CAPE100 to maintain neuronal and myelin integrity in important brain regions, including the cerebral cortex, hippocampus, striatum, midbrain, and cerebellum. Additionally, CAPE reduced the accumulation of methylmercury in the brain and cerebrospinal fluid, indicating its detoxifying properties. The co-administration of vitamin B1 (VTB1(200)) further enhanced the therapeutic effects of CAPE. Complete blood count (CBC) analysis revealed hematological abnormalities induced by MTME+5, including reductions in RBCs, hemoglobin, WBCs, and platelets, along with increased eosinophils and basophils. CAPE treatment successfully normalized these parameters, suggesting it promotes systemic recovery. Together, these results position CAPE as a promising neuroprotective agent for ALS, effectively addressing neurocomplications.

Keywords: *Caffeic acid phenethyl ester (CAPE), Methylmercury, ALS-Like neurodegeneration, Neuroprotection, Molecular docking, Neuroinflammation, Oxidative stress.*

O-02/F/013 ORAL · OFFLINE

Ferrous Sulfate and Lipopolysaccharide Co-Exposure Induces Neuroinflammation and Motor Dysfunction in Wistar Rats: A Preclinical Model of Parkinson's Disease–Like Pathology

Priyanku Bora*, Shivam Kumar Pandey

Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga 142001 Punjab, India
Email: priyankubora72@gmail.com

Background: Parkinson's disease (PD) is a progressive neurological disease characterized by the degeneration of dopaminergic neurons in the substantia nigra. Iron is an important micronutrient in the brain, but excess exposure and buildup in the substantia nigra and striatum may induce pathological alterations relevant to PD.

Objective: To study neurobehavioral, biochemical and dopaminergic structural alterations resembling to PD-like symptoms upon co-exposure to ferrous sulfate (FeSO4) and lipopolysaccharide (LPS).

Methods: Wistar rats were treated to FeSO4 and LPS for 4 weeks. Neurobehavioral, biochemical, molecular and immunohistopathological analyses were performed. The analyses included assessment of tyrosine hydroxylase, α-Synuclein, astrocyte activation, iron deposition and indicators of apoptosis and ferroptosis.

Result: The co-exposure led to motor impairments, oxidative stress, neuroinflammation, iron dysregulation, protein accumulation, ferroptosis, and apoptotic cell death. In addition, there was a decrease in tyrosine hydroxylase levels and an increase in α-synuclein accumulation, compatible with PD disease. Immunohistopathology demonstrated astrocyte activation and iron deposition, both of which are implicated in neuroinflammation and oxidative stress. Changes in the indicators of apoptosis and ferroptosis leads to the dose-dependent involvement of FeSO4 in neuronal death in the rat brain.

Conclusions: The co-exposure to FeSO4 and LPS induces synergistic mechanisms involved in neuroinflammation and neurodegeneration associated with PD. Therapeutic treatment of these pathogenic pathways may be potential option for PD.

Keywords: *Neuroinflammation; Parkinson's disease; Lipopolysaccharide; Iron; Ferroptosis*

O-02/F/014 ORAL · OFFLINE

Development and Preclinical Evaluation of Brassica oleracea Sprout-Derived Electrospun Scaffold for Peripheral Nerve Repair

Sakshi Bajaj[1]*, Sumeet Gupta[2]*, Ashwani Dhingra[1]

[1]Department of Pharmacology, Global Research Institute of Pharmacy, Radaur
[2]Department of Pharmacology, M.M.U College of Pharmacy, Mullana
Email: sakshibajaj2012@gmail.com

Background: Peripheral nerve injury is associated with oxidative stress and functional impairment, necessitating the development of effective regenerative strategies. Brassica oleracea sprouts contain bioactive phytoconstituents with potential antioxidant and neuroprotective properties. The present study evaluated B. oleracea sprout extracts and developed an electrospun scaffold for peripheral nerve repair.

Methods: B. oleracea seeds were germinated under controlled conditions to obtain sprouts. The sprouts were extracted using aqueous and hydroethanolic solvents. The extracts were subjected to preliminary phytochemical screening and evaluated for antioxidant activity using the DPPH free-radical scavenging assay. Their cytocompatibility was assessed using the MTT assay. Based on the in vitro findings, the selected extract was further evaluated in a preclinical model. Sciatic nerve crush injury was induced experimentally, followed by application of the developed scaffold at the injury site. The scaffold was fabricated using electrospinning and subsequently evaluated for its ability to support functional recovery. Behavioural and neurological parameters were assessed following treatment.

Results: The prepared extracts showed the presence of various phytochemical constituents and demonstrated antioxidant activity in the DPPH assay. The MTT assay indicated satisfactory cellular compatibility at the evaluated concentrations. The selected extract demonstrated promising activity in the preclinical study. An electrospun scaffold incorporating the selected bioactive extract was successfully developed and applied to the sciatic nerve injury model. Behavioural assessment demonstrated improvement in functional parameters following scaffold treatment.

Conclusion: The findings suggest that B. oleracea sprout-derived bioactive extracts incorporated into an electrospun scaffold may provide a promising approach for supporting peripheral nerve repair and functional recovery.

Keywords: *Brassica oleracea sprouts; Sulforaphane; Electrospun scaffold; Peripheral nerve injury; Sciatic nerve crush; Antioxidant activity; Neuroprotection; Peripheral nerve regeneration.*

O-02/F/015 ORAL · OFFLINE

Neuroprotective Effects of Cryptotanshinone Against Rotenone-Induced Parkinsonism in Adult Zebrafish

Sunit Kumar Gupta*[1], Khadga Raj Aran[2]

[1]*Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India*
[2]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: sunitgupta66@gmail.com

Parkinson's disease (PD) is a chronic, neurodegenerative disorder with motor dysfunction and loss of dopaminergic cells. Rotenone is a mitochondrial complex I inhibitor that is extensively used to generate a PD like pathology by mitochondrial dysfunction, oxidative stress, neuroinflammation and neuronal damage. Cryptotanshinone (CT), a bioactive compound from Salvia miltiorrhiza, is known to have antioxidant, anti-inflammatory and neuroprotective effects. In the present study, we examined the neuroprotective effects of CT against PD-like symptoms in adult zebrafish that were induced by the exposure to rotenone. The neuroprotective effects of CT against PD-like symptoms were seen in adult zebrafish after induction with rotenone in the present study. Adult zebrafish (4–5 months) were randomly assigned to six groups (n=12), and then exposed to 5 µg/L of rotenone in the water and to 10 and 20 mg/kg of CT, i.p., for 28 days. Behavioral, biochemical, neurochemical, histopathological and immunohistochemical evaluations were then conducted. There was a dose-dependent effect in which CT reduced anxiety-like behaviour and restored locomotor activity in a significant way, while rotenone produces an adverse effect. CT also prevented neuroinflammation changes induced by rotenone, restored mitochondrial complex I activity and normalized the changes in neurotransmitter levels. Histopathological examination showed that CT could prevent neurodegeneration, apoptosis and morphological changes caused by rotenone without affecting neuronal integrity. In addition, immunohistochemical staining showed that Nrf2 expression was restored, being decreased after rotenone treatment, which reflects an improvement of the endogenous antioxidant defense. Overall, CT showed dose-dependent neuroprotective effects against rotenone-induced PD in zebrafish by restoring neurotransmitter homeostasis and by activating the antioxidant defense pathway through Nrf2, suggesting further investigation of CT as a potential therapeutic agent for PD.

Keywords: *Cryptotanshinone; Parkinson's disease; Rotenone; Adult zebrafish; Neuroprotection; Oxidative stress.*

O-02/F/016 ORAL · OFFLINE

Emerging Pharmacological and Pharmaceutical Strategies for Polyendocrine Metabolic Ovarian Syndrome (PMOS): From Novel Therapeutics to Advanced Drug Delivery

Sanjeevani*

School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan, India

sanjeevani.shr31@gmail.com

Introduction: Polyendocrine Metabolic Ovarian Syndrome (PMOS), formerly known as Polycystic Ovary Syndrome (PCOS), is a complex endocrine and metabolic disorder involving interacting neuroendocrine, metabolic, and ovarian dysfunctions. Its multifactorial pathophysiology highlights the need for therapeutic approaches that address underlying disease mechanisms rather than focusing solely on symptomatic management.

Aim & Objectives: To review emerging pharmacological approaches for PMOS, with emphasis on metabolic modulators and neuroendocrine targets, and to explore advanced pharmaceutical strategies for improving their therapeutic performance.

Methods: A comprehensive literature analysis was conducted focusing on major pathophysiological mechanisms of PMOS, including increased gonadotropin-releasing hormone pulsatility, altered luteinizing hormone secretion, hyperandrogenism, insulin resistance, and ovarian dysfunction. Emerging therapeutic approaches were evaluated according to their mechanisms of action and potential clinical applications. Advanced formulation strategies relevant to these agents were also explored.

Results: Emerging therapeutic approaches, including incretin-based therapies and neurokinin-3 (NK3) receptor antagonists, demonstrate potential for targeting important metabolic and neuroendocrine components of PMOS. Advanced formulation approaches, including cyclodextrin-based complexation, may offer opportunities to improve the solubility, stability, and bioavailability of selected drug candidates. Computational modelling and Quality by Design (QbD) approaches may further support rational formulation development and optimization.

Summary: Emerging pharmacological approaches, particularly incretin-based therapies and neurokinin-3 (NK3) receptor antagonists, offer promising opportunities to target the metabolic and neuroendocrine components of PMOS. Advanced formulation strategies, including cyclodextrin complexation, together with computational modelling and Quality by Design (QbD), may further support optimization of promising therapeutic candidates.

Conclusion: Integrating novel pharmacological targets with advanced drug-delivery and pharmaceutical-development strategies may provide a rational framework for the development of next-generation PMOS therapies and improve the therapeutic potential of emerging drug candidates.

Keywords: *Polyendocrine Metabolic Ovarian Syndrome; Novel Therapeutics; Neuroendocrine Modulators; Incretin-Based Therapy; Cyclodextrins; Quality by Design*

O-02/F/017 ORAL · OFFLINE

Double Edge Neurochemical Sword: Relevance of Gaba and Neurodegeneration

Prachi[1]*, Lovekesh Singh[2]

[1]*Bachleor of Pharmacy, ISF College of Pharmacy, Moga-142001, Punjab, India*
[2]*Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: prachinagpal2005@gmail.com

The principle role of GABA as the major inhibitory chemical substance and neurotransmitter is to regulate excitatory and inhibitory activities in the central nervous system. It is more abundant in tissues such as the hippocampus, the thalamus, the basal ganglia, and the brainstem, where the neurotransmitter GABA acts critically in coordinating neuronal activity and regulating the overall brain. The manifestations of GABAergic signalling are fundamental in such processes as learning, memory consolidation, and neural networks stability maintenance. GABA controls brain excitability while affecting the immune response and preserving neurons. Altered GABAergic signalling plays a significant role in the pathogenesis of a wide array of neurological and psychiatric conditions, including Alzheimer's Disease, Parkinson's disease, epilepsy, Huntington's disease, multiple sclerosis, and autism. These diseases usually serve as an indication of a disturbance of the normal distribution and balance of excitatory and inhibitory activities of the central nervous system. Using the mechanisms of GABA signalling at different receptor levels, scientists found useful strategies for dealing with afflictions such as seizures, mood disorders, and neurodegenerative diseases. Comprehensive knowledge about GABA may result in revolutionary treatments for severe neurological and psychiatric diseases.

Keywords: *GABA, Neurodegeneration, Neurochemical, Autism, Huntington's disease.*

O-02/F/018 ORAL · OFFLINE

Recent Advances in Insulin Therapy: Emerging Role of Cyclodextrin-Based Drug Delivery Systems

Rishita Das*

3rd Year, Doctor of Pharmacy, School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan
Email: rishitadas13@gmail.com

Background: Insulin therapy is essential for glycemic management, particularly in type 1 diabetes mellitus. Conventional subcutaneous administration is associated with injection burden, variable absorption, and hypoglycemia. Recent advances include rapid- and long-acting insulin analogues, smart pens, insulin pumps, continuous glucose monitoring, and automated insulin delivery. Cyclodextrins have emerged as promising excipients for developing advanced and non-invasive insulin delivery systems.

Objective: To review recent advances in insulin therapy and to study the future prospectus of cyclodextrin use in insulin stability, bioavailability, and delivery.

Methods: A literature-based review was conducted using published scientific studies and recent research reports concerning advances in insulin therapy, biotechnology, nanotechnology, and cyclodextrin-mediated drug delivery. Relevant evidence regarding insulin analogues, smart delivery systems, oral insulin formulations, CD-based nanoparticles, and mucoadhesive delivery systems was evaluated with emphasis on therapeutic potential and translational challenges.

Results: Formulations based on CDs possess great promise in protecting insulin against gastrointestinal destruction, increasing their intestinal retention and absorption, and enabling controlled drug release. Formulations of modified CDs and CDs incorporated into nanoparticles have been successful in preclinical testing for oral administration of insulin.

Conclusion: Cyclodextrin-based delivery represents a promising emerging approach for next-generation insulin therapy. Integration with nanotechnology and glucose-responsive systems may facilitate oral or minimally invasive insulin delivery. Further studies are required to establish safety, bioavailability, and clinical efficacy.

Keywords: *Insulin Therapy, Cyclodextrin, Oral Insulin Delivery, Insulin Analogues, Drug Delivery Systems, Diabetes Mellitus*

O-02/F/019 ORAL · OFFLINE

Arbutin mediated Neuroprotection in Zebrafish model of Traumatic Brain Injury via modulating Nrf2/ NF-κB pathway

Romanpreet Kaur*, Shamsher Singh

[1]*Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: romanpreetkaur@isfcp.org

Introduction: Traumatic Brain Injury (TBI) is a major cause of mortality and disability worldwide and is characterized by oxidative stress, neuroinflammation, and neurotransmitter imbalance. Arbutin, a naturally occurring glycoside with antioxidant and anti-inflammatory properties, may protect against secondary brain injury.

Methodology: Adult zebrafish were subjected to a novel non-invasive force-induced TBI model and randomly allocated into seven groups (n=14): normal control, TBI control, arbutin per se, arbutin-treated groups (25, 50, and 100 mg/kg, i.p.), and a co-treatment group receiving arbutin (100 mg/kg) with chrysin (25 mg/kg). Behavioural assessments, including the open field test, novel tank diving test, T-maze, and novel object recognition test, were performed on days 1, 4, and 7. Brain tissues were analysed for oxidative stress markers (MDA, nitrite, GSH, and SOD), neurotransmitters (GABA and glutamate), pro-inflammatory cytokines (TNF-α, IL-1β, and IL-6), histopathology, and Nrf2/NF-κB immunohistochemistry.

Results: Arbutin significantly improved locomotion, anxiety-like behaviour, spatial memory, and recognition ability. It restored oxidative balance, normalized GABA and glutamate levels, reduced pro-inflammatory cytokines, and attenuated histopathological damage. Immunohistochemistry demonstrated dose-dependent enhancement of Nrf2 immunoreactivity with reduced NF-κB expression. Co-treatment with chrysin also produced protective effects.

Summary and Conclusion: Arbutin exhibits significant neuroprotective potential against force-induced TBI in zebrafish, likely through modulation of oxidative stress, neuroinflammation, neurotransmitter imbalance, and Nrf2/NF-κB expression. Co-treatment with chrysin also produced protective effects.

Keywords: *Traumatic Brain Injury, Arbutin, Zebrafish, Nrf2, NF-κB, Neuroprotection*

O-02/F/020 ORAL · OFFLINE

Neuroprotective Effect of Sinigrin in Aluminium chloride and Copper sulphate induced Alzheimer's like symptoms in zebrafish via targeting NLRP3/NF-κB/p38MAPK Pathways and Cuproptosis

Sanchi Jain*, Shamsher Singh

Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga-142001, Punjab, India.
Email: manglasanchi@gmail.com

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive impairment, oxidative stress, mitochondrial dysfunction, neuroinflammation, and amyloid- associated pathology. The present study investigated the neuroprotective effects of Sinigrin in a zebrafish model of AD- like neurotoxicity induced by co- administration of AlCl3 and CuSO4, with donepezil used as the reference treatment. Sinigrin, particularly at 50 mg/kg, significantly improved locomotor activity, reduced anxiety- like behaviour, and alleviated learning and memory deficits. These behavioral improvements were associated with restoration of antioxidant defenses, improvement in mitochondrial activity, and normalization of neurotransmitter levels. Sinigrin treatment also attenuated the AlCl3 and CuSO4- induced increase in inflammation- and AD- associated markers, including Aβ1-42, p38 MAPK, NLRP3, FDX1, TNF- α, IL-18, and IL- 1β. Histopathological examination further demonstrated preservation of neuronal architecture in the brains of sinigrin- treated zebrafish, while immunohistochemical analysis revealed reduced NF-κB immunoreactivity, indicating attenuation of neuroinflammatory signaling. In addition, molecular docking analysis showed favourable interactions of sinigrin with NLRP3 and p38MAPK, providing structural support for its potential interaction with these molecular targets. Overall, the findings suggest that sinigrin exerts broad neuroprotective effects by simultaneously influencing oxidative stress, mitochondrial dysfunction, neuroinflammation, amyloid- associated pathology, and the NF-κB/NLRP3/p38MAPK/FDX1 signaling axis. Sinigrin particularly at 50 mg/kg, may therefore represent a promising multitarget neuroprotective candidate for further investigation in AD.

Keywords: *Alzheimer's disease, Sinigrin, Neurodegeneration, Neuroinflammation, Cuproptosis.*

O-02/F/021 ORAL · OFFLINE

From Excipients to Therapeutics: The Emerging Pharmacological Role of Cyclodextrins

Priyan Kumar*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga-142001, Punjab, India.
Email: guptapriyan07@gmail.com

Current Relevance and Pharmacological Approaches Cyclodextrins (CDs) are commonly used as pharmaceutical excipients to improve the solubility, stability, dissolution and bioavailability of poorly water-soluble drugs. They form inclusion complexes with drug molecules and can improve their availability in the body. Recent studies have shown that improved bioavailability may also result in better therapeutic effects. One such example is the hyperoside–2-hydroxypropyl-βcyclodextrin (HPβCD) inclusion complex, which showed improved pharmacokinetic exposure along with enhanced therapeutic effects in an experimental colitis model. Apart from drug delivery, cyclodextrins are also being explored for their pharmacological potential. Alzheimer's disease is one emerging area where cyclodextrin-based approaches have shown promising results in experimental studies. Their interaction with cholesterol and cellular pathways has increased interest in their possible use in neurodegenerative disorders. Another important example is sugammadex, a modified γ-cyclodextrin that is clinically used to reverse neuromuscular blockade through selective drug encapsulation. Overall, cyclodextrins are gradually moving beyond their traditional role as excipients and gaining importance in therapeutic applications through improved bioavailability, enhanced therapeutic effects and pharmacological activity.

Keywords: *Cyclodextrins, Bioavailability, Therapeutic Effects, Hyperoside, HPβCD, Alzheimer's Disease, Sugammadex.*

O-02/F/022 ORAL · OFFLINE

Cyclodextrin-Based siRNA Delivery in Cancer: From Gene Silencing to Therapeutic Response

Kashish*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga, Punjab, India
Email: kashishbansal011@gmail.com

Background: Small interfering RNA (siRNA) offers a promising approach for cancer treatment by selectively suppressing the expression of disease-associated genes. However, its therapeutic application is limited by poor stability, nuclease degradation, inefficient cellular uptake and difficulty in achieving effective intracellular delivery. Cyclodextrins (CDs), because of their modifiable structure and ability to form functional supramolecular systems, have emerged as potential nonviral carriers for siRNA delivery.

Objective: To critically examine how cyclodextrin architecture and functionalization influence siRNA complexation, cellular uptake, gene silencing and downstream anticancer effects.

Discussion: Recent studies demonstrated that the structural design of CD-based carriers plays an important role in siRNA delivery. The compared β-CD monomers, dimers and cationic β-CD polymers has been reported that the polymeric systems efficiently complexes siRNA, whereas the monomer and dimer showed limited complexation under the tested conditions. The primary-aminefunctionalized polymer achieved approximately 40% cellular uptake around 40% of gene knockdown in A549-luc lung carcinoma cells help to maintaining the ≥80% cell viability during in vitro test. In another recent study, they developed a polydopamine-modified CD metal-organic framework for BCL-2 siRNA delivery. The system improved siRNA stability, reduced BCL-2 protein expression and showed tumour retention with therapeutic effects in an A549 tumour model. Conclusion: The transition from efficient intracellular delivery to measurable pharmacological response highlights the potential of cyclodextrin-based platforms in cancer gene therapy. However, their clinical translation still requires further evaluation of safety, intracellular trafficking, reproducibility and long-term therapeutic efficacy.

Keywords: *Cyclodextrins; siRNA; Cancer; Gene silencing; BCL-2; Nanocarriers*

O-02/F/023 ORAL · OFFLINE

Advance in COVID-19 Vaccine; A Comprehensive Status

SK Nurul Hoda*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga, Punjab, India
Email: sknurulh41@gmail.com

The COVID-19 pandemic was one of the most significant global public health emergencies of the last century, creating an urgent need for effective therapeutic interventions and vaccines against SARS-CoV-2. Vaccination has played a crucial role in controlling the pandemic by reducing the risk of infection, symptomatic disease, severe illness, hospitalization, and death. Several COVID-19 vaccines have been authorized worldwide, including mRNA, viral-vector, protein-subunit, and inactivated-virus vaccines. These vaccines stimulate the immune system by presenting viral antigens or providing genetic instructions for antigen production, thereby generating protective immune responses.

Recent advances have focused on developing innovative vaccine-delivery approaches, including intranasal vaccines, inhalable formulations, nano vaccines, and high-density microarray patch (HD-MAP) vaccines. Intranasal and inhalable vaccines aim to induce immune protection at mucosal surfaces, while patch-based vaccines offer a minimally invasive and potentially convenient method of administration. These emerging technologies may improve vaccine accessibility, stability, administration, and patient acceptance.

This review summarizes recent advances in COVID-19 vaccine development, delivery technologies, mechanisms of action, and efficacy. It also discusses ongoing research addressing the impact of emerging SARS-CoV-2 variants on vaccine effectiveness and the need for improved next-generation vaccines.

Keywords: *COVID-19, SARS-CoV-2, COVID-19 vaccines, intranasal vaccines, nano vaccines, microarray patches, vaccine efficacy.*

O-02/F/024 ORAL · OFFLINE

Cyclodextrins In Pulmonary Drug Delivery

Manmeet Singh*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga, Punjab, India
Email: 9888067164m@gmail.com

Oxidative stress is closely associated with the development and progression of several pulmonary disorders, including cystic fibrosis, acute lung injury, pulmonary hypertension, bronchopulmonary dysplasia, chronic airway diseases, lung cancer, and COVID-19. Consequently, antioxidant and anti-inflammatory therapies are being investigated as supportive approaches for managing these conditions. However, many naturally derived antioxidants have limited clinical application because of poor aqueous solubility, instability, and low bioavailability.

Pulmonary drug delivery offers a promising strategy by transporting therapeutic agents directly to the lungs while reducing hepatic first-pass metabolism, systemic exposure, and potential organ toxicity. Cyclodextrins have attracted considerable interest as pulmonary drug carriers due to their ability to improve the solubility and stability of poorly water-soluble compounds. Recent approaches include surface modification of cyclodextrins, combination with other drug-delivery systems, and incorporation of emerging therapeutics such as cannabidiol, siRNA, and antibodies. Despite these developments, the absence of robust and physiologically relevant models for evaluating lung-targeted delivery remains a major limitation. Further research addressing this challenge may facilitate the translation of cyclodextrin-based pulmonary systems into clinically effective and commercially viable therapies.

Keywords: *Oxidative stress; Cyclodextrins; Pulmonary drug delivery; Antioxidants; Inflammation; Inclusion complex; lung diseases.*

O-02/F/025 ORAL · OFFLINE

Current and Emerging Therapeutic Strategies for Amyotrophic Lateral Sclerosis: From Pharmacological Approaches to Gene and Stem Cell Therapies

Tanya Upadhyay*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga, Punjab, India.
Email: tanyaupadhyaynkm@gmail.com

Amyotrophic lateral sclerosis (ALS) is a devastating neurodegenerative condition in which motor neurons progressively die, causing muscle weakness, paralysis, and ultimately respiratory failure. At present, only two drugs riluzole and edaravone are approved, and while they can slightly slow disease progression, they do not stop or reverse it.

Recent advances are shifting the focus from symptom management to targeting the root causes of ALS. Gene-based therapies, especially antisense oligonucleotides like tofersen, can silence faulty genes such as SOD1 that drive certain forms of ALS. Newer tools like CRISPR/Cas9 and RNA interference are also being explored to correct or suppress disease-causing mutations in genes like C9orf72, TARDBP.

In parallel, stem cell approaches using mesenchymal, neural, or induced pluripotent stem cells aim to either replace lost motor neurons or create a supportive environment that reduces inflammation and protects remaining cells. Although early trials show encouraging signs, questions about long-term safety and effectiveness remain.

Together, these innovations are paving the way for personalized, disease-modifying treatments that combine genetic insights, biomarkers, and advanced delivery systems to give real hope to people living with ALS

Keywords: *Amyotrophic lateral sclerosis, Pharmacological therapy, Edaravone, Gene therapy, Antisense oligonucleotides, Tofersen, CRISPR/Cas9, Stem cell therapy, Mesenchymal stem cells, Neural progenitor cells*

O-02/F/026 ORAL · OFFLINE

Targeting Neuroinflammation in Alzheimer's Disease: Emerging Pharmacological Strategies and Therapeutic Perspectives

Bhavna Thakur

Department of Pharmacology, ISF College of Pharmacy, Ghal Kalan, Moga, Punjab, India
Email: bhavnathakur40249@gmail.com

Alzheimer's disease (AD) is a multifactorial and progressive neurodegenerative condition characterized by gradual deterioration of memory, cognition, and neuronal function. Although amyloid-β deposition and abnormal tau phosphorylation are well established pathological features, growing evidence suggests that neuroinflammation is also closely associated with the development and progression of AD. Persistent activation of microglia and astrocytes can promote the production of inflammatory cytokines, chemokines, reactive oxygen species, and other mediators, thereby contributing to neuronal dysfunction, synaptic alterations, and neurodegeneration. The present review discusses the involvement of neuroinflammatory processes in AD and summarizes emerging pharmacological approaches aimed at modulating these mechanisms. Major pathways of interest include microglial activation, NLRP3 inflammasome signaling, Toll-like receptor-mediated responses, NF-κB signaling, oxidative stress, and cytokine-driven neuronal injury. Recent therapeutic strategies involving NLRP3 inflammasome inhibitors, microglial modulators, anti-inflammatory compounds, and other potential disease-modifying agents are considered with respect to their neuroprotective effects and therapeutic prospects. Particular attention is also given to the challenges of selectively controlling pathological inflammation without interfering with the physiological functions of microglia, along with the difficulty of achieving effective drug delivery across the blood–brain barrier. In addition, the use of emerging biomarkers may support early identification of neuroinflammatory changes and improve patient selection for targeted therapies. Overall, pharmacological modulation of neuroinflammation represents a promising approach for the development of disease-modifying interventions in AD. Further preclinical investigations and well-designed clinical studies are warranted to determine the efficacy, safety, and translational potential of these emerging therapeutic strategies.

Keywords: *Alzheimer's disease; Neuroinflammation, Microglia, NLRP3 inflammasome, NF-κB, Neuroprotection, Pharmacological therapy.*

O-02/F/027 ORAL · OFFLINE

Neuroprotective Effects of Honokiol Against Icv-Stz-Induced Cognitive Dysfunction, Neuroinflammation, and Aβ1–42/Nf-Kb Signaling in Rats

Lovekesh Singh[1]*, G.D Gupta[2]

[1]*Research Scholar, I.K Gujral Punjab Technical University, Kapurthala, 144603*
[1]*Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India*
[2]*Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: lovekesh@isfcp.org

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, amyloid-β (Aβ1–42) accumulation, oxidative stress, and neuroinflammation. The present study evaluated the neuroprotective effects of honokiol against intracerebroventricular streptozotocin (ICV-STZ)-induced AD-like changes in rats. Animals received bilateral ICV-STZ (3 mg/kg) at stereotaxic coordinates of −2 mm anteroposterior, 1.6 mm mediolateral, and 1.5 mm dorsoventral on days 1 and 3 after surgery. Cognitive and behavioural alterations were evaluated using the Morris Water Maze and Elevated Plus Maze. Honokiol (5 and 10 mg/kg, i.p.) was administered on days 7, 14, and 21. On day 22, animals were sacrificed and hippocampal tissue was collected for biochemical, neurotransmitter, histopathological, and immunohistochemical analyses. ICV-STZ administration produced significant cognitive impairment, increased acetylcholinesterase activity, oxidative stress, and neuroinflammatory responses, along with altered neurotransmitter levels and increased Aβ1–42 and NF-κB expression. Honokiol treatment significantly improved behavioural performance and attenuated these biochemical and inflammatory alterations. It also reduced Aβ1–42 deposition and NF-κB immunoreactivity while preserving hippocampal neuronal architecture. Overall, honokiol demonstrated significant neuroprotective activity against ICV-STZ-induced AD-like pathology, possibly through its antioxidant, anti-inflammatory, and cholinergic modulatory effects, along with suppression of Aβ1–42 accumulation and NF-κB signaling.

Keywords: *Honokiol, Neurodegeneration, Neuroinflammation, Alzheimer's disease*

O-02/F/028 ORAL · OFFLINE

Intranasal Somatropin and Folic Acid Combination Therapy Attenuates Autism Like Neuropathology via Modulation of IGF-1, Klotho, GFRA-1, and GLP-1 Signaling

Janvi Verma*, Sidharth Mehan

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: janviverma@isfcp.org

Autism is a multifactorial neurodevelopmental disorder characterized by impaired social interaction, behavioural abnormalities, oxidative stress, neuroinflammation, neurotransmitter imbalance, and disrupted neurotrophic signaling. The present study investigated the neuroprotective efficacy of intranasal somatropin (SMTN) alone and in combination with folic acid (FoA) in a propionic acid (PPAD)-induced experimental model of autism in Wistar rats. Autism-like pathology was induced through intracerebroventricular administration of PPAD (0.26 M/10 µL) for 11 consecutive days. Thereafter, animals received intranasal SMTN (500 or 1000 µg/kg, intranasally) and/or FoA (5 mg/kg, orally) from day 12 to day 44. Behavioral assessments, biochemical estimations, ELISA-based molecular analysis, gross pathological examination, histopathology, and molecular docking studies were performed to evaluate therapeutic efficacy. PPAD administration produced severe behavioural impairments, reduced body weight, neurotransmitter dysregulation, oxidative stress, neuroinflammation, neuronal degeneration, and marked downregulation of IGF-1, Klotho, GFRA-1, and GLP-1 signaling pathways in brain regions and cerebrospinal fluid. Intranasal SMTN treatment significantly improved locomotor activity, motor coordination, stress-related behaviour, learning, and memory in a dose-dependent manner. Intranasal SMTN also restored acetylcholine, dopamine, serotonin, and GABA levels while reducing glutamate-mediated excitotoxicity. Furthermore, SMTN enhanced neurotrophic signalling, improved myelin integrity, and reduced neuronal degeneration. Notably, combined administration of SMTN1000 with FoA produced the most significant neuroprotective and neurorestorative effects across behavioural, neurochemical, molecular, and histopathological parameters. In conclusion, intranasal somatropin, particularly in combination with folic acid, demonstrates promising therapeutic potential against autism-associated neuropathology through modulation of GH–IGF-1-mediated neurotrophic and metabolic pathways.

Keywords: *Autism; Somatropin; Folic Acid; IGF-1/Klotho/ GFRA-1/GLP-1 Signaling; Propionic Acid-Induced Autism Model; Neuroprotection.*

O-02/F/029 ORAL · OFFLINE

Protective effect of fisetin alone and in combination with lactobacillus using experimental model of diabetes associated cognitive impairment in rats

Navdeep*

ISF College of Pharmacy, Moga, Punjab 142001, India
Email: navdeepb353@gmail.com

A major risk factor for progressive cognitive impairment is type 2 diabetes mellitus (T2DM), which is brought on by frequent consumption of a high-fat diet (HFD). In an HFD-STZ-induced T2DM rat model, the current work examines the possible neuroprotective effects of fisetin, both by itself and in conjunction with Lactobacillus. Albino Wistar rats were fed a high-fat diet (HFD) and given a single intraperitoneal injection of 45 mg/kg of Streptozotocin (STZ) to cause diabetes. Rats were given fisetin (25, 50 mg/kg) orally along with Lactobacillus at 1.5 x 10^9 CFU/mL once the diabetes state was confirmed. Behavioral tests like NORT, MWM, EPM were performed to analyze cognition and memory. Biochemical indicators, neurotransmitters, molecular (NF-κB by immunohistochemistry) analysis, and histological study of tissues were also performed. Fisetin treatment, both by itself and in conjunction with Lactobacillus, reduced lipid profile, biochemical, and neurochemical abnormalities in rats and recovered cognitive defects and glucose levels ($p < 0.05$ vs. STZ-HFD group). Additionally, in diabetic rats, the combination of fisetin (50 mg/kg/p.o.) and Lactobacillus (1.5 x 10^9 CFU/mL) significantly produced a protective effect compared to fisetin treatment alone ($p < 0.05$ vs. STZ-HFD Fisetin 25 and 50 mg/kg/p.o. group). The study's findings showed that the combination of fisetin and Lactobacillus demonstrates remarkable antioxidant properties, modifies neurotransmitter levels, and suppresses the NF-κB pathway, suggesting a potential treatment for cognitive issues related to diabetes.

Keywords: *Type 2 diabetes mellitus, Diabetes-associated cognitive impairment, HFD-STZ model, Fisetin, Lactobacillus, Neuroinflammation, Oxidative stress*

O-02/F/030 ORAL · OFFLINE

ROLE OF ROBOTICS IN MOTOR REHABILITATION AFTER ISCHEMIC STROKE

Kashish*, Lovekesh Singh

Bachelor of Pharmacy, ISF College of Pharmacy and Research, Moga, Punjab, India
Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Email: aroraakashish.02@gmail.com

Ischemic stroke is a common neurological condition that can cause significant motor impairments, including muscle weakness, poor coordination, reduced balance, and difficulty performing functional movements. These limitations can affect independence and quality of life. Motor rehabilitation plays an important role in improving physical function after stroke, but conventional therapy may be constrained by the need for intensive, repetitive, and individualized training. Rehabilitation robotics has emerged as a supportive technology that can enhance motor recovery by providing controlled, repetitive, and task-specific exercises. Robotic rehabilitation devices can assist patients with upper- or lower-limb movements according to their individual functional abilities. The level of assistance can be adjusted progressively, allowing patients to actively participate in therapy while receiving appropriate mechanical support. Many robotic systems also incorporate sensors and feedback mechanisms to measure movement accuracy, range of motion, speed, and other performance parameters. Such objective measurements can help therapists monitor progress and modify treatment programs. Robotics-assisted rehabilitation may promote motor relearning and support neuroplastic changes through intensive and repetitive practice. It can also complement conventional physiotherapy by increasing training opportunities and improving the consistency of therapeutic exercises. Overall, robotic technology represents a promising approach for individualized motor rehabilitation following ischemic stroke, although further research is required to establish optimal treatment protocols and long-term functional outcomes.

Keywords: *Stroke, Robotics, Motor, Rehabilitation*

O-02/F/031 ORAL · OFFLINE

Restoration of IGF-1 and GLP-1 Signalling by 4-Hydroxyisoleucine in Experimental Demyelination: Implications for Neuroprotection

Zuber Khan*, Sidharth Mehan, Ghanshyam Das Gupta

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Research Scholar, IK Gujral Punjab Technical University, Jalandhar, Punjab, India
Email: zuber3491@gmail.com

Background: Demyelinating disorders are characterized by disruption of myelin integrity, neuroinflammation, glial injury, and subsequent neuronal dysfunction. Ethidium bromide (EBrD) induces focal demyelination through preferential cytotoxicity toward oligodendroglial cells and is widely used to investigate mechanisms underlying myelin injury and repair. 4Hydroxyisoleucine (4-HI), a bioactive amino acid derivative, has demonstrated diverse pharmacological effects; however, its therapeutic potential in experimental demyelination remains unexplored.

Objective: This study investigated the neuroprotective and myelin-protective effects of 4-HI in EBrD-induced focal demyelination in rats, with particular emphasis on neuroinflammatory, apoptotic, neurotransmitter, and IGF-1/GLP-1-associated molecular responses.

Methods: Adult Wistar rats were subjected to intracerebral administration of EBrD into the intracerebral peduncle (ICP) region to induce focal demyelination. Animals were subsequently treated orally with 4-HI (100 or 200 mg/kg) or semaglutide (2 mg/kg). Neurobehavioral functions, including locomotor activity, motor coordination, and cognitive performance, were evaluated. Biochemical and molecular investigations were performed to assess inflammatory and apoptotic mediators, neurotransmitter alterations, and hematological parameters. Histopathological and myelin-specific assessments were conducted to evaluate demyelination, neuroinflammatory changes, and tissue repair. qRT-PCR was performed to determine the expression of IGF-1, GLP-1, and selected inflammatory mediators. Molecular docking was additionally employed to predict the potential interactions of 4-HI with IGF-1R and GLP-1R.

Results: EBrD induced marked behavioral, biochemical, molecular, and histopathological alterations consistent with focal demyelination. 4-HI improved motor coordination, locomotion, and cognition while attenuating inflammatory, apoptotic, and neurotransmitter abnormalities. Histopathological analysis showed reduced myelin disruption and neuroinflammation. 4-HI also modulated IGF-1, GLP-1, and inflammatory mediator expression. Molecular docking demonstrated favorable predicted interactions with IGF-1R and GLP-1R, supporting their potential involvement in the observed neuroprotective effects.

Conclusion: 4-Hydroxyisoleucine attenuated behavioral, inflammatory, apoptotic, and histopathological abnormalities associated with EBrD-induced focal demyelination and modulated IGF-1- and GLP-1-associated molecular responses. The findings suggest that 4-HI may exert neuroprotective and myelin-preserving effects through coordinated regulation of neuroinflammatory and growth factor/incretin-related pathways. Further studies incorporating protein-level validation and receptor-specific pharmacological approaches are warranted to establish the mechanistic contribution of IGF-1/GLP-1 signaling to the therapeutic effects of 4HI.

Keywords: *4-Hydroxyisoleucine; ethidium bromide; focal demyelination; neuroprotection; neuroinflammation; IGF-1; GLP-1; myelin repair*

O-02/F/033 ORAL · OFFLINE

Oleanolic Acid as a Neuroprotective Agent Against Methylmercury-Induced Neurodegeneration: Modulation of PI3K/Akt/mTOR, STAT3, and GSK-3β Signalling Networks

Baljit Kaur*, Ramaish Sharma, Sidharth Mehan

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disorder characterized by motor neuron degeneration, muscle weakness, and impaired motor function. Methylmercury exposure may aggravate neurodegenerative processes through neuroinflammation, oxidative stress, and neuronal signaling abnormalities. This study investigated the neuroprotective potential of oleanolic acid (OLA), a bioactive phytoconstituent of Olea europaea, against methylmercury-induced neurodegeneration, focusing on the PI3K/Akt/mTOR/STAT-3/GSK-3β signaling pathway. In-silico, in-vitro, and in-vivo studies were conducted. Rats received methylmercury (5 mg/kg, p.o.) and OLA (100 and 200 mg/kg, i.p.) for 42 days. Behavioral, gross morphological, histopathological, neurochemical, and hematological parameters were evaluated in brain tissues, cerebrospinal fluid, and plasma. The effects of OLA combined with edaravone (10 mg/kg, i.p.) were also investigated. OLA significantly improved motor and behavioral functions, attenuated gross and histopathological brain abnormalities, and modulated the PI3K/Akt/mTOR/STAT-3/GSK-3β signaling pathway. OLA also improved altered MBP and NEFL levels and selected neurochemical and hematological parameters. Co-administration of OLA with edaravone produced enhanced neuroprotective effects compared with methylmercury exposure alone. Oleanolic acid exhibited significant neuroprotective effects against methylmercury-induced neurodegeneration in experimental ALS, potentially through modulation of the PI3K/Akt/mTOR/STAT-3/GSK-3β signaling pathway. These findings support further investigation of OLA as a potential adjunctive therapeutic strategy for ALS.

Keywords: *Amyotrophic lateral sclerosis, Demyelination, Methymercury, PI3K/Akt/mTOR/STAT-3/GSK-3β, Neurodegenation, Neuroprotection.*

O-02/F/034 ORAL · OFFLINE

Neuroprotective Effects of 4-Hydroxyisoleucine Against Propionic Acid-Induced Autism-Like Behavioral and Neurochemical Alterations: Role of IGF-1/GLP-1 Signaling

Arun Kumar Sharma*, Sonalika Bhalla, Sidharth Mehan, Sant Kumar Verma

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India

Autism spectrum disorder (ASD) is a complex neurodevelopmental disorder associated with disturbances in neurotransmitter homeostasis, impaired neurodevelopment, deficits in social communication, and cognitive dysfunction. Insulin-like growth factor-1 (IGF-1) and glucagon-like peptide-1 (GLP-1) play important roles in neuronal growth, survival, and homeostasis, and dysregulation of IGF-1/GLP-1 signaling has been implicated in the pathophysiology of ASD. 4-Hydroxyisoleucine (4-HI), a pharmacologically active amino acid derived from Trigonella foenum-graecum, exhibits insulin-mimetic and neuroprotective properties. In the present study, the neuroprotective efficacy of 4-HI was compared with that of the GLP-1 receptor agonist liraglutide (LRG) in a propionic acid (PPA)-induced experimental model of autism. The effects of orally administered 4-HI at doses of 50 and 100 mg/kg on IGF-1/GLP-1 signaling were investigated. Repeated intracerebroventricular (ICV) administration of PPA for the first 11 days of the experimental period produced autism-like neurobehavioral, neurochemical, gross morphological, and histopathological abnormalities in rats. The dose-dependent neuroprotective effects of 4-HI were evaluated by assessing neurotransmitter levels and neuroinflammatory cytokines in brain homogenates and blood plasma, along with apoptotic and antioxidant markers in the brain and plasma. Behavioral assessments included spontaneous locomotor activity, neuromuscular coordination, stress-related behavior, learning, and memory. Furthermore, Luxol Fast Blue (LFB) staining revealed marked myelin loss and demyelination in the brains of PPA-treated rats. Treatment with 4-HI and LRG significantly attenuated the PPA-induced behavioral, biochemical, gross morphological, and histopathological abnormalities. LFB-stained brain sections further demonstrated restoration of white matter integrity following treatment with 4-HI and LRG. Overall, the findings suggest that 4-HI exerts neuroprotective effects in PPA-induced autism-like conditions, potentially by enhancing IGF-1 and GLP-1 signaling and restoring associated neuronal and myelin abnormalities.

Keywords: *Autism spectrum disorder; Propionic acid; IGF-1; GLP-1; 4-Hydroxyisoleucine; Liraglutide; Neuroprotection; Neuroinflammation; Demyelination; Neurotransmitters.*

O-02/F/035 ORAL · OFFLINE

Rituximab–Magnesium Acetyl Taurate Co-treatment Protects Against Methylmercury-Induced ALS-Like Neurotoxicity Through Regulation of ERK, JNK, and p38 MAPK Signaling

Karishma Aggarwal*, Trina Saha, Sidharth Mehan, Ghanshyam Das Gupta

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Email: Karishmaaggarwal@isfcp.org

Amyotrophic lateral sclerosis (ALS) is a debilitating neurodegenerative condition involving progressive motor neuron loss and a complex interplay of oxidative injury, neuroinflammation, mitochondrial impairment, excitotoxicity, and aberrant intracellular signaling. This study evaluated the protective effects of rituximab (RTXMB), administered either alone or in combination with magnesium acetyl taurate (MACT600), in a methylmercury (MLMC5)-induced experimental model of ALS-like neurotoxicity, with particular emphasis on extracellular signal-regulated kinase (ERK), c-Jun N-terminal kinase (c-JNK), and p38 mitogen-activated protein kinase (p38 MAPK) signaling. Adult Wistar rats received MLMC5 (5 mg/kg, orally) for 21 consecutive days to establish ALS-like neurotoxicity, followed by treatment with RTXMB (50 or 100 mg/kg) and/or MACT600 (600 mg/kg) from days 22–42. Neuromotor and behavioral performance, neurochemical parameters, oxidative and inflammatory markers, signaling proteins, hematological indices, gross pathological alterations, and histopathological changes were subsequently assessed using behavioral assays, ELISA, Western blot analysis, biochemical estimations, and microscopic examination. Prolonged MLMC5 exposure resulted in substantial behavioral and neuromuscular deficits, together with enhanced oxidative stress, inflammatory responses, glutamate-mediated excitotoxicity, apoptotic signaling, tissue methylmercury burden, and disruption of ERK/c-JNK/p38 MAPK-associated signaling. These molecular abnormalities were accompanied by demyelination, neuronal deterioration, altered neurotransmitter homeostasis, skeletal muscle injury, and hematological abnormalities. RTXMB treatment alleviated these MLMC5-associated alterations, with the 100 mg/kg dose producing a greater protective response than the lower dose. Notably, co-treatment with RTXMB100 and MACT600 produced the most consistent improvement across the evaluated endpoints, characterized by restoration of antioxidant capacity, attenuation of inflammatory and apoptotic processes, normalization of neurotransmitter disturbances, preservation of myelin architecture, and reduced neuronal pathology. Collectively, these findings indicate that combined RTXMB and MACT600 treatment provides enhanced protection against methylmercury-induced ALS-like neurotoxicity, potentially through coordinated regulation of ERK/c-JNK/p38 MAPK signaling and downstream neuroinflammatory, oxidative, and apoptotic mechanisms. This combination warrants further investigation as a potential pharmacological strategy for modifying ALS-associated pathological processes.

Keywords: *Amyotrophic lateral sclerosis; Rituximab; Magnesium acetyl taurate; Methylmercury neurotoxicity; MAPK signaling; ERK/c-JNK/p38 MAPK pathway; Motor neuron degeneration; Neuroinflammation; Oxidative stress; Neuroprotection*

O-02/F/037 ORAL · OFFLINE

Spermine Alleviates Aluminum and Iron-Induced Alzheimer's Disease Neurotoxicity in rats by Downregulating tau phosphorylation, Aβ42, and NF-κB expression.

Sarabjit Singh*[1], Khadga Raj Aran[1]

Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India -142001
Email: sarabsinghpoohli@gmail.com

Alzheimer's disease (AD), the most prevalent dementia, involves progressive cognitive and memory decline in the elderly. Chronic aluminium and iron exposure promotes AD-like pathology via amyloid plaque accumulation, tau hyperphosphorylation, oxidative stress, neuroinflammation, and cholinergic degeneration. This study evaluated spermine's neuroprotective effect against aluminium chloride ($AlCl_3$)- and iron (Fe)-induced AD-like symptoms in rats. Rats received $AlCl_3$ (100 mg/kg, p.o.) ± Fe (120 µg/g, p.o.) for 28 days; spermine (5 or 10 mg/kg, i.p.) was administered during the final 14 days. Memory was assessed via morris water maze, actophotometer, and novel object recognition test. On day 29, brains were harvested for neuroinflammatory, biochemical, neurotransmitter, metal, and NF-κB analyses. $AlCl_3$/Fe co-administration elevated oxidative stress, cytokine levels, neurotransmitter imbalance, and biochemical derangements. Spermine dose-dependently improved memory, attenuated proinflammatory cytokines, restored neurotransmitters and antioxidant enzymes, reduced Aβ42 and tau phosphorylation, upregulated Bcl-2, and downregulated NF-κB and caspase-3. Collectively, spermine conferred neuroprotection through anti-inflammatory, antioxidant, and anti-apoptotic mechanisms.

O-02/F/038 ORAL · OFFLINE

AI-Guided Design and Quality-by-Design Optimization of Hydroxypropyl-β-Cyclodextrin Inclusion Complexes of Gliclazide for Improved Oral Drug Delivery in Type 2 Diabetes Mellitus

Hasibullah Khairi

Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: hasibkhairi73@gmail.com

Type 2 diabetes mellitus (T_2DM), a prevalent chronic endocrine disorder, is characterized by chronic hyperglycemia, rendering patients susceptible to various severe complications such as atherosclerosis, diabetic cardiomyopathy, diabetic nephropathy, and diabetic retinopathy. Following subcutaneous insulin therapy, oral administration of hypoglycemic drugs serves as an effective therapeutic strategy for the management of T_2DM. Gliclazide (GLZ), a sulfonylurea drug, is a first-line anti-T_2DM drug that exerts its hypoglycemic effect by stimulating insulin secretion from pancreatic β-cells. However, its poor water solubility and inadequate gastric absorption are two pivotal limitations hindering its clinical efficacy. To address these challenges, GLZ was first encapsulated into hydroxypropyl-β-cyclodextrin (HP-β-CD) to form GLZ_HP-β-CD inclusion complex, aiming to enhance drug's water solubility. Subsequently, polypropylene carbonate (PPC) and polycaprolactone (PCL) were blended and optimized at a mass ratio of 7:3 based on a series of evaluations, including film-forming capacity and shape memory performance, to develop a novel gastro-retentive drug delivery system (GRDDS). Furthermore, the in vivo hypoglycemic efficacy and pharmacokinetic properties of this system were systematically evaluated in T_2DM rats. The results indicated that the water solubility of GLZ in GLZ_HP-β-CD formulation was 2.42-fold higher than that of pure GLZ. Gastric retention studies revealed that the GLZ_HP-β-CD_PPC/PCL (7/3) formulation achieved a prolonged gastric retention time of up to 10 h, which was significantly longer than that of the GLZ_HP-β-CD formulation. Pharmacokinetic analyses showed that the oral bioavailability of GLZ from the GLZ_HP-β-CD_PPC/PCL (7/3) formulation was 312.14% relative to the GLZ_HP-β-CD formulation. Additionally, T_2DM rats treated with the GLZ_HP-β-CD_PPC/PCL (7/3) formulation exhibited significantly reduced blood glucose levels, along with marked improvements in insulin resistance and dyslipidemia. In conclusion, this novel PPC/PCL-based GRDDS represents a promising carrier for poorly water-soluble drugs requiring prolonged gastric retention to enhance absorption.

O-02/F/039 ORAL · OFFLINE

Protective Role of Phytosterols in the Behavioural Alterations in Aluminium Chloride Induced Alzheimer's Disease Rat Model

Harsh Bawa*, Arshdeep Kaur, Satinder Kaur
Khalsa College of Pharmacy
Email: harshbawa99@gmail.com

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by impairment of memory, learning, cognition, and behavioural functions. The present study was undertaken to evaluate the protective role of phytosterol against behavioural alterations in an aluminium chloride and iron-induced Alzheimer's disease rat model. Female Wistar rats weighing 180–220 g was divided into six groups, with eight animals in each group. Alzheimer-like cognitive dysfunction was induced by administration of aluminium chloride (100 mg/kg, p.o.) and iron (120 µg/g, p.o.) for 28 days. Phytosterol was administered at doses of 50 and 100 mg/kg, while Donepezil (1 mg/kg) was used as the standard drug. Cognitive and behavioural functions were assessed using the Elevated Plus Maze, Morris Water Maze, and Pole Climbing tests. The disease group exhibited marked cognitive impairment, as indicated by increased transfer and escape latencies, reduced time spent in the target quadrant, and poor pole-climbing performance. Treatment with phytosterol significantly improved behavioural and cognitive performance compared with the disease group. The high dose of phytosterol generally produced greater improvement in spatial learning, memory retention, and conditioned avoidance behaviour, whereas the low dose showed better improvement in the Elevated Plus Maze. These findings suggest that phytosterol possesses neuroprotective potential against aluminium- and iron-induced cognitive dysfunction, possibly through its antioxidant and anti-inflammatory properties. Further biochemical, histopathological, and molecular studies are required to establish its precise mechanism and therapeutic potential.

Keywords: *Alzheimer's disease, Phytosterol, Aluminium chloride, Iron-induced neurotoxicity, Cognitive dysfunction, Neuroprotection, Oxidative stress, Behavioural assessment, Wistar rats, Donepezil.*

O-02/F/040 ORAL · OFFLINE

Neuroprotective effect of Empagliflozin against weight-drop model-induced traumatic brain injury in experimental rats

Lav Goyal*, Raj Kumar Narang, Shamsher Singh
**Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab*
Email: lavgoyal1@gmail.com

Background: Traumatic brain injury (TBI) triggers a series of secondary pathological events, including neuroinflammation, oxidative stress, and disturbances in neurotransmitter homeostasis. Empagliflozin (EMPA), a US FDA-approved drug, has recently been reported to possess antioxidant and anti-inflammatory properties.

Aim and Objective: The present study was designed to evaluate the neuroprotective and antiinflammatory effects of EMPA in a rat model of TBI induced by the weight-drop method.

Materials and methods: After TBI induction, EMPA was administered intraperitoneally at 5 mg/kg and 10 mg/kg for duration of 28 days. Behavioral assessments were conducted weekly, and biochemical analyses were performed to determine oxidative stress markers, inflammatory cytokines, and neurotransmitter levels. Histopathological and immunohistochemistry studies were performed.

Results: TBI resulted in a significant increase in pro-inflammatory cytokines (TNF-α, IL-6, and IL-1β), along with impaired antioxidant defense and altered neurotransmitter balance. Treatment with EMPA significantly improved behavioral outcomes, reduced neuroinflammatory cytokine levels, and normalized neurotransmitter levels and protein expression. Research has shown that EMPA (10mg/kg) has a much greater effect than EMPA (5mg/kg). Furthermore, co-administration of ML-385, a selective Nrf2 inhibitor, diminished the protective effects of EMPA, which was confirmed by histological and immunohistochemistry studies.

Conclusion: Overall, the findings demonstrate that EMPA mitigates TBI-induced neuroinflammation, reduces oxidative stress, and restores neurotransmitter balance. These results suggest that EMPA may serve as a repurposed therapeutic agent for the management of TBI-associated inflammatory responses.

Keywords: *Traumatic brain injury, Empagliflozin, weight drop model, neuroinflammation, oxidative stress*

P-02/F/001 POSTER · OFFLINE

Shielding the Epileptic Brain: Targeting the Nrf2–ARE Pathway for Neuroprotection and Disease Modification

Nakul Kapoor*, Sania Grover

Department of Pharmacology, ISF College of Pharmacy, Moga - 142001, Punjab, India
Email: nakulkapoor768@gmail.com

Introduction: Epilepsy is a chronic neurological disorder characterized by recurrent seizures. Increasing evidence suggests that oxidative stress and neuroinflammation contribute significantly to epileptogenic and seizure-induced neuronal damage. Nuclear factor erythroid 2–related factor 2 (Nrf2) is a key transcription factor that regulates cellular antioxidant defense mechanisms.

Aim & Objectives: To review the role of Nrf2 in epilepsy and evaluate its potential as a therapeutic target for reducing oxidative stress, neuroinflammation, and neuronal injury. Methods: A literature-based review was conducted using published research articles and review papers focusing on Nrf2 signaling pathways, oxidative stress, and epilepsy.

Results: Studies demonstrate that seizures increase oxidative stress, leading to neuronal damage. Activation of the Nrf2 pathway enhances the expression of antioxidant and cytoprotective genes, reduces reactive oxygen species production, suppresses neuroinflammation, and improves neuronal survival. Various studies using experimental models have shown that Nrf2 activators may reduce seizure severity and provide neuroprotective effects.

Summary: Nrf2 is a master regulator of antioxidant defense and cellular protection. In epilepsy, seizure-induced oxidative stress and inflammation contribute to neuronal damage and disease progression. Activation of the Nrf2 pathway enhances antioxidant enzyme expression, reduces oxidative injury, and promotes neuronal survival. Various preclinical studies indicate that Nrf2 activation may decrease seizure severity and improve neurological outcomes, highlighting its potential as a novel therapeutic target in epilepsy management.

Conclusion: Nrf2 plays a crucial role in maintaining redox homeostasis and protecting neurons from seizure-induced injury. Targeting the Nrf2 signaling pathway represents a promising strategy for the development of novel therapies for epilepsy, particularly in patients with drug-resistant epilepsy. Further clinical studies are required to establish its therapeutic efficacy and safety.

Keywords: *Nrf2, Epilepsy, Oxidative Stress, Neuroprotection, Neuroinflammation, Antioxidants*

P-02/F/002 POSTER · OFFLINE

Candida auris: Decoding Antifungal Drug Resistance and Exploring Next-Generation Therapeutic Strategies

Nandini*[1], Komal[2]

[1]Department of Pharmacy, ISF College of Pharmacy, Moga, Punjab 142001, India
[2]Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab 142001, India
Email: nan22052006@gmail.com

Introduction: Candida auris is a multidrug-resistant fungal pathogen linked to healthcare infections and outbreaks globally. Its resistance to key antifungal classes like azoles and echinocandins complicates treatment. Challenges include accurate identification, biofilm formation, environmental persistence and limited therapies. Addressing its resistance mechanisms and exploring new antifungal strategies are crucial for effective management.

Aim & Objectives: To evaluate antifungal drug resistance mechanisms in Candida auris and investigate new therapeutic strategies, including novel antifungal agents, drug-repurposing methods and advanced drug-delivery systems aimed at enhancing treatment outcomes.

Methods: A comprehensive literature review analyzed peer-reviewed research on C. auris, focusing on its epidemiology, pathogenicity, antifungal resistance mechanisms, biofilm-related resistance, current therapies, emerging antifungal agents, combination therapy, drug repurposing and nanotechnology-based delivery systems.

Results: C. auris exhibits significant resistance to antifungal treatments due to various mechanisms such as target-site alterations, enhanced drug efflux, and biofilm formation. Recent advancements in therapy, including new antifungal agents, combination therapies and innovative delivery systems, show promise in addressing this resistance. Additionally, improved diagnostic technologies and susceptibility testing may facilitate quicker and more Personalized treatment decisions.

Summary: This review discusses the dynamics of C. auris infections, emphasizing antifungal resistance, therapeutic challenges, and new pharmacological strategies. It highlights next-generation antifungal agents, combination therapies, drug repurposing and innovative drug-delivery methods as potential alternatives to combat resistant strains.

Conclusion: The emergence of multidrug-resistant Candida auris poses significant challenges in antifungal therapy. Strategies such as improved diagnostics, rational drug selection, novel drug discovery, combination treatments and advanced drug-delivery technologies are essential for managing these resistant infections. Ongoing pharmacological research and clinical validation are critical for developing effective therapeutic options.

Keywords: *Candida auris, Antifungal Resistance, Multidrug Resistance, Antifungal Therapy, Drug Discovery, Biofilm, Nanotechnology.*

P-02/F/003 POSTER · OFFLINE

Protective effects of diacerein against quinolinic acid-induced Huntington's disease-like symptoms in adult zebrafish by targeting GSK-3β signalling

Himesh Thakar*

Department of Pharmacology. ISF College of Pharmacy, Moga – 142001, Punjab, India
Email: 2439425@isfcp.org

A progressive loss of motor control, cognition and emotional modulation is the hallmark of Hungtington's disease (HD), a genetic neurodegenerative illness. In lab models, quinolinic acid (QA), a hazardous intermediary of the kynurenine branch of tryptophan metabolism, is frequently used to produce experimental HD-like disease. The anthraquinone-based substance diacerein's binding behaviour toward glycogen synthase kinase-3 beta (GSK-3) was evaluated using AutoDock molecular docking β studies. The goal of the experiment was to determine whether diacerein could have neuroprotective and anti-inflammatory effects in an adult zebrafish model of QA induced neurotoxicity similar to Hungtington's disease. For each treatment condition, fourteen mature zebrafish were assigned. To create the HD-like experimental model, quinolinic acid (QA) was administered intracerebroventricularly (I.C.V.) on day 0. Tetrabenazine was used as the reference treatment drug while diacerein was given orally at 25 and 50mg/kg once daily for 14 days. Three paradigms were used to assess neurobehavioral function at the conclusion of the dosage period: the new tank diving test for anxiety-like responses, the T-maze for spatial learning and memory, and the open-field test for spontaneous locomotion. Brain samples were prepared for biochemical tests, such as measurements of total protein, lipid peroxidation (LPO), reduced glutathione (GSH), nitrite, acetylcholinesterase (AChE), and catalase, following the completion of behavioral evaluations. The proinflammatory cytokines IL-1β, TNF-, and IL-17 were measured, along with the α neurotransmitters GABA and glutamate. In order to describe treatment related morphological changes, a histological examination of brain sections was finally conducted. In the zebrafish treated with QA, diacerein treatment improved locomotor activity, restored disturbed neurotransmitter profiles, and reduced oxidative damage. It also reduced GSK-3 activity and the generation of pro-inflammatory cytokines. In β adult zebrafish exhibiting Huntington's disease-like symptoms, diacerein together reduced the neurotoxic alterations brought on by quinolinic acid and improved the corresponding behavioural deficits.

Keywords: *Zebrafish, Huntington's Disease, diacerein, Quinolinic acid, Neurotoxicity.*

P-02/F/004 POSTER · OFFLINE

An Insight on Etiology and Pathogenesis of Neurodevelopmental Disorders

Devanshu*, Kulwant Singh, Sanjeev Kalra

Rajendra Institute of Technology and Sciences, 4th Milestone, Hisar Road, Sirsa
Email: devanshuverma2020@gmail.com

Neurodevelopmental disorders (NDDs) are a heterogeneous group of conditions originating during early brain development and characterized by persistent impairments in cognition, communication, learning, behaviour, motor function, and social interaction. Autism spectrum disorder, attention-deficit/hyperactivity disorder, intellectual disability, specific learning disorders, and motor disorders represent major NDDs with substantial lifelong consequences. Their tiology is multifactorial, involving complex interactions among genetic susceptibility, epigenetic regulation, prenatal and perinatal complications, environmental exposures, nutrition, infections, inflammation, and psychosocial stress. Increasing evidence indicates that these factors converge during critical developmental windows to disrupt normal neurodevelopmental trajectories. Pathogenesis involves interconnected molecular and cellular mechanisms, including altered neurogenesis, neuronal migration and differentiation, synaptic formation and plasticity, neurotransmitter imbalance, neuroinflammation, oxidative stress, mitochondrial dysfunction, blood-brain barrier impairment, and dysregulated intracellular signalling. Alterations in excitatory and inhibitory neurotransmission, particularly glutamatergic and GABAergic systems, together with abnormalities in serotonergic and dopaminergic signalling, may contribute to behavioural and cognitive phenotypes. Epigenetic modifications and pathways such as mTOR, Wnt, and MAPK further influence gene expression and neuronal connectivity. Understanding these interconnected pathways may facilitate identification of biomarkers, early diagnosis, risk stratification, preventive strategies, and development of mechanism-based and personalized interventions. A multidisciplinary approach integrating genetics, neuroscience, pharmacology, environmental health, and behavioural science is essential for improving lifelong outcomes and advancing precision neurodevelopmental care and reduce the long-term social, educational, and economic burden of NDDs.

Keywords: *Neurodevelopmental disorders, oxidative stress, neuroinflammation, intracellular signalling.*

P-02/F/005 POSTER · OFFLINE

Engineering the Niche: Laminin-Based Biomaterials and Isoforms in Advanced Tissue Regeneration

Aarav Shorie*, Pankaj Kumar Maurya

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: shorieaarav@gmail.com

Introduction: Tissue regeneration requires biomimicking the extracellular matrix (ECM), which provides structural and biochemical cues regulating cell adhesion, proliferation, differentiation, and tissue organization. Laminin is a key ECM glycoprotein with diverse isoforms, including laminin-111, -211, -332, -411, and -511, that regulate tissue-specific cellular functions.

Aim & Objectives: To explore the potential of laminin isoforms and laminin-based biomaterials in developing biomimetic niches for advanced tissue regeneration and to evaluate their regenerative applications and translational challenges.

Methodology: A focused literature review was conducted on laminin isoforms, recombinant laminins, laminin-derived peptides, and laminin-functionalized scaffolds, hydrogels, and 3D-printed biomaterials. Their effects on cell adhesion, differentiation, angiogenesis, inflammation, and tissue repair were evaluated.

Results: Laminin-based biomaterials enhanced cellular adhesion, survival, proliferation, and lineage-specific differentiation. Isoform-specific applications showed potential in neural repair, skeletal muscle regeneration, skin healing, vascularization, and organ regeneration. Recombinant human laminins and laminin-derived peptides improved reproducibility and reduced dependence on animal-derived matrices. Integration with 3D bioprinting and nanofabrication further enhanced biomimetic tissue engineering.

Summary: Laminin-functionalized biomaterials effectively reproduce important ECM signals and provide tissue-specific cues for regeneration. However, production cost, stability, isoform optimization, scalability, and regulatory challenges remain.

Conclusion: Laminin-centered biomaterial strategies represent a promising approach for next-generation regenerative medicine and warrant further preclinical and clinical investigation.

Keywords: *Laminin; Tissue regeneration; Extracellular matrix; Biomaterials; Laminin isoforms; 3D bioprinting; Tissue engineering.*

P-02/F/006 POSTER · OFFLINE

From Enzyme to Therapy: The Role of GABA-Transaminase in CNS Disorders

Hiya Khera* and Sania Grover

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: hiyakhera20007@gmail.com

Introduction: Neurological disorders-including epilepsy, autism spectrum disorder, Huntington's disease, multiple sclerosis, and Alzheimer's disease-disrupt core brain functions such as cognition, mood, motor control, and language, significantly diminishing patients' quality of life. Neurotransmitters including glutamate, dopamine, norepinephrine, and gamma-aminobutyric acid (GABA) underlie normal neuronal signalling. GABA, the brain's principal inhibitory messenger, has disturbances in its regulation linked to numerous neurological conditions. The mitochondrial enzyme GABA-transaminase (GABA-T) governs GABA breakdown into succinic semialdehyde, controlling GABA availability across brain regions. Since excessive or insufficient GABA-T activity can shift this balance, the enzyme has drawn interest as a contributor to, and therapeutic target for, several neurological diseases.

Aim and Objective: This review consolidates current understanding of GABA-T's involvement across Huntington's disease, epilepsy, multiple sclerosis, autism, and Alzheimer's disease, clarifying whether GABA-T overactivity or underactivity underlies each condition and whether the enzyme is a viable pharmacological target.

Methods: Relevant peer-reviewed literature on GABA-T enzymatic function and disease-specific alterations was reviewed and compared across the five disorders to identify patterns of dysregulation and their alignment with therapeutic strategies.

Results: In Huntington's disease, epilepsy, and multiple sclerosis, heightened GABA-T activity lowers GABA availability, contributing to disease pathology. In autism, reduced GABA-T activity causes GABA accumulation, implicated in behavioural features. This suggests GABA-T inhibitors may benefit the former group, while agonists may suit autism. In Alzheimer's disease, findings remain divided over whether enhanced GABA-T activity is beneficial.

Summary: GABA-T emerges as a disorder-dependent player in neurological disease, with its overstimulation or suppression driving distinct pathological outcomes.

Conclusion: Its role is well characterized in Huntington's disease, epilepsy, multiple sclerosis, and autism, but remains unresolved in Alzheimer's disease, warranting further study to establish GABA-T as a credible therapeutic target.

Keywords: *GABA-transaminase; GABAergic neurotransmission; neurological disorders; Huntington's disease; therapeutic target.*

P-02/F/007 POSTER · OFFLINE

Aluminium Chloride-Induced Cognitive Dysfunction in Adult Zebrafish: Interplay of Oxidative Stress, Neurochemical Dysregulation, and Nrf2 Suppression

Amit Nadda* and Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: naddaamit2@gmail.com

Aluminium is a metal known to cause neurotoxicity in the brain by promoting neurodegeneration and impairing memory and cognitive ability. AlCl3 exposure has been reported to increase reactive oxygen species (ROS) and inflammatory markers, contributing to neuronal degeneration. In the present study, zebrafish were exposed to AlCl3 at three doses (50, 100, and 200 µg/L) for four consecutive days. On days 1 and 4, the novel diving test was performed to assess anxiety. T-maze and novel object recognition tests were conducted on days 3 and 4, respectively, to evaluate memory using ANY-maze software. On day 4, zebrafish were sacrificed, and whole brains were collected for biochemical, neurotransmitter, histopathological, and immunohistochemical analyses.

AlCl3 exposure significantly decreased total distance travelled and the number of entries into the top zone, while increasing the time spent in the bottom zone in the novel diving test. In the T-maze test, AlCl3-treated zebrafish showed significantly increased transfer latency to the favourable zone, increased time spent, and increased entries into the unfavourable zone. Exploration time with the novel object was also significantly reduced following AlCl3 treatment. Furthermore, GSH and SOD levels were significantly decreased, whereas MDA levels were increased, indicating enhanced oxidative stress. Neurotransmitter levels were also altered, with significantly decreased GABA, dopamine, noradrenaline, and serotonin levels and increased glutamate levels in the zebrafish brain. Histopathological and immunohistochemical analyses revealed a marked increase in pyknotic neurons and reduced Nrf2 expression following AlCl3 exposure. These findings suggest that AlCl3 induces significant behavioral, biochemical, neurochemical, morphological, and molecular alterations in zebrafish, ultimately contributing to AD-like pathology.

Keywords: *Aluminium chloride; $AlCl_3$; Zebrafish; Neurotoxicity; Oxidative stress; Neurodegeneration.*

P-02/F/008 POSTER · OFFLINE

PROTACs in Targeted Cancer Therapy: Mechanisms, Therapeutic Applications, Challenges and Future Perspectives

Rajat Kumar Mahanty* and Navjot Kaur Sandhu

Department of Pharmacology, ISF College of Pharmacy, Moga - 142001, Punjab, India
Email: rajatmahanty0@gmail.com

Proteolysis-targeting chimera (PROTAC) degrades disease-associated proteins and has become a promising targeted protein degrader. Compared with traditional protein inhibitors, it exhibits the advantages of complete degradation of target proteins and the ability to continuously remove disease-related proteins, so that the drug can work in a catalytic manner and exhibit an advantage in overcoming drug resistance. These characteristics make it an ideal tool for studying the mechanism of malignant tumors and for developing new anticancer drugs. Recent advances in the application of PROTACs in tumor treatment mainly include regulating oncogenic signalling pathways to exert antitumor effects, participating in cuproptosis by regulating p53 signalling, glutathione systems, redox, and mitochondrial functions. In addition, Nano-PROTACs can improve tumor targeting efficiency and reduce side effects of PROTACs by increasing solubility and stability, oral bioavailability, cellular uptake, and tumor targeting, and reducing toxicity, thus enhancing the overall therapeutic effect. The design of PROTACs provides a good platform for exploring tumor pathogenesis, screening of effective molecular targets, rational design of combination therapy schemes, and individualized treatment of tumour's. However, there are still some challenges in the research and development of Nano-PROTACs, including the need for more E3 ubiquitin ligases, out-of-pocket distribution and toxic side effects; the occurrence of drug resistance; poor pharmacokinetics; complexity and difficulties in PROTAC design and optimization. The progress of nano-drugs, the discovery of new E3 ubiquitin ligases, and the aid of artificial intelligence design will promote the development of Nano-PROTACs.

Keywords: *PROTACs, Cancer therapy, Protein degradation, Cuproptosis, Nanomedicine*

P-02/F/009 POSTER · OFFLINE

Baxdrostat: A Novel Aldosterone Synthase for the Management of Hypertension

Disha Mittal* and Sania Grover

Department of Pharmacology, ISF College of Pharmacy and Research, Moga - 142001, Punjab, India
Email: dishamittal378@gmail.com

Introduction: Hypertension is a major global health problem and a leading risk factor for cardiovascular, cerebrovascular, and renal diseases. Despite the availability of multiple antihypertensive medications, adequate blood pressure control remains difficult in many patients, especially those with resistant hypertension. Baxdrostat is a novel, selective aldosterone synthase (CYP11B2) inhibitor that reduces aldosterone synthesis and represents a promising new approach to hypertension management.

Aim and Objective: To review the mechanism of action, antihypertensive efficacy, safety, and therapeutic potential of baxdrostat in patients with uncontrolled or resistant hypertension.

Methods: Baxdrostat selectively inhibits aldosterone synthase, reducing of aldosterone synthesis, decreases renal sodium and water retention to low blood pressure.

Results: Clinical studies have demonstrated that baxdrostat can produce clinically meaningful reductions in systolic and diastolic blood pressure, particularly in patients with resistant hypertension.

Summary: Baxdrostat has generally demonstrated a tolerable safety profile in clinical studies. Because aldosterone suppression can influence electrolyte balance and renal function, monitoring of serum potassium, renal function, and blood pressure is important during treatment.

Conclusion: Baxdrostat represents a promising novel approach to hypertension treatment by directly targeting aldosterone synthesis, offering a potential therapeutic option for resistance hypertension.

Keywords: *Baxdrostat; Hypertension; Aldosterone synthase inhibitor; CYP11B2; Resistant hypertension.*

P-02/F/010 POSTER · OFFLINE

Combined Clemastine fumarate and Selenomethionine promote remyelination via PI3K/Akt/mTOR signalling in experimental Multiple Sclerosis

Sadia Rahman*

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: rahmansadia0537@gmail.com

Multiple sclerosis is a chronic demyelinating disorder of the central nervous system characterized by neuroinflammation, oxidative stress, axonal injury, and progressive loss of myelin. Although currently available disease-modifying therapies effectively suppress immune activity, their ability to promote remyelination and neurological recovery remains limited. Clemastine fumarate (CMF), a first-generation antihistamine, has demonstrated remyelinating potential through the promotion of oligodendrocyte maturation, whereas selenomethionine (SLM), a selenium-containing antioxidant, may attenuate oxidative stress and inflammatory injury. As these agents target distinct yet complementary pathological mechanisms, their combined therapeutic potential in MS remains unexplored. Therefore, the present study investigated the neuroprotective and remyelinating effects of CMF and SLM, administered individually or in combination, in an ethidium bromide (EMBE)–induced demyelination model in adult Wistar rats (n = 8/group). Following ICP EMBE administration, animals received CMF (20 or 40 mg/kg, i.p.), SLM (5 mg/kg, i.p.), or combination treatment for 28 days. Behavioural, neurochemical, inflammatory, oxidative stress, apoptotic, and histopathological parameters were evaluated together with PI3K, Akt, and mTOR protein expression. EMBE administration produced marked motor and cognitive deficits, neurotransmitter imbalance, oxidative stress, neuroinflammation, apoptotic alterations, altered PI3K, Akt, and mTOR protein expression and extensive demyelination. Treatment with CMF and SLM significantly attenuated these pathological changes, with combination therapy producing the greatest overall benefit. Treatment was further associated with normalization of altered PI3K, Akt, and mTOR protein expression and substantial preservation of myelin integrity. CMF and SLM thus appear to exert complementary neuroprotective and remyelinating effects, CMF principally promoting oligodendrocyte-mediated remyelination and SLM limiting oxidative and inflammatory injury that together converge on the PI3K/Akt/mTOR axis, supporting simultaneous dual-target intervention as a rational strategy for MS.

Keywords: *Multiple sclerosis; Clemastine fumarate; Selenomethionine; Ethidium bromide; Oligodendrocyte differentiation; Demyelination; Neuroinflammation*

P-02/F/011 POSTER · OFFLINE

Pulmonary–Gut Microbiome Axis in Chronic Respiratory Diseases: From Microbial Metabolites to Precision Therapeutics

Kanish Kumar*, Dr Ayushreeya Banga, Dr Sourabh Kosey

Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: kumarkanish1979@gmail.com

Background: Chronic respiratory diseases such as chronic obstructive pulmonary disease, asthma, and bronchiectasis are major causes of morbidity and mortality worldwide. Emerging evidence suggests that respiratory health is influenced by a complex interaction between the pulmonary and gut microbiomes. This pulmonary–gut microbiome axis involves bidirectional communication through microbial metabolites, immune regulation, epithelial barrier function, and systemic inflammatory pathways. Understanding these interactions may provide new opportunities for disease prevention.

Methods: A narrative review of available evidence was undertaken to examine the relationship between gut and pulmonary microbiota in chronic respiratory diseases. Emphasis was placed on microbiome dysbiosis, microbial metabolites, immune-mediated mechanisms, and their potential therapeutic implications. Evidence concerning short-chain fatty acids (SCFAs), including acetate, propionate, and butyrate, was evaluated in relation to inflammatory regulation, epithelial integrity, and host immune responses. Emerging microbiome-based therapeutic approaches, including dietary interventions, probiotics, prebiotics, postbiotics, and targeted microbial modulation, were also considered.

Results: Current evidence indicates that gut microbial dysbiosis may contribute to systemic inflammation and altered immune responses associated with chronic respiratory diseases. Microbial metabolites, particularly SCFAs, may influence pulmonary inflammation and immune homeostasis. Advances in metagenomics, metabolomics, and multi-omics approaches are improving the identification of microbial signatures associated with disease severity and treatment response. These findings highlight the potential of microbiome-derived biomarkers for patient stratification and precision therapeutics.

Conclusion: The pulmonary–gut microbiome axis represents an emerging therapeutic frontier in chronic respiratory diseases. Integrating microbiome profiling with clinical and molecular data may facilitate personalized interventions and improve treatment outcomes. Well-designed clinical studies are required to establish causal mechanisms and translate microbiome-based strategies into routine precision respiratory medicine.

Keywords: *Chronic respiratory disease, gut microbiome, pulmonary system, short-chain fatty acids.*

P-02/F/012 POSTER · OFFLINE

The Brain–Lung–Heart Axis: Decoding the Hidden Crosstalk Linking Respiratory, Neurological and Cardiovascular Diseases

Palak Mittal*, Ayushreeya Banga, Sourabh Kosey

Department of Pharmacy Practice, ISF College of Pharmacy, Moga - 142001, Punjab, India
Email: palakmittal5566@gmail.com

Background: The Brain–Lung–Heart Axis provides a clear framework for understanding links among the nervous system, pulmonary system, and heart function. Problems such as stroke-related lung infections, stress-induced heart issues, and memory decline in people with chronic lung disease suggest that shared pathways connect these organs rather than they act alone.

Methods: We reviewed published studies from clinical research, laboratory experiments, and translational models. The focus was on how the nervous system, immune responses, inflammation, and gut-derived metabolites connect the brain, lungs, and heart. The authors compared evidence across disciplines to identify recurring mechanisms supporting this axis.

Results: The review shows that autonomic nervous system imbalance-especially in vagal and sympathetic activity-can trigger lung inflammation and irregular heart rhythms. Inflammatory molecules such as IL6 and TNFα repeatedly drive damage across all three organs. Gut microbiome metabolites can further worsen systemic inflammation, linking neurological problems with lung and heart disease. Clinical studies confirm that people with chronic respiratory illness are more likely to develop memory problems and cardiovascular disease, with inflammation and nervous system imbalance serving as key bridges.

Conclusion: The Brain–Lung–Heart Axis offers a focused way to understand complex diseases that affect multiple systems. Recognizing this crosstalk as a central mechanism may guide future therapies, including neuromodulation, anti-inflammatory drugs, and microbiome-based treatments. More interdisciplinary research is needed to turn these insights into practical prevention and care strategies. Clinically, this framework may help identify shared pathways for earlier risk assessment, better prognosis, and more coordinated management across brain, lung, and heart disease.

Keywords: *Respiratory system, Neurological system, Cardiovascular system, Brain–Lung–Heart Axis.*

P-02/F/013 POSTER · OFFLINE

HSC as Pharmacological Targets in Alcohol-Associated Liver Fibrosis: Mechanisms, Plasticity and Emerging Antifibrotic Strategies

Priyam Nandy*, Sourabh Kosey

Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Moga Punjab, India
Email: priyamnandy06@gmail.com

Alcohol-associated liver disease (ALD) is a condition which can progress to fibrosis and cirrhosis. Hepatic Stellate cells (HSCs) are crucial in this process as chronic alcohol consumption activates them and causes them to assume a myofibroblast-like phenotype, which leads to an increase in extracellular matrix deposition. This review will discuss the molecular mechanisms of HSC activation and plasticity in AALD, focusing on the implication of TGF-β/SMAD and NF-κB/AP-1 signaling, oxidative and metabolic stress and gut–liver–immune interactions. Importantly, the activation of HSCs is reversible; namely activated HSCs can be de-activated, undergo cellular senescence, or undergo apoptosis, which could be the basis of fibrosis regression. These are significant periods of time for pharmacologic intervention. New antifibrotic strategies, such as modulation of PPAR-γ signaling, microRNA-based strategies, epigenetic regulation and selective targeting of senescent HSCs, have potential to improve the control of HSC-driven fibrogenesis and facilitate fibrosis resolution. In addition, non-invasive biomarkers and molecular imaging methods could aid in the evaluation of HSC activity and tracking therapeutic response. Finally, activation, plasticity and fate of HSCs provide a potentially valuable pharmacological target for the development of targeted anti-fibrotic drugs in AALD.

Keywords: *Hepatic stellate cells; Alcohol-associated liver disease; Liver fibrosis; HSC activation; Antifibrotic therapy; Fibrosis regression*

P-02/F/014 POSTER · OFFLINE

Nicotine and brain: Neuropharmacological Mechanism, Effects, and Addiction

Afsar Alam*, Zuber Khan

Department of Pharmacology, ISF College of Pharmacy, Moga 142001, Punjab, India
Email: afsaralam98089@gmail.com

Nicotine primarily affects the brain via attaching to nicotinic acetylcholine receptors, namely [alpha4\beta2] receptors. This activates neuron in the reward pathway, increasing dopamine release in the mesolimbic system, specifically the ventral tegmental region and nucleus accumbens. As a result, nicotine causes emotions of pleasure, alertness, and increased attention.

The brain adapts to nicotine after frequent use. The receptors get desensitized, and their number can rise over time, resulting in tolerance. This means the individual requires more nicotine to achieve the same effect. Nicotine withdrawal symptoms include irritation, anxiety, low mood, difficulty concentration, and strong cravings. Nicotine addiction occurs when the drug regularly promotes use through dopamine signaling and acquired associations with smoking or other nicotine products. Environmental signals, stress, and habitual behavioral can all cause craving and relapse. Although nicotine may provide short-term cognitive benefits, its intense reward and withdrawal cycle make it highly addictive. In summary, nicotine alters brain signaling, particularly cholinergic and dopaminergic pathways, and repetitive activation is the primary cause of dependence and addiction.

Keywords: *Nicotine: neuropharmacology, brain nicotinic acetylcholine receptors, dopamine reward pathway, neurotransmission, neuroplasticity, dependence.*

P-02/F/015 POSTER · OFFLINE

Drug Repurposing from 2021–2025: Recent Advances, Clinical Outcomes and Emerging Opportunities

Ambika Thakur*, Navneesh

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315705@isfcp.org

Drug repurposing has emerged as a strategic approach to accelerate therapeutic development by identifying new clinical applications for existing drugs with established pharmacological, safety, and pharmacokinetic profiles. Between 2021 and 2025, advances in computational biology, artificial intelligence (AI), machine learning, network pharmacology, multi-omics, and real-world evidence have substantially expanded the discovery and prioritization of repurposing candidates. This review provides a comprehensive overview of recent advances in drug repurposing, emphasizing clinically relevant outcomes and emerging opportunities across infectious diseases, cancer, neurological disorders, metabolic diseases, and rare diseases. Evidence from clinical trials during this period demonstrates both successful therapeutic repositioning and substantial challenges in translating promising preclinical findings into clinical benefit. The COVID-19 pandemic further highlighted the potential and limitations of repurposing, demonstrating the importance of rigorous clinical validation. Integration of electronic health records, drug–target interaction networks, molecular docking, transcriptomic signatures, and AI-driven predictive models is increasingly enabling systematic identification of novel drug–disease associations. However, limited intellectual property protection, inadequate funding for late-stage trials, formulation and dose optimization, regulatory complexities, and inconsistent clinical evidence remain major barriers. Future opportunities lie in precision medicine, biomarker-guided repurposing, combination therapies, federated real-world data, and explainable AI. Collectively, these developments position drug repurposing as a complementary strategy to conventional drug discovery, with considerable potential to address unmet medical needs while reducing development time, cost, and translational risk.

Keywords: *Drug repurposing; Drug repositioning; Drug discovery; Artificial intelligence; Clinical trials; Real-world evidence; Precision medicine; Drug–target interactions.*

P-02/F/016 POSTER · OFFLINE

Once-Weekly Insulin Icodec: A New Paradigm in Basal Insulin Therapy

Prince*, Kumari Kajal, Aman Rai

ISF College of Pharmacy, Moga-142001, Punjab, India
Email: prince0003320@gmail.com

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia, which occurs due to problems in insulin secretion, insulin action, or both and remains a major global health burden. Insulin therapy is central to the management of type 1 diabetes and is frequently required in advanced type 2 diabetes, but over the past two decades, once-daily basal insulin analogues have served as the cornerstone of injectable therapy for type 2 diabetes; nevertheless, their real-world performance is continually undermined by daily injection fatigue. Patients sometimes also experience mediocre adherence and extremely poor glycemic control when they are unable to take them daily or twice daily. To solve this problem, a scientist Novo Nordisk created Insulin Icodec, the first once-weekly basal insulin analogue, with the intention of streamlining medication administration and enhancing adherence. It is a novel once-weekly basal insulin analogue that has recently been approved to improve glycemic control in adults with type 2 diabetes. Its mechanism includes Insulin icodec's prolonged half-life (~1 week) results from reversible albumin binding, which creates a circulating depot enabling sustained, once-weekly glucose-lowering activity. Randomized treat-to-target trials (ONWARDS program) have demonstrated glycemic efficacy measured by HbA1c reduction that is non-inferior to, and in some trials superior to, once-daily basal analogues (insulin glargine, insulin degludec). All factors considered, insulin icodec is a significant development in the treatment of diabetes, with the ability to optimize insulin regimens and enhance patient-centred outcomes. However, further research is necessary to assess long-term safety and wider clinical applicability.

Keywords: *Diabetes mellitus, HbA1c, Insulin Icodec, Treatment, once weekly*

P-02/F/017 POSTER · OFFLINE

Reprogramming Multiple Sclerosis Therapy: From Immune Dysregulation to Precision Pharmacology - Beyond Relapse Control Toward Remyelination and Emerging Therapeutic Targets

Juhi Anand*

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315734@isfcp.org

Multiple Sclerosis (MS) is a chronic immune mediated disease of the central nervous system that mainly affects the brain, spinal cord and optic nerves. In MS abnormal activation of the immune system causes inflammation and damage to myelin, the protective covering of nerves fibre. This leads to disturbed nerve signal transmission and may result in problems such as weakness, numbness, visual disturbances, poor balance and difficulty in walking. Both genetic and environmental factors are believed to contribute to the development of MS, while T cells, B cells, microglia and inflammatory mediators play important roles in disease progression.

The current pharmacological treatment focuses on reducing inflammation and relapses. Drugs such as ocrelizumab and ofatumumab target CD20-positive B-cells, natalizumab acts on α4-integrin, and fingolimod and siponimod modulate S1P receptors. Although these therapies have significantly improved relapse control, they may not be sufficient to prevent progressive disability, neurodegeneration, or myelin repair failures.

As a result, MS pharmacotherapy is gradually shifting to a more precise, mechanism-based approach. Emerging targets, such as Bruton's tyrosine kinase (BTK), which regulates B-cell and myeloid-cell signaling, are being studied for their potential role in peripheral and CNS inflammation. At the same time, remyelination and neuroprotection are emerging as potential therapeutic strategies.

This poster presents the changing approach to MS treatment - from broad immune suppression towards precision pharmacology, neuroprotection and remyelination - with the aim of highlighting how future therapies may not only control disease activity but also protect and potentially repair the nervous system.

Keywords: *Multiple Sclerosis, Neuroinflammation, BTK Inhibitors, Remyelination, Neuroprotection.*

P-02/F/018 POSTER · OFFLINE

Savant Syndrome: An Overview of Genetic and Environmental Determinants, Neurobiological Mechanisms, and Future Perspectives

Jyotish Kumar*

Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab-142001
Email: 2315735@isfcp.org

Savant syndrome is a rare condition characterized by exceptional abilities in specific domains, including music, art, mathematics, memory, and calendar calculation, often occurring in individuals with autism spectrum disorder (ASD), other neurodevelopmental conditions, intellectual disabilities, or acquired brain injury. The striking discrepancy between general cognitive functioning and domain-specific abilities provides a unique opportunity to investigate brain organization, functional specialization, and neuroplasticity. The emergence of savant abilities is considered multifactorial, involving potential interactions among genetic susceptibility, atypical neurodevelopment, environmental influences, learning experiences, intensive practice, and acquired neurological changes. Proposed neurobiological mechanisms include atypical structural and functional connectivity, enhanced perceptual processing, specialized neural network recruitment, altered memory processing, and compensatory neuroplasticity. However, the genetic, molecular, and neural determinants underlying savant abilities remain incompletely understood. This review integrates current evidence on the genetic, environmental, neurobiological, and cognitive factors associated with savant syndrome and discusses their potential contribution to exceptional abilities. Future research should incorporate advanced neuroimaging, genomic and transcriptomic approaches, neurophysiological techniques, longitudinal neuropsychological assessment, and computational methods to elucidate the mechanisms underlying savant abilities. Such multidisciplinary approaches may also support individualized educational and behavioral strategies that nurture exceptional skills while promoting adaptive functioning and quality of life. Overall, savant syndrome represents a remarkable manifestation of human cognitive diversity and neuroplasticity, offering valuable insights into the neural basis of memory, learning, creativity, expertise, and brain plasticity.

Keywords: *Savant syndrome; autism spectrum disorder; Exceptional abilities; Neurodevelopmental disorders; Neuroplasticity; Brain connectivity; Cognitive specialization; Enhanced perceptual processing; Neuroimaging; Neural mechanisms.*

P-02/F/019 POSTER · OFFLINE

Translational Potential of Sulforaphane as a Multi-Target Neuroprotective Strategy for Multiple Sclerosis

Muskan Sanan*, Divya Choudhary, Riya Samanta, Sidharth Mehan

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: muskansanan07@gmail.com

Multiple sclerosis (MS) is a progressive disorder of the nervous system involving neuroinflammation, demyelination, and neuronal loss which causes motor and cognitive dysfunction. The aim of this study was to explore the neuroprotective and therapeutic effects of sulforaphane (SFN), a bioactive phytochemical, in an experimental model of MS induced by ethidium bromide (EB) on Wistar rats. SFN efficacy was compared to omaveloxolone (OMV) and dimethyl fumarate (DMF). EB was used to induce demyelination and then treated with various doses of SFN, OMV and DMF. Therapeutic efficacy has been evaluated by molecular docking, neurobehavioral and histopathological evaluation. In terms of neuronal and glial integrity, SFN restored neuronal and astrocytic morphology and myelin architecture, reduced microglial infiltration and inflammation, and restored neurotransmitter balance and motor-cognitive performance. On the molecular level, SFN activated the antioxidant signaling pathway (Nrf2/HO-1/SIRT1) and inhibited the STAT3 and BACE1 pathways involved in neurodegeneration. SFN showed antioxidant, anti-inflammatory, remyelinating and neuroprotective properties and an hepatic safety profile better than that of the hepatotoxic changes associated with OMV. All together, these results suggest that SFN could be a potential multi-target therapeutic agent for MS-associated neuroinflammation and demyelination, and warrant further mechanistic and clinical study and translation.

Keywords: *Multiple Sclerosis, Sulforaphane, Ethidium Bromide, Demyelination, Neuroinflammation, Neuroprotection.*

P-02/F/020 POSTER · OFFLINE

Biomarkers in Traumatic Brain Injury: A Promising Tool for Early Diagnosis

Ayush Sohal*, Sania Grover
ISF College of Pharmacy and Research, Moga, 142001, Punjab, India
Email: ayushsohal786@gmail.com

Background: Traumatic brain injury (TBI) is common and may range from mild to severe. Mild TBI can be difficult to identify because symptoms may be unclear and CT scans may be normal. Blood biomarkers may help indicate brain injury.

Objective: To review important biomarkers in TBI and assess their role in early detection and assessment, particularly in mild TBI.

Methods: Research articles and review papers on TBI biomarkers were studied. GFAP, UCH-L1, S100B, NSE, neurofilament light chain (NfL), and tau protein were compared for their source, association with brain injury, and possible clinical uses.

Results and Discussion: Traumatic brain injury can damage neurons, astrocytes, and axons, causing proteins to be released into the blood. GFAP and S100B are mainly associated with astrocyte injury, while UCH-L1 and NSE are associated with neuronal injury. NfL and tau are mainly related to axonal damage. GFAP, UCH-L1, and S100B show good potential in mild TBI and may help identify patients less likely to have serious brain injury and support decisions about CT scanning. However, biomarker levels can be influenced by the timing of blood collection, test methods, and injuries to other body parts.

Conclusion: Blood biomarkers may support the diagnosis and management of TBI, especially mild TBI, alongside clinical examination and CT imaging. Further studies are needed to establish standard testing methods and cut-off values for routine use.

Keywords: *Traumatic brain injury, Mild TBI, Biomarkers, GFAP, UCH-L1, S100B.*

P-02/F/021 POSTER · OFFLINE

Cannabinoids In Parkinson's Disease: Exploring New Therapeutic Horizons

Kanchan Sharma*, Sania Grover
ISF College Of Pharmacy and Research, Moga, 142001, Punjab, India
Email: kanchansharma95929@gmail.com

Background: Parkinson's disease (PD) is a progressive brain disorder that mainly affects movement and can also cause problems such as sleep disturbance, pain, anxiety and changes in mood. Current medicines can reduce symptoms, but they may not control all symptoms and long-term treatment can cause complications. Because of this, cannabinoids are being studied as a possible supportive treatment.

Objective: To review the role of cannabinoids, especially cannabidiol (CBD), in Parkinson's disease and understand their possible benefits and limitations.

Methods: Research articles and review papers on cannabinoids in PD were studied. Their possible effects on motor symptoms, non-motor symptoms, levodopa-induced dyskinesia, mechanisms of action and safety were compared.

Results and Discussion: Cannabinoids act through the endocannabinoid system and may affect brain pathways involved in movement and inflammation. Preclinical studies suggest that CBD may have antioxidant, anti-inflammatory and neuroprotective effects. Some clinical studies have reported possible benefits for pain, sleep problems, anxiety, psychiatric symptoms and quality of life. However, results for motor symptoms and levodopa-induced dyskinesia are inconsistent. Differences in cannabinoid type, dose, treatment duration and small study populations make the evidence difficult to compare. Side effects such as dizziness, drowsiness and other problems may also occur.

Conclusion: Cannabinoids, particularly CBD, show potential as an additional approach for selected symptoms of PD. However, current evidence is not strong enough to recommend their routine use. Larger and better-designed clinical studies are needed to confirm their benefits, appropriate doses and long-term safety.

Keywords: *Cannabinoids; Cannabidiol; Parkinson's disease; Endocannabinoid system; Motor symptoms; Neuroprotection.*

P-02/F/022 POSTER · OFFLINE

Advancements in Cyclodextrin-Based Nanoparticle Therapies for Breast Cancer: Current Trends and Future Prospects

MD Habibullah*

Department of Pharmacology, ISF College Of Pharmacy, Moga-142001, Punjab, India
Email: habibbadri717@gmail.com

Breast cancer remains one of the most challenging malignancies worldwide, with treatment frequently limited by systemic toxicity, drug resistance, inadequate tumor targeting, and tumor heterogeneity. Nanotechnology has emerged as a promising approach to address these limitations by improving drug solubility, stability, bioavailability, controlled release, and selective delivery to tumor tissues. Among advanced nanocarriers, cyclodextrin (CD)-based systems have attracted considerable attention because of their ability to form inclusion complexes with poorly soluble drugs and their versatility for constructing multifunctional and stimuli-responsive delivery platforms. Recent advances have explored cyclodextrin-containing nanoparticles, polymeric systems, liposomal formulations, and hybrid nanocarriers for the delivery of anticancer agents. These systems can be engineered to respond to tumor-associated stimuli such as acidic pH, reactive oxygen species, redox conditions, enzymes, temperature, light, and magnetic fields, enabling more controlled and site-specific drug release. CD-based nanocarriers may also facilitate combination therapy, improve intracellular drug accumulation, and potentially address multidrug resistance. Current research is increasingly focused on subtype-specific targeting, personalized nanomedicine, immunomodulation, theranostic applications, and multifunctional nanoparticle design. However, challenges including nanotoxicity, reproducibility, scalability, manufacturing complexity, regulatory requirements, and limited clinical validation remain important barriers to translation. Future research should therefore emphasize standardized characterization, clinically relevant in vivo studies, biodegradable materials, and well-designed clinical trials. Overall, cyclodextrin-based nanoparticle platforms represent an evolving strategy for enhancing precision and therapeutic effectiveness in breast cancer treatment.

Keywords: *Breast cancer; Cyclodextrins; Nanoparticles; Drug delivery; Targeted therapy; Stimuli-responsive nanocarriers; Controlled release; Nanomedicine.*

P-02/F/023 POSTER · OFFLINE

Combined Puerarin and Magnesium Acetyl Taurate Intervention Mitigates Autism-Like Pathology Through Glutamatergic and MAPK Pathway Regulation

Dipu Kumar Sharma

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315718@isfcp.org

Autism is a multifactorial neurodevelopmental disorder characterized by social deficits, stereotypical behaviour, and neu rotransmitter imbalance. This study evaluated the neuroprotective potential of Puerarin (PUN) and Magnesium Acetyl Tau rate (MGAT) in a propionic acid (PPNA)-induced rat model of autism. PPNA was administered intracerebroventricularly for 11 consecutive days to induce autism-like features, followed by a 44-day treatment period with PUN (300 mg/kg, i.p.) and MGAT (500 mg/kg, p.o.). A comprehensive assessment was conducted, including behavioural analysis, biochemical and molecular evaluations, cerebrospinal fluid and plasma profiling, and histopathology. Treatment with PUN and MGAT, particularly in combination, improved behavioural outcomes, restored neurotransmitter balance, reduced neuroinflam mation and apoptotic signaling, and attenuated activation of the glutaminase–glutamate/NMDAR and MAPK pathways (C-JNK, ERK1/2, P38 MAPK). Additionally, treatment increased magnesium levels and PSD-95 expression, indicating significant neuroprotection. These findings support the potential of PUN and MGAT as a multitarget therapeutic strategy for autism and warrant further translational investigation.

Keywords: *Puerarin, Magnesium acetyl taurate, Propionic acid, Induced autism, Neuroinflammation, Glutaminase/glutamate pathways, Synaptic and neurochemical restoration*

P-02/F/024 POSTER · OFFLINE

Microbial Short-Chain Fatty Acids as Epigenetic and Metabolic Regulators of Neuroinflammation: From Gut Microbiota Signalling to Therapeutic Translation

Aman Kumar*, Pankaj Kumar Maurya

Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Email: kumaraman823587@gmail.com

Microbial short-chain fatty acids (SCFAs), primarily acetate, propionate, and butyrate, are emerging as important mediators of gut–brain communication and neuroimmune homeostasis. Produced mainly through microbial fermentation of dietary fiber, SCFAs regulate brain and immune functions through interconnected epigenetic, receptor-mediated, metabolic, and mitochondrial mechanisms. This poster provides an overview of the molecular pathways through which SCFAs influence neuroinflammation, beginning with their microbial biosynthesis, absorption, systemic availability, and communication across the gut–brain interface. Particular emphasis is placed on SCFA-mediated epigenetic regulation through histone deacetylase inhibition, histone acetylation/acylation, DNA methylation, chromatin remodeling, and non-coding RNAs, together with receptor-dependent signaling via FFAR2/GPR43, FFAR3/GPR41, and GPR109A/HCAR2 and downstream pathways including MAPK, PI3K/Akt, AMPK, NF-κB, and NLRP3 inflammasome signaling. The metabolic and mitochondrial effects of SCFAs, including regulation of acetyl-CoA metabolism, the TCA cycle, oxidative phosphorylation, reactive oxygen species, autophagy, and mitophagy, are also highlighted. Furthermore, their interactions with microglia, astrocytes, neurons, oligodendrocytes, and oligodendrocyte precursor cells are discussed in relation to neuroinflammation, neuroprotection, and remyelination. Evidence linking SCFA dysregulation with neurological and psychiatric disorders, including Alzheimer's disease, Parkinson's disease, multiple sclerosis, stroke, epilepsy, and stress-associated neuroinflammation. Importantly, the biological effects of SCFAs are context dependent and influenced by metabolite type, concentration, exposure duration, disease stage, microbiome composition, and host metabolic status, highlighting the emerging SCFA paradox. Finally, the therapeutic potential of SCFA-based strategies is investigated, including engineered microbial consortia, precision microbiome therapeutics, targeted delivery systems, probiotics, synbiotics, postbiotics, and prebiotics. Overall, this poster highlights SCFAs as potential targets for the development of precision techniques in neuroimmunopharmacology and as possible modulators of the epigenetic-metabolic-immune axis.

Keywords: *Short-chain fatty acids; Gut–brain axis; Neuroinflammation; Gut microbiota; Epigenetics; Mitochondrial metabolism*

P-02/F/025 POSTER · OFFLINE

Evaluation of Terminalia Chebula in Combination with Bacopa Monnieri for Reversing $AlCl_3$ Induced Alzheimer's Disease in Rats

Anjali[1], Ankita[1]*, Aashee Singh[1], Kartik Jamwal, Vandana Bhatia[1], Shiv Kumar Kushawaha[1], Mahendra Singh Ashawat[2]

[1]Department of Pharmacology, Laureate Institute of Pharmacy, Kathog, Distt. Kangra, H.P, (India), 176031.
[2]Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog, Distt. Kangra, H.P, (India), 176031.
Email: ankitaa1912004@gamil.com

Background: Alzheimer's disease (AD) is a multifactorial neurodegenerative disorder characterized by progressive cognitive decline, oxidative stress, cholinergic dysfunction, and neuroinflammation. Current therapies mainly provide symptomatic relief, highlighting the need for safe and multi-targeted therapeutic approaches. Hydroalcoholic extract of Terminalia Chebula (HAETC) and Bacopa Monnieri (BM) possess antioxidant, anti-inflammatory, and neuroprotective properties.

Objective: To evaluate the neuroprotective efficacy of HAETC alone and in combination with BM in an aluminium chloride ($AlCl_3$)-induced Alzheimer's-like model in Wistar rats.

Methods: Wistar rats were administered $AlCl_3$ (175 mg/kg, i.p.) for 36 days to induce AD-like pathology. Treatment groups received HAETC (200 or 300 mg/kg) alone or in combination with BM (50 or 100 mg/kg), while donepezil (2 mg/kg) served as the standard drug. Behavioral performance was evaluated using the Open Field Test, Elevated Plus Maze, and Morris Water Maze. Hippocampal tissue was analyzed for MDA, GSH, SOD, TNF-α, IL-6, and AChE activity. Histopathological examination assessed hippocampal integrity.

Results: $AlCl_3$ administration caused cognitive impairment, increased MDA, AChE, TNF-α, and IL-6 levels, and decreased GSH and SOD levels. HAETC and BM treatment significantly reversed these alterations, improved behavioral performance, reduced oxidative stress and neuroinflammation, inhibited AChE activity, and preserved hippocampal architecture. The HAETC 300 mg/kg + BM 100 mg/kg combination showed effects comparable to donepezil.

Conclusion: HAETC and BM demonstrated synergistic neuroprotective effects by attenuating oxidative stress, neuroinflammation, and cholinergic dysfunction, thereby improving cognitive performance. The combination may represent a promising natural multi-targeted approach for AD management.

Keywords: *Alzheimer's Disease, Aluminium Chloride, Neurodegenerative disorder, Oxidative Stress.*

P-02/F/026 POSTER · OFFLINE

Neuroprotective Potential of Ethanolic Extract of Cuphea sp. Against Aluminium Chloride-Induced Alzheimer's Disease in Experimental Animals

Vishakha, Shayena*, Palak, Aditya, Shiv Kumar Kushwaha

Department of Pharmacology, Laureate Institute of Pharmacy, Kathog, Distt. Kangra, H.P. (India), 176031.
Email: shayena2044@gmail.com

Introduction: Alzheimer's disease (AD) is a prevalent neurodegenerative disorder characterized by progressive cognitive decline, oxidative stress, and neuroinflammation. Existing therapies have limited efficacy, emphasizing the need for novel treatments. Natural products offer promising multitarget neuroprotective effects and represent potential therapeutic candidates for AD

Aim: The present study aimed to evaluate the neuroprotective potential of the ethanolic extract of Cuphea sp. against aluminium chloride ($AlCl_3$)-induced Alzheimer's disease in experimental animals.

Methods: Molecular docking and in silico pharmacokinetic profiling were performed using AutoDock Tools v1.5.6 and the BOILED-Egg model, respectively, to investigate the interaction and drug-likeness of phytoconstituents of Cuphea sp. An AD-like model was induced in rats using $AlCl_3$ (175 mg/kg), followed by oral administration of ethanolic extract of Cuphea sp. at doses of 100, 200, and 400 mg/kg for 36 days. Behavioural and cognitive functions were assessed using the open field test, elevated plus maze, and Morris water. Biochemical parameters, including malondialdehyde (MDA), reduced glutathione (GSH), and superoxide dismutase (SOD), along with inflammatory markers TNF-α and IL-1β were evaluated. Hippocampal histopathology was also performed.

Results: Molecular docking demonstrated favourable binding of Cuphea sp. phytoconstituents with AD-related targets, while the BOILED-Egg model predicted favourable pharmacokinetic properties and potential BBB penetration. Treatment improved locomotor and cognitive performance, restored GSH and SOD levels, reduced MDA, TNF-α, and IL-1β, and ameliorated hippocampal neuronal damage.

Conclusion: The findings suggest that ethanolic extract of Cuphea sp. possesses promising neuroprotective activity and may represent a potential natural therapeutic candidate for AD.

Keywords: *Alzheimer's disease, Cuphea sp., Molecular docking, BOILED-Egg model.*

P-02/F/027 POSTER · OFFLINE

Plant-Derived Bioactives in Diabetic Wound Healing: From Molecular Mechanisms to Therapeutic Translation

Sunil Kumar*, Rajnish Srivastava, Naresh Kumar Rangra

Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India-174103
Email: sunil120.phd25@chitkarauniversity.edu.in

Wounds greatly affect health-care systems, especially in resource-limited developing countries where 80% of individuals use traditional plant-based medicine for diabetic wounds. Effective wound healing is complex, involving stages such as hemostasis and inflammation, with diabetes posing significant challenges due to complications from hyperglycemia, oxidative stress, and increased infection risk. This review highlights medicinal plants' roles in diabetic wound healing, addressing the limitations of traditional therapies and discussing advanced bioactive materials, including engineered therapeutic systems and multifunctional biomaterials that enhance angiogenesis and reduce infections. Major phytochemical classes, including flavonoids, phenolic compounds, terpenoids, alkaloids, tannins, and polysaccharides, are considered in relation to key signaling pathways involved in wound repair, such as Nrf2/ARE, NF-κB, PI3K/Akt, MAPK, and HIF-1α/VEGF signaling. Their reported effects on reactive oxygen species, inflammatory mediators, fibroblast proliferation, keratinocyte migration, collagen deposition, angiogenesis, and re-epithelialization are also examined. Particular attention is given to formulation and delivery strategies, including hydrogels, nanocarriers, lipid-based systems, polymeric matrices, and combination approaches designed to improve stability, bioavailability, sustained release, and localized activity. It also considers the challenges in clinical translation of these innovative therapies, aiming to improve healing outcomes and quality of life for diabetic patients.

Keywords: *Diabetic wound healing; Plant-derived bioactives; Phytochemicals; Flavonoids; Phenolic compounds; Oxidative stress; Chronic inflammation; Angiogenesis; Nrf2/ARE; NF-κB; Tissue regeneration; Hydrogels; Nanocarriers; Therapeutic translation.*

P-02/F/028 POSTER · OFFLINE

Pharmacognostic and Phytochemical Evaluation of Ficus religiosa L. Fruits with Ethnobotanical Perspectives

Vikas[1], Pushap Kumar Chandel[1], Nikhil koundal[1], Atul Sharma[1], Nishant Goutam[1]*, Mahendra Singh Ashawat[2]

[1]*Department of Pharmacology, Laureate Institute of Pharmacy, Kathog, Dist. Kangra, H.P, (India),176031.*

[2]*Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog, Dist. Kangra, H.P, (India),176031.*

Email: Nishant.laxmipd@gmail.com

Background: Ficus religiosa L. (Moraceae), commonly known as sacred fig or peepal, is an important ethnomedicinal plant traditionally used for inflammatory, gastrointestinal, respiratory, skin, wound, and neurological disorders. However, systematic pharmacognostic and phytochemical evaluation of its fruits is essential for establishing quality-control parameters.

Objective: The present study aimed to investigate the pharmacognostic, physicochemical, and phytochemical characteristics of F. religiosa fruits and to assess the ethnobotanical significance of its primary and secondary extracts.

Materials and Methods: Fresh fruits were collected, botanically authenticated, shade-dried, powdered, and extracted with ethanol using a Soxhlet apparatus. The obtained primary extract was subsequently processed to obtain a secondary extract. Macroscopic, microscopic, and organoleptic characteristics were evaluated, along with physicochemical parameters and extractive yield. Qualitative phytochemical screening was performed for major classes of secondary metabolites, and total phenolic content was quantitatively estimated.

Results: The fruits exhibited distinctive macroscopic, organoleptic, and microscopic characteristics suitable for pharmacognostic identification and quality control. The ethanolic primary extract showed appreciable extractive yield and tested positive for phenolics, flavonoids, tannins, terpenoids, and glycosides. The secondary extract also demonstrated the presence of several phytochemical constituents, confirming the occurrence of diverse bioactive secondary metabolites. Quantitative analysis revealed a considerable total phenolic content, indicating the potential of the fruit as a source of phenolic compounds. The physicochemical parameters further provided useful quality standards for the crude drug.

Conclusion: The findings establish preliminary pharmacognostic, physicochemical, and phytochemical standards for F. religiosa fruits. The presence of diverse constituents in both extracts supports its ethnobotanical importance and warrants further investigation of its potential pharmacological activities.

Keywords: *Ficus religiosa L.; Pharmacognosy; Phytochemistry; Ethanolic extract; Secondary extract; Secondary metabolites; Total phenolics; Ethnobotany; Quality control.*

P-02/F/029 POSTER · OFFLINE

Exploring The Renoprotective Potential of White Rain Lilly Through Phytochemical Analysis, Gc-Ms Profiling and Molecular Docking

Ankush[1], Tanvi kaushal[1]*, Sakshi[1], Shruti Sharma[1], Swati Rana[1], Mahendra Singh Ashawat[2]

[1]*Department of Pharmacology, Laureate Institute of Pharmacy, Kathog, Distt. Kangra H.P. (INDIA),176031*

[2]*Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog, Distt. Kangra H.P. (INDIA),176031*

Email: tanvikaushal14052003@gmail.com

Introduction: An estimated 674 million individuals worldwide (9%) suffer from chronic kidney disease (CKD), with low - and middle – income nations bearing a disproportionate share of the burden. According to reports,17.2% of Indians have chronic kidney disease which is a serious public health issue since oxidative stress and inflammation are the main cause of kidney damage, new plant- based treatments are required.

Objectives: Using preliminary phytochemical screening, gas chromatography-mass spectrometry (GC-MS) profiling, and molecular docking analysis of its discovered bioactive compounds, the current study sought to explore the possible reno-protective action of white rose lilly.

Methods: Plant material from white rain lilies were isolated and first screened for phytochemicals. Volatile and semi-volatile chemicals were identified using GC-MS. Molecular docking was done used to assess the discovered compounds against specific targets of oxidative -inflammatory proteins and kidney damage.

Results: Several biologically significant phytochemical classes were found in preliminary phytochemical screening. Seven bioactive components flavonoids, tannins, saponins, alkaloids, triterpenoids, steroids, carotenoids from several chemical categories were identified by GC-MS Profiling, demonstrating the pharmacological richness of the plant extract. Following these tests, the extract was examined to determine phytochemicals in which 34 compounds were found in the extract. Numerous substances showed consistent interactions with significant active site residues, indicating their potential role in regulating pathways linked to inflammation, oxidative stress and renal cellular damage.

Conclusion: white rose lilly, exhibits encouraging reno protective potential, as evidenced by its phytochemical profile, bioactive chemicals discovered by GC-MS and advantages molecular docking interactions

Keywords: *White rose lily; Renoprotection; Phytochemical screening; GC–MS; Molecular docking; Oxidative stress.*

P-02/F/030 POSTER · OFFLINE

Anti-Parkinsonian and Neuroprotective Effects of Acetone Extract of Justicia adhatoda L.

Shaksham, Akanksha*, Kanishka, Divya, Shavinder Kumari, Shiv Kumar Kushawaha

Department of Pharmacology, Laureate Institute of Pharmacy, Kathog, H.P., India – 176031.
Email: akankshadogra13@gmail.com

Introduction: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by degeneration of dopaminergic neurons in the substantia nigra pars compacta, resulting in motor impairment, oxidative stress, neuroinflammation, and neuronal damage. The potential anti-Parkinsonian activity of Justicia adhatoda L. remains insufficiently explored.

Aim & Objectives: To evaluate the anti-Parkinsonian and neuroprotective properties of the acetone extract of Justicia adhatoda L. (AEJA).

Methods: Preliminary phytochemical screening and GC-MS analysis were performed, followed by ADME prediction, molecular docking, and simulation studies of selected phytoconstituents against PD-related targets. Reserpine-induced PD was established in Wistar rats, which were treated with AEJA at 100, 200, and 400 mg/kg.

Results: GC-MS identified 14 phytoconstituents, with selected compounds showing favorable pharmacokinetic properties, including blood-brain barrier penetration. AEJA treatment increased locomotor activity and motor coordination, reduced malondialdehyde levels, and attenuated neuroinflammation through reductions in TNF-α and IL-1β. Histopathological analysis demonstrated dose-dependent preservation and restoration of neuronal architecture, with substantial improvement at 400 mg/kg. Androstan-3-one, 17-hydroxy-2,4-dimethyl was identified as a possible bioactive compound.

Summary: AEJA produced dose-dependent improvements in behavioral, biochemical, and histopathological parameters in the reserpine-induced PD model.

Conclusion: AEJA may have anti-Parkinsonian and neuroprotective potential by regulating motor dysfunction, oxidative stress, neuroinflammation, and neuronal damage.

Keywords: *Justicia adhatoda L.; Parkinson's disease; reserpine; acetone extract; oxidative stress; neuroinflammation*

P-02/F/031 POSTER · OFFLINE

Imidazo[1,2-a] pyridine as a Privileged Scaffold in Neurodegenerative Drug Discovery: SAR and Therapeutic Perspectives

Jashanpreet Kaur*, Rajnish Srivastava*, Naresh Kumar Rangra, Amit Chaudhary

Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India-174103
Email: jashanpreet.kaur@chitkarauniversity.edu.in

Background: Alzheimer's disease (AD) and Parkinson's disease (PD) are complex neurodegenerative diseases which consist of interrelated processes such as oxidative stress, neuroinflammation, neurotransmitter imbalance, protein misfolding, mitochondrial dysfunction and neuronal death. Failures of symptom-based and single drug therapy approaches have led to the need for multitarget-directed small-molecules (SMEs). Imidazo [1,2-a] pyridine is one such heterocyclic scaffold that has shown promise to be modified structurally and used for CNS active molecules.

Aim: The primary aim of the present critical review is to assess SAR of imidazo[1,2-a]pyridine-derived SMEs towards AD/PD-related targets and their relevance for neuroprotective potential.

Methodology: Critical analysis of existing literature was conducted by PRISMA focusing on substituents, their positions, electronic and lipophilic characteristics, pharmacophore blending, and linker features. Activities toward targets related to AD such as AChE, BChE, and BACE1, as well as the mechanisms of action in PD patients, were analyzed in combination with molecular docking, molecular dynamics, antioxidation, neuroprotection, and in vivo studies.

Critical Perspective: The correct substitution and pharmacophore hybridization could be a way to improve target recognition and multi-functional behavior. Unfortunately, there are few systematic SAR studies that would include target binding, ADMET parameters, BBB permeability, cell neuroprotection, and in vivo confirmation. The comparative SAR data between the structural elements of the imidazo[1,2-a]pyridine and AD/PD mechanism are also not enough.

Conclusion: Imidazo[1,2-a]pyridine is a potential lead molecule to design SMEs with multitarget capabilities.The combination of structure-based and computational-biological approaches can help in finding optimized SMEs with enhanced multitarget profile and CNS pharmacophoric characteristics as potent neuroprotectives against AD and PD.

Keywords: *Imidazo[1,2-a]pyridine; Structure–activity relationship; Alzheimer's disease; Parkinson's disease; Small-molecule entities; Multitarget-directed ligands; Neuroprotection, Molecular docking.*

P-02/F/032 POSTER · OFFLINE

Neuroprotective Effects of Betulinic Acid Against Lipopolysaccharide and Ferrous Sulfate Induced Neurotoxicity in SH-SY5Y Cells via Modulation of P38mapk/NF-Kb/GPX4/Nrf2/Keap-1/HO-1 Signaling Pathways

Shalini Sil*, Shivam Kumar Pandey

Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy
GT Road, NH 95, Ghal Kalan, Moga, Punjab-142001, India
Email: shalini9733sil@gmail.com

Background: Betulinic acid (BA) is a pentacyclic triterpenoid known for its wide pharmacological activity and neuroprotective properties.

Objective: The study explored the protective effects of BA on neuroblastoma cells against ferroptosis, apoptosis, neuroinflammation and dopaminergic neuronal death induced by LPS and FeSO4, while examining the underlying molecular mechanisms.

Methods: Differentiated SH-SY5Y cells were subjected to exposure from LPS and FeSO4 with pretreatment using BA in concentrations ranging from 0.3 to 30 μM. The viability of the cells was measured using MTT assay, while apoptosis were assessed via flow cytometry. Additionally western blotting and immunocytochemical staining were employed to investigate key proteins linked to ferroptosis, apoptosis, oxidative stress, inflammation and the survival of dopaminergic neurons.

Result: Co-exposure to LPS and FeSO4 resulted in a dose dependent decrease in cell viability significantly countered by BA pretreatment. This exposure elevated the expression of DMT1, Bax, caspase-3 and α-synuclein while reducing GPX4, FTH1, SLC7A11, Nrf2, Keap1, HO-1, PARK7, Bcl-2, NeuN and TH. These molecular shifts led to ferroptosis, apoptosis, neuroinflammation and dopaminergic cell death. Moreover, the treatment increased levels of IL-6, TNF- α and the phosphorylation of p38 MAPK and NF- κB. Notably, BA pretreatment effectively reversed these molecular changes and mitigated cellular injury.

Conclusion: These results highlight BA's potential as a therapeutic agent for oxidative stress-related neurodegenerative conditions like Parkinson's disease by suggesting that it exerts neuroprotection by modulating the GPX4/Nrf2/keap-1/HO-1 antioxidant defense and p38MAPK/NF-κB inflammatory signaling pathways.

Keywords: *Betulinic acid, lipopolysaccharide, Ferrous sulfate, Apoptosis, ferroptosis, SH-SY5Y cells.*

P-02/F/033 POSTER · OFFLINE

Gestational Diabetes Mellitus: Maternal-Fetal Metabolic Interactions

Anshu Kumari[1]*, Bhabni, Manjeet Kumar

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: anshukri1516@gmail.com

Gestational diabetes mellitus (GDM) is one of the most common metabolic complications of pregnancy and is characterized by hyperglycaemia first recognized during pregnancy. It develops primarily as a result of progressive maternal insulin resistance, driven by physiological and placental adaptations, together with inadequate pancreatic β-cell compensation. When insulin secretion is insufficient to meet the increased metabolic demands of pregnancy, maternal blood glucose levels rise, resulting in hyperglycaemia. Because maternal glucose readily crosses the placenta, foetal exposure to elevated glucose concentrations stimulates increased foetal pancreatic insulin secretion. Foetal hyperinsulinemia promotes excessive foetal growth and may increase the risk of macrosomia, neonatal hypoglycaemia, and other adverse perinatal outcomes. The landmark Hyperglycaemia and Adverse Pregnancy Outcome (HAPO) study, which included 23,316 pregnant women, demonstrated a continuous association between maternal glucose concentrations and adverse pregnancy outcomes. Importantly, the consequences of GDM extend beyond pregnancy. Women with GDM have an increased long-term risk of developing type 2 diabetes and other metabolic disorders, while offspring exposed to an adverse intrauterine metabolic environment may have an increased susceptibility to obesity, insulin resistance, and metabolic disease later in life. These effects may be mediated through foetal metabolic programming, whereby altered maternal glucose and nutrient availability influence foetal development and long-term metabolic function.

Keywords: *Gestational diabetes mellitus; Hyperglycaemia; Insulin resistance; Foetal hyperinsulinemia; Macrosomia; Adverse pregnancy outcomes; Foetal metabolic programming; Type 2 diabetes mellitus.*

P-02/F/034 POSTER · OFFLINE

Cyclodextrin Based Drug Delivery for Atherosclerosis: Improving Solubility and Promoting Cholesterol Removal

Kirti Sharma*

School of Pharmaceutical Sciences, Jaipur National University, Jagatpura, Jaipur, Rajasthan, India
Email: kirtisharma16906@gmail.com

Introduction: Atherosclerosis is a common cardiovascular condition in which cholesterol and fats accumulate inside the arterial walls, leading to plaque formation and restricted blood flow. Some drugs used in its treatment have poor water solubility, which can affect their dissolution and absorption. Cyclodextrins, especially hydroxypropyl-β-cyclodextrins (HPβCD), have attracted attention for improving drug delivery and supporting cholesterol removal.

Objective: This study aimed to explore the role of cyclodextrin based drug delivery systems in improving the solubility and bioavailability of poorly water-soluble drugs and promoting cholesterol removal in atherosclerosis.

Methods: Relevant literature was reviewed to understand cyclodextrin structure, inclusion-complex formation, solubility enhancement and cholesterol mobilizing activity. Research findings on HPβCD and its potential effects on lipid accumulation and plaque formation were also examined.

Results: Studies suggest that cyclodextrins can improve drug solubility, dissolution and stability by forming inclusion complexes. HPβCD may help mobilize cholesterol from lipid loaded cells and support cholesterol efflux. Experimental research has also reported reductions in lipid accumulation and plaque formation with selected cyclodextrin based systems. However, further research is needed to confirm their safety and effectiveness.

Conclusion: Cyclodextrin based drug delivery offers a promising approach that combines improved drug solubility with potential cholesterol removing effects. Further laboratory and clinical studies are required to optimize these systems and determine their possible role in future atherosclerosis treatment.

Keywords: *Cyclodextrins; Hydroxypropyl-β-cyclodextrin (HPβCD); Atherosclerosis; Drug delivery; Solubility enhancement; Cholesterol efflux.*

P-02/F/035 POSTER · OFFLINE

Current Relevance Of Artificial Intelligence in Diagnosis of Parkinson's Disease

Lata*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab
Email: 281lata@gmail.com

Parkinson's disease (PD) is a progressive neurodegenerative disorder affecting the nervous system and is marked by a number of motor symptoms including resting tremor, bradykinesia, rigidity, and postural instability, as well as a variety of non-motor symptoms. The usual method of arriving at a diagnosis is through a clinical evaluation, this possibly causing a delay in identifying the disease, especially in the early stages when pathological changes occur before there are noticeable clinical symptoms. The aim is that artificial intelligence (AI), especially machine learning (ML) and deep learning (DL), is becoming a promising method for achieving an early and accurate diagnosis of PD.As to current relevance, AI-based systems are able to analyse complex and multidimensional data derived from handwriting and drawing patterns, speech and voice characteristics, gait and movement, neuroimaging, clinical records, and digital biomarkers. They can detect subtle patterns associated with disease that would be hard to spot with traditional assessment methods. Recent studies have shown promising diagnostic performance, with possible uses in early-stage screening, monitoring of disease progression, and in providing personalised clinical management and long-term patient monitoring. Combining multimodal data may also improve diagnostic accuracy and help to enable objective, non-invasive assessments. However, problems such as the availability of limited and heterogeneous datasets, the need for external validation, interpretability, privacy concerns, and clinical implementation still exist. In conclusion, the present evidence shows that AI has great potential to complement traditional neurological assessments, help in the earlier detection of the disease, and play a role in achieving more accurate and individualised management of Parkinson's disease.

Keywords: *Artificial Intelligence (AI); Parkinson's Disease; Early Diagnosis; Machine Learning; Neuroimaging; Biomarkers.*

P-02/F/036 POSTER · OFFLINE

Role of Heavy Metals in the Pathogenesis of Alzheimer's Disease: Recent Molecular Targets

Shreshtha Phartyal*, Shamsher Singh Bajwa

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: shreshtha.121102@gmail.com

Background: Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by amyloid-β (Aβ) deposition, tau pathology, oxidative stress, mitochondrial dysfunction, and neuroinflammation. Emerging evidence suggests that exposure to heavy metals, including lead, mercury, cadmium, arsenic, and aluminium, may aggravate these pathological processes by disrupting neuronal and cellular homeostasis.

Objective: This review aims to elucidate the molecular mechanisms underlying heavy metal mediated neurotoxicity in AD and identify emerging molecular targets with potential therapeutic significance.

Methods: A comprehensive literature review was performed using scientific databases, including PubMed, Scopus, and ScienceDirect, focusing on recent experimental and review studies addressing heavy metal exposure, AD pathogenesis, oxidative stress, neuroinflammation, metal dyshomeostasis, amyloid and tau pathology, mitochondrial dysfunction, and ferroptosis. Relevant molecular pathways and potential therapeutic targets were systematically identified and synthesized from the retrieved literature.

Results: Heavy metals contribute to AD progression through interconnected mechanisms involving excessive reactive oxygen species generation, impaired antioxidant defense, mitochondrial dysfunction, and disruption of metal homeostasis. Key molecular targets include Nrf2/HO-1, NF-κB, MAPK, NLRP3 inflammasome, PI3K/Akt, GPX4, and SLC7A11, with emerging evidence implicating ferroptosis and exosome-mediated miRNA signaling in neuroinflammation and neuronal injury.

Conclusion: Targeting metal dyshomeostasis and its downstream molecular pathways may provide promising opportunities for developing novel disease-modifying strategies against AD.

Keywords: *Alzheimer's disease; Heavy metals; Neurotoxicity; Oxidative stress; Neuroinflammation; Mitochondrial dysfunction; Ferroptosis; Molecular targets.*

P-02/F/037 POSTER · OFFLINE

Molecular Pathogenesis of Cancer and Pharmacological Targeting of Tumor Progression

Md.Asif Ansari*

Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: asifansari82077736@gmail.com

Cancer is a complex disease characterized by uncontrolled cell proliferation, resistance to apoptosis, angiogenesis, invasion, and metastasis. Its molecular pathogenesis involves genetic and epigenetic alterations affecting oncogenes, tumor suppressor genes, and signaling pathways such as RAS/MAPK, PI3K/AKT/mTOR, and Wnt/β-catenin. These alterations promote tumor growth and progression. Understanding these mechanisms has enabled the development of targeted pharmacological therapies, including tyrosine kinase inhibitors, monoclonal antibodies, angiogenesis inhibitors, PARP inhibitors, and immune checkpoint inhibitors. Conventional chemotherapy also remains an important treatment approach by disrupting DNA synthesis and cell division. Despite significant advances, drug resistance, toxicity, tumor heterogeneity, and recurrence remain major challenges. This poster highlights the molecular basis of cancer progression and the role of pharmacological targeting in developing more selective and effective anticancer therapies.

Keywords: *Cancer; Molecular pathogenesis; Targeted therapy; Signal transduction pathways; Tyrosine kinase inhibitors; Immune checkpoint inhibitors; Angiogenesis; Drug resistance.*

P-02/F/038 POSTER · OFFLINE

Neuroprotective Effect of Fisetin and Lactobacillus acidophilus in 3-Nitropropionic acid induced Huntington's Disease in Rats targeting PI3K/Akt/GSK-3β Signaling Pathway

Rohan Bansal*, Shamsher Singh*

Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: bansalrohan027@gmail.com

Huntington's disease (HD) is a progressive neurodegenerative disorder characterized by oxidative stress, mitochondrial dysfunction, neuroinflammation, and progressive neuronal damage. The present study was undertaken to investigate the neuroprotective effects of Fisetin, both alone and in combination with Lactobacillus acidophilus, in a 3- nitropropionic acid (3- NP) induced rat model of Huntington's disease- like neurotoxicity. Experimental HD- like alterations were induced by administration of 3- NP (10 mg/kg). Animals were subsequently treated with Fisetin (15 and 30 mg/kg) and Lactobacillus acidophilus (1.5*109 CFU/ml/day). Behavioral changes were assessed by evaluating body weight, motor coordination, grip strength, and open field activity. Biochemical and molecular assessments included oxidative stress markers, inflammatory cytokines, neurotransmitter levels, intestinal permeability, and the expression of Nrf2 and NF-κB. Histopathological and immunohistochemical examinations were also performed. Administration of 3-NP resulted in marked behavioral deficits accompanied by oxidative stress, mitochondrial dysfunction, neuroinflammation, and excitotoxicity, alterations in Nrf2 and GSK- 3β expression, and substantial neuronal degeneration in the brain. Treatment with Fisetin significantly improved behavioral performance and strengthened the antioxidant defense system in a dose-dependent manner. Fisetin treatment also helped restore the imbalance in neurotransmitters, and reduced the levels of pro- inflammatory cytokines. In addition, Fisetin enhanced Nrf2 and GSK- 3β expression and preserved neuronal architecture, as supported by histopathological findings. The findings indicate that Fisetin has significant neuroprotective potential against 3- NP- induced Huntington's disease- like alterations, with the combination of Fisetin and Lactobacillus acidophilus showing the strongest protective response.

Keywords: *Huntington's disease, Fisetin, Lactobacillus acidophilus, Neurodegeneration, Neuroinflammation.*

P-02/F/039 POSTER · OFFLINE

Type 2 Diabetes Mellitus: Evolution of Pharmacotherapy and Recent Advances in Drug Discovery

Akshita Jain[1]*

School Of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan
Email: akshitajain841@gmail.com

Introduction: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterised by high blood glucose level due to insulin resistance, progressive pancreatic β-cell dysfunction and destruction, and impaired insulin secretion. Long term uncontrolled diabetes can lead to the micro- and macrovascular complications that requires effective pharmacological treatment and management. This poster summarises the evolution of T2DM pharmacotherapy and recent drug discoveries that provide benefits beyond glycemic control.

Objective: Pharmacotherapy of T2DM comprises metformin, sulfonylureas, thiazolidinediones, DPP-4 inhibitors, insulin, and other glucose-lowering agents. Recent advances have significantly expanded the available treatment options of T2DM. SGLT2 inhibitors, empagliflozin and dapagliflozin, reduce renal glucose reabsorption and promote urinary glucose excretion also provides cardiovascular and renal benefits in appropriate patients. GLP-1 receptor agonists such as semaglutide and dulaglutide improve glucose-dependent insulin secretion, reduce glucagon release, slow gastric emptying, and support weight loss. One of the most encouraging drugs in this field is tirzepatide, a dual GIP/GLP-1 receptor agonist that combines complementary incretin effects on glycemic control and body weight.

Conclusion: Current research is exploring multi-target incretin agonists, personalised pharmacotherapy, and treatment of metabolic complications such as obesity, fatty liver disease, cardiovascular issues, renal impairment. Further development of multi-target and personalised therapies will improve the long-term prognosis for patients with T2DM.

Keywords: *Type 2 diabetes mellitus; Drug discovery; Pharmacotherapy; GLP-1 receptor agonists; GIP/GLP-1 dual agonists; Tirzepatide.*

P-02/F/041 POSTER · OFFLINE

The interplay between inflammation and oxidative stress in depression: pathogenic mechanisms and treatment approaches

Akaljot Kaur*, Mayank Attri
Guru Nanak Dev University
Email: akaljotkaith@gmail.com

Depression is a complex neuropsychiatric disorder that extends beyond simple monoamine dysregulation, with growing evidence implicating chronic low-grade inflammation and oxidative stress as central contributors to its pathophysiology. This review examines how these two processes interact bidirectionally to disrupt neurotransmission, mitochondrial function, synaptic plasticity, and neurogenesis in depressed individuals. Elevated pro-inflammatory cytokines (IL-1β, TNF-α, IL-6) interfere with serotonin, dopamine, and norepinephrine signaling, in part by shunting tryptophan metabolism toward neurotoxic kynurenine pathway products, while also activating microglia and impairing BDNF expression. Concurrently, oxidative stress-marked by elevated lipid peroxidation, reduced antioxidant enzyme activity (SOD, catalase, GPx), and mitochondrial dysfunction-damages neuronal structures and further amplifies neuroinflammation. Central to this crosstalk are the NF-κB and Nrf2 signaling pathways: NF-κB drives pro-inflammatory gene expression, while impaired Nrf2 activation weakens antioxidant defenses, together sustaining a self-perpetuating cycle of neuronal injury linked to structural brain changes (hippocampal atrophy, reduced cortical thickness) seen in depression, particularly treatment-resistant cases. The review discusses therapeutic strategies targeting these pathways-including NSAIDs, cytokine antagonists, minocycline, Nrf2 activators (e.g., sulforaphane), antioxidants (NAC, omega-3s, curcumin), and lifestyle interventions-while noting that clinical evidence remains preclinical-heavy and inconsistent due to patient heterogeneity, small trial sizes, and translational gaps from animal models. The authors argue that biomarker-stratified, personalized approaches targeting inflammatory and oxidative profiles represent a promising path toward precision psychiatry for depression, especially in inflammation-dominant or treatment-resistant subtypes.

Keywords: *Depression; Neuroinflammation; Oxidative Stress; NF-κB; Nrf2; Kynurenine Pathway; Mitochondrial Dysfunction; Precision Psychiatry*

P-02/F/042 POSTER · OFFLINE

Cancer Pharmacology and Drug Discovery

Nitesh Kumar*, Himanshu Kumar, Shreya Sharma
Department of Pharmacognosy, ISF College of Pharmacy, Moga – 142001, Punjab, India
Department of Pharmacology, ISF College of Pharmacy, Moga – 142001, Punjab, India
Email: 231575@gmail.com

Cancer remains a leading cause of mortality worldwide, driven by uncontrolled proliferation and resistance to cell death. Pharmacology plays a pivotal role in cancer drug discovery, encompassing identification, development, and optimization of therapeutic agents. Current anticancer drugs are classified into antitumor antibiotics, plant alkaloids, hormonal agents, targeted therapies, and immunotherapies. Drug discovery has evolved from conventional cytotoxic screening to rational, target-based approaches including high-throughput screening, structure-activity relationship studies. Natural products contribute over 60% of anticancer leads, with phytochemicals serving as scaffolds for semisynthetic analogues like paclitaxel and etoposide. challenges such as multidrug resistance, narrow therapeutic index, and systemic toxicity persist. Emerging strategies including antibody-drug conjugates and Nanophytomedicines offer precision and reduced toxicity.

Keywords: *Cancer Pharmacology; Anticancer Drug Discovery; Targeted Therapy; Immunotherapy; Natural Products; Multidrug Resistance; Antibody–Drug Conjugates; Nanophytomedicine.*

P-02/F/043 POSTER · OFFLINE

Recent Research Trends in the Field of Chronopharmacology

Amanpreet Kaur*, Rakesh Chawla, Sandeep Goyal

University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridkot
Email: preetamansarsoy1725@gmail.com

Chronopharmacology is an emerging field of pharmacology that investigates the relationship between biological rhythms and the action of medicines. Recent research has focused on how circadian rhythms influence physiological processes such as sleep–wake cycles, hormone secretion, blood pressure, metabolism, immune responses, and gastrointestinal functions, thereby affecting drug pharmacokinetics and pharmacodynamics. The timing of drug administration can influence absorption, distribution, metabolism, excretion, therapeutic response, and adverse effects. Current research trends include chronotherapy, chronopharmacokinetic, chronopharmacodynamic, chronotoxicology, and the development of chronotherapeutic drug-delivery systems. Applications are being explored in cardiovascular disorders, asthma, cancer, diabetes, and other chronic diseases where disease activity and drug responsiveness vary throughout the day. Integration of circadian biology with personalized medicine may facilitate patient-centered dosing strategies based on individual circadian patterns, lifestyle, and physiological characteristics. Despite its potential, challenges remain in translating circadian principles into clinical practice, optimizing dosing schedules, and developing suitable drug-delivery systems. Overall, recent advances in chronopharmacology highlight its potential to improve therapeutic efficacy, minimize adverse effects, and support safer, more precise, and individualized.

Keywords: *Chronopharmacology; Circadian Rhythm; Chronotherapy; Chronopharmacokinetics; Chronopharmacodynamics; Personalized Medicine*

P-02/F/044 POSTER · OFFLINE

ROLE OF HORMONES IN THE HUMAN BODY, IT'S ROLE, FUNCTIONS, DISODERS & TREATMENT PROFILE

Ravi Sahu*, Dr. Vijay Nigam, Mr. Bhan Singh Yadav

Department of Pharmacology, Daksh Institute of Pharmaceutical Sciences, Chhatarpur, Madhya Pradesh-471001, India
Email: ravisahuu9@gmail.com

Hormones are essential biochemical messengers that regulate numerous physiological processes, including growth, metabolism, reproduction, and tissue repair. Among these functions, hair growth is a complex biological process significantly influenced by hormonal balance. Hair follicles undergo cyclic phases of growth (anagen), regression (catagen), and resting (telogen), all of which are controlled by endocrine signaling. Hormones such as androgens, estrogens, thyroid hormones, growth hormone, insulin, cortisol, prolactin, and melatonin play vital roles in maintaining normal hair follicle function. Hormonal imbalance resulting from endocrine disorders, aging, stress, genetic predisposition, or metabolic diseases can disrupt the hair growth cycle, leading to conditions such as androgenetic alopecia, telogen effluvium, alopecia areata, and diffuse hair thinning.

Recent advances in endocrinology and dermatology have improved the understanding of hormone-mediated mechanisms involved in hair follicle biology, enabling the development of targeted therapeutic approaches. Current treatment strategies include hormone replacement therapy for endocrine deficiencies, anti-androgen medications, topical agents such as minoxidil, oral therapies including finasteride and dutasteride, corticosteroids for autoimmune hair disorders, nutritional supplementation, and emerging regenerative therapies such as platelet-rich plasma (PRP) and stem cell-based interventions. The selection of treatment depends on the underlying hormonal cause, patient characteristics, disease severity, and potential adverse effects. Regular hormonal assessment and individualized treatment plans are essential to optimize clinical outcomes while minimizing complications. This review highlights the physiological role of hormones in human growth with particular emphasis on hair growth regulation. It also summarizes the Pathophysiology of hormone-related hair disorders, available diagnostic approaches, current pharmacological treatments, and emerging therapeutic options. A comprehensive understanding of hormonal regulation and evidence-based management strategies can contribute to improved patient care and support the development of more effective therapies for hormone-associated hair disorders in the future.

Keywords: *Endocrinology, Dermatology, Hair follicles, nutritional supplementation, regenerative therapies, hormonal regulation.*

P-02/F/045 POSTER · OFFLINE

A Comparative Exploration Of Artemisia Annua And Artemisia Afra Against Drug-Resistant Tuberculosis

Ashutosh Narayan Jha*, Nitika Sharma
I.S.F. College of Pharmacy, Moga, Punjab
Email: 2315710@gmail.com

Introduction: Mycobacterium tuberculosis (Mtb) is a deadly pathogen and the causative agent of human tuberculosis, causing approximately 1.5 million deaths annually. When a patient develops multidrug-resistant tuberculosis bacteria have become resistant to at least the anti-tuberculosis frontline drugs Isoniazid and Rifampicin, the two most powerful medications. Then the bacteria mutated and learned how to completely block out the two frontline fighters (Isoniazid and Rifampicin). The increasing drug resistance of this pathogen necessitates novel and improved treatment strategies.

Methodology: Artemisia annua and Artemisia afra extracts were tested for the treatment of bacterial infection against Mycobacterium tuberculosis under different nutritional conditions. For the treatment of Mycobacterium tuberculosis, we used the extracts of both plants, Artemisia annua and Artemisia afra, in the presence of different nutritional sources, such as glycerol, glucose, and cholesterol, to evaluate their bactericidal activity.

Results: However, both plant extracts showed bactericidal activity against Mycobacterium tuberculosis; however, Artemisia afra showed a better bactericidal effect under any nutritional conditions, while Artemisia annua showed its highest activity in the presence of glycerol.

Summary and conclusion: Here, as the result we got that both Artemisia annua and Artemisia afra demonstrated antibacterial activity against Mycobacterium tuberculosis. In which the Artemisa afra showed better consistent activity, but Artemisia annua showed particularly effective activity when glycerol was used as a nutritional compound.

Keywords: *Mycobacterium, Tuberculosis, Artemisia Annua, Artemisia Afra, Artemisnin,*

P-02/F/046 POSTER · OFFLINE

TRF2 as an Emerging Therapeutic Target for Functional Neuroregeneration

Pranav Kapur*, Pankaj Kumar Maurya
Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India
Email: 2439460@isfcp.org

Introduction: Functional neuroregeneration requires coordinated regulation of neural stem-cell activity, neuronal differentiation, neuronal survival, axonal growth, and restoration of neural connectivity. Telomere dysfunction, DNA damage, oxidative stress, and cellular senescence can compromise the regenerative capacity of neural cells. Telomeric repeat-binding factor 2 (TRF2), a core component of the shelterin complex, is classically recognized for protecting telomeres from DNA damage and maintaining genomic stability. Increasing evidence, however, indicates that TRF2 also possesses important non-telomeric functions in neural stem-cell maintenance, neuronal differentiation, gene regulation, cellular survival, and neural repair. These emerging functions position TRF2 as a potential molecular link between telomere biology and neuroregenerative processes.

Aim and Objective: This poster aims to evaluate the emerging therapeutic potential of TRF2 in functional neuroregeneration. The objectives are to examine the role of TRF2 in telomere protection and genomic stability; elucidate its involvement in neural stem-cell maintenance and neuronal differentiation; explore its potential contribution to neuronal survival and axonal repair; and identify molecular pathways through which TRF2 modulation may facilitate structural and functional neural recovery.

Methodology: A comprehensive literature-based review was conducted using peer-reviewed studies addressing TRF2, telomere biology, neural stem cells, neural progenitor cells, neurogenesis, neuronal differentiation, neuronal survival, axonal regeneration, DNA damage, cellular senescence, and neural repair. Evidence from cellular, molecular, animal, and translational studies was critically integrated to establish mechanistic relationships between TRF2-mediated telomeric and non-telomeric functions and neuroregenerative outcomes.

Conclusion: TRF2 represents an emerging molecular regulator at the intersection of telomere biology and neural regeneration. Through telomere protection and non-telomeric regulation of neural cellular processes, TRF2 may support neural stem-cell maintenance, neuronal differentiation, survival, and axonal repair. However, direct evidence demonstrating that therapeutic TRF2 modulation produces functional neuroregeneration remains limited. Future studies should establish the cell-specific, isoform-specific, and context-dependent functions of TRF2 and determine whether targeted modulation can safely promote axonal regeneration, neural connectivity, and functional recovery in neurological disorders.

Keywords: *TRF2 (Telomeric Repeat-Binding Factor 2), Neuroregeneration, Neural Stem Cells, Axonal Repair, Telomere Protection*

P-02/F/047 POSTER · OFFLINE

Study over Malaria vectors, its spread ability, cure & treatment profile of Malaria in India

Savita Ahirwar*, Vijay Nigam, Bhan Singh Yadav

Department of Pharmacology, Daksh Institute of Pharmaceutical Sciences, Chhatarpur, Madhya Pradesh-471001, India
Email: savitaahirwar1307@gmail.com

Malaria control strategies need to respond to geographical hotspots of transmission. Detection of hotspots depends on the sensitivity of the diagnostic tool used. We conducted cross-sectional surveys in 3 sites within Kilifi County, Kenya, that had variable transmission intensities. Rapid diagnostic test (RDT), microscopy, and polymerase chain reaction (PCR) were used to detect asymptomatic parasitemia, and hotspots were detected using the spatial scan statistic. Eight thousand five hundred eighty-one study participants were surveyed in 3 sites. There were statistically significant malaria hotspots by RDT, microscopy, and PCR for all sites except by microscopy in 1 low transmission site. Pooled data analysis of hotspots by PCR overlapped with hotspots by microscopy at a moderate setting but not at 2 lower transmission settings. However, variations in degree of overlap were noted when data were analyzed by year. Hotspots by RDT were predictive of PCR/microscopy at the moderate setting, but not at the 2 low transmission settings. We observed long-term stability of hotspots by PCR and microscopy but not RDT. Malaria control programs may consider PCR testing to guide asymptomatic malaria hotspot detection once the prevalence of infection falls.

Keywords: *RDT, PCR, Malaria, parasitemia, microscopy.*

P-02/F/048 POSTER · OFFLINE

ADVERSE DRUG REACTIONS AND PHARMACOVIGILANCE

Golu Kumar*, Supriya Das

ISF College of Pharmacy, Moga, Punjab
Email: 2315725@isfcp.org

Background: Adverse drug reactions (ADRs) are unwanted and harmful responses to medicines occurring at normal doses used for the prevention, diagnosis, or treatment of diseases. ADRs are an important public health concern because they can increase morbidity, mortality, treatment costs, and hospital admissions. Pharmacovigilance is the science and activities concerned with the detection, assessment, understanding, and prevention of adverse effects or other drug-related problems.

Objective: The present abstract aims to highlight the importance of ADR monitoring and pharmacovigilance in ensuring the safety and rational use of medicines.

Methods: Pharmacovigilance involves systematic collection and evaluation of safety information through spontaneous ADR reporting, patient and healthcare-professional reports, clinical studies, medical records, and other surveillance systems. Healthcare professionals, including pharmacists, physicians, and nurses, play an important role in identifying, documenting, assessing, and reporting suspected ADRs. Proper reporting helps in detecting new safety signals and evaluating the risk–benefit profile of medicines.

Results: Effective pharmacovigilance can help identify previously unknown or rare ADRs, reduce preventable medication-related harm, and support appropriate regulatory actions. Increased awareness among healthcare professionals and patients can improve ADR reporting rates. Pharmacists can contribute significantly through patient counselling, medication review, monitoring, and education regarding possible adverse effects.

Conclusion: ADR monitoring is an essential component of safe and effective healthcare. A strong pharmacovigilance system promotes early detection of drug-related risks and supports safer medicine use. Improving awareness, encouraging spontaneous reporting, and strengthening collaboration among healthcare professionals can significantly enhance patient safety and the overall quality of healthcare.

Keywords: *Adverse Drug Reactions, Pharmacovigilance, Drug Safety, ADR Reporting, Patient Safety.*

P-02/F/049 POSTER · OFFLINE

Pharmacological Evaluation of Tributyrin and Vitamin- D in the Management of Glucocorticoid induced Osteoporosis in Rats

Parth Sharma*, Samrat Chauhan

Adesh College of Pharmacy, Adesh Medical College & Hospital, Kurukshetra, Haryana
Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab
Email: parthsharma6843@gmail.com

Osteoporosis is oftenly acknowledged as the bone predisposing disorder which involves the persistent breakdown of bone tissue and led to negative bone balance. It eventuates due to the poor function of osteoblasts (bone forming cells) and hyperactivity of osteoclasts (bone resorbing cells) that directly contributes to the impairment in process of bone remodeling and sudden bone fractures. The mechanisms laid behind the eventuality of osteoporosis are decreased blood serum calcium and phosphate levels, chronic intake of steroidal drugs and other medications, altered vitamin D levels and many more underlying pathological causes. It is a serious chronic and initially clinically asymptomatic complication which requires the treatment by utilization of the multiple medications for prolonged duration, approximately about 2 to 3 years. The investigation encompasses the rat model for 28 days in which disease has been induced by the chronic and consecutive exposure of glucocorticoid (dexamethasone) for 28 days. The treatment is designed to be administered for the last 14 days in complete 28 days of protocol as the preventive therapy by using tributyrin and vitamin D in the specific dose combinations. The activity of vitamin D and tributyrin stimulates the calcium ion transporters and absorption of phosphate molecules respectively that contributes to improved bone health. Additionally, it is also aimed to elevate the rate of Ca^{+2} influx and makes the calcium more available in the systemic circulation by targeting specifying catalysts like HDAC and ultimately, will be up taken by the cells and causes bone cell differentiation due to catalytic potential of vitamin D which also enhances rate of bone remodeling process. Thereby, study primarily aims to unravel the submaximal effective therapeutic dose with the short treatment regimen and potential synergistic effects in the management of osteoporosis. Conclusively, the study is designed to bring forth the effective bone restorative potential by employing the above-mentioned treatment approach in order to diminish the ill effects of the exacerbating bone disorder.

Keywords: *Osteoporosis, Dexamethasone, Tributyrin, Vitamin D, Bone Remodelling, Calcium Homeostasis, Histone Deacetylase (HDAC), Synergistic Therapy, Bone Regeneration, Glucocorticoid-Induced Osteoporosis.*

P-02/F/050 POSTER · OFFLINE

Cyclodextrin-Based Strategies for siRNA Delivery: From Molecular Design to Therapeutic Gene Silencing

Kamalpreet Singh*, Sukhwinder Singh, Parminder Gangar, Anmolpreet Singh, Pooja A. Chawla

University Institute of Pharmaceutical Sciences and Research, Sadiq Road, Society Nagar, FaridkotPunjab-151203, India
Email: sandhukamal0977@gmail.com

Compared to other delivery systems, cyclodextrins (CDs) have an added advantage of having no or low toxicity. Cyclodextrin-based delivery systems have the added advantage of offering nucleic acid delivery without the need for transfection agents. Natural CDs lack the tendency to bind to nucleic acids; therefore, modifications need to be made to the CD structures. The last couple of years have seen intense research in amphiphilic monomers, CD-based polymers, hybrid dendrimers, covalent CD systems, and host-guest systems, especially the β-CD-adamantane systems.

In order to improve the transfection efficiency, several strategies have been employed including charge modification and inclusion of active transport systems. Among charge modifications, primary amines are preferred over quaternary ammonium groups, since the former can be protonated and, therefore, facilitate escape from endosomes. A major advantage of the host-guest systems is the ease of modification. This allows the simple incorporation of targeting groups or stealth polyethylene glycol (PEG) groups.

First-in-man (Phase-I) clinical trial of CALAA-01 demonstrated good safety and tolerability when used for the treatment of solid tumors. Cancer therapies targeting VEGF and Bcl-2 are also at an advanced stage of development. Brain delivery of CD-based siRNA has been achieved to suppress the expression of mutated huntingtin protein in Huntington's disease.

Cyclodextrin-based delivery systems are at a relatively earlier stage of development compared to other siRNA delivery systems. Off-target effects and endosomal entrapment of the delivery systems remain challenging areas for further development.

Keywords: *β-Cyclodextrins, siRNA delivery, endosomal escape, host-guest interactions.*

P-02/F/051 POSTER · OFFLINE

Aromatic l-amino acid decarboxylase and Glial-derived neurotrophic factor therapy: Potential therapeutic approach for Parkinson's disease

Gurmandeep Singh*, Lav Goyal, Shamsher Singh
ISF College of Pharmacy, Moga, (142001), Punjab, India
Email: gurmansingh02340@gmail.com

Introduction- Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized predominantly by the degeneration of nigrostriatal dopaminergic neurons, resulting in motor dysfunction and other neurological manifestations. Despite advances in symptomatic management, conventional therapies, do not adequately prevent disease progression and may produce complications with long-term use. Gene therapy (GT) has therefore emerged as a promising strategy for targeted and potentially sustained treatment of PD.

Aim and objectives- This review evaluates the therapeutic potential of gene-based approaches involving aromatic L-amino acid decarboxylase (AADC) and glial cell line-derived neurotrophic factor (GDNF) for restoring dopaminergic function and protecting vulnerable neuronal populations in PD.

Methods- Relevant preclinical and clinical evidence concerning AADC- and GDNF-based GT was reviewed, with emphasis on targeted gene delivery, modulation of dopaminergic neurotransmission, neurotrophic signaling, and delivery approaches targeting the striatum and putamen.

Results and discussion- AADC-based GT may enhance the conversion of exogenously administered levodopa to dopamine within the striatum, potentially improving dopaminergic neurotransmission and reducing dependence on frequent systemic medication. Other gene-based approaches targeting enzymes involved in dopamine synthesis, including tyrosine hydroxylase, may further enhance therapeutic efficacy. Targeted delivery to the putamen using viral vectors, encapsulated cell systems, and other delivery platforms has demonstrated promising neuroprotective and functional effects in experimental and clinical studies.

Conclusion- AADC and GDNF GT represent promising complementary approaches for PD, combining restoration of dopamine synthesis with neuroprotection. Further optimization of vector design, targeted delivery, dosing, and long-term safety is required to establish their clinical utility.

Keywords: *Parkinson's disease, Glial derived neurotrophic factor, Aromatic L-amino acid decarboxylase, Gene Therapy, tyrosine hydroxylase.*

P-02/F/052 POSTER · OFFLINE

Stereoselective Pharmacology: The Role of Molecular Handedness in Drug Action

Manjot Kaur*, Dilpreet Kaur, Sandeep Goyal
University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridkot-151203, Punjab, India
Email: manjotkaur5800@gmail.com

Stereoselective pharmacology is an important area of drug research that focuses on how the three-dimensional arrangement of atoms in a drug can influence its biological activity. Some drugs contain chiral centres and exist as two mirror-image forms called enantiomers. Although these enantiomers have the same chemical formula, they may interact differently with receptors, enzymes and transporters because biological targets are also three-dimensional and often chiral. As a result, one enantiomer may produce a stronger therapeutic effect, while the other may show lower activity or different pharmacological effects. Stereoselectivity can influence drug absorption, distribution, metabolism, excretion, efficacy and toxicity. Ibuprofen is an important example, where the S-enantiomer shows greater cyclooxygenase inhibitory activity. Other drugs, including warfarin and salbutamol, also demonstrate clinically relevant stereoselective behaviour. Understanding molecular handedness helps scientists select and design appropriate stereoisomers to improve therapeutic activity and reduce unwanted effects. With advances in medicinal chemistry, molecular modelling and drug development, stereochemistry has become an important consideration in the development of safer and more effective medicines. Thus, stereoselective pharmacology provides an important link between organic chemistry, medicinal chemistry and pharmacology and highlights how small differences in molecular shape can produce significant differences in drug action.

Keywords: *Stereoselective pharmacology; Chirality; Enantiomers; Molecular handedness; Drug-receptor interaction; Stereoisomers*

P-02/F/053 POSTER · OFFLINE

From Toxins to Therapeutics: Venom Pharmacology

Dilpreet Kaur*, Manjot Kaur, Sandeep Goyal

University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridkot-151203, Punjab, India
Email: dk7723758@gmail.com

Venom pharmacology is an emerging area of drug discovery that focuses on biologically active compounds present in animal venoms. Venoms contain peptides, proteins and enzymes that can act on specific targets in the human body. Although these substances are mainly known for their toxic effects, research has shown that some venom components can be developed into useful therapeutic agents. Venom-derived compounds have shown potential in pain management and cardiovascular medicine by affecting ion channels, enzymes, receptors and blood-clotting pathways. Ziconotide, a synthetic peptide based on a compound originally identified from cone-snail venom, is used for severe chronic pain and acts by blocking N-type calcium channels. In cardiovascular medicine, captopril was developed from research on peptides found in Bothrops jararaca venom and acts by inhibiting angiotensin-converting enzyme. Snake-venom research has also contributed to the development of antiplatelet drugs such as tirofiban and eptifibatide, which target platelet aggregation. These examples demonstrate how venom components can provide useful molecular leads for modern drug development. With advances in venom analysis, peptide engineering and drug-discovery techniques, more venom-derived compounds are being explored for therapeutic applications. Thus, venom pharmacology provides an interesting link between toxicology, pharmacology and modern medicine and may contribute to the development of targeted therapies for pain and cardiovascular disorders.

Keywords: *Venom pharmacology; Venom-derived drugs; Ziconotide; Captopril; Pain management; Cardiovascular medicine*

P-02/F/054 POSTER · OFFLINE

Molecular Glues: Turning the Undruggable into Druggable

Arshpreet Kaur*, Ms. Jasleen Kaur

Bachelor of Pharmacy, ISF College of Pharmacy and Research, Moga, Punjab, India
Email: arshh1412@gmail.com

Drugging the undruggable represents an emerging paradigm in drug discovery aimed at targeting previously inaccessible biological targets. Molecular glues are a novel class of small molecules that modulate protein–protein interactions to induce selective protein degradation, stabilization, or activation. By expanding the range of therapeutically addressable proteins, MGs are opening new avenues for treating cancer, neurodegenerative disorders, and other diseases. Molecular glues combine the favourable pharmacokinetic properties of small-molecule drugs with the target specificity of biologics. As targeted protein degraders, they recruit an E3 ubiquitin ligase to a target protein, forming a ternary complex that promotes ubiquitination and subsequent proteasomal degradation. The discovery of thalidomide as a molecular glue marked a major shift in drug discovery. Thalidomide recruits the transcription factors IKZF1 and IKZF3 to the CRL4^CRBN E3 ubiquitin ligase complex, leading to their ubiquitination and degradation. This discovery paved the way for the development of diverse molecular glues with distinct structures and mechanisms. From serendipitous discoveries to rational design, molecular glues have evolved into a promising therapeutic modality with the potential to overcome traditional limitations of drug discovery. Their ability to modulate previously undruggable proteins positions them as powerful tools for next-generation therapeutics across oncology, immunotherapy, neurodegeneration, and beyond.

Keywords: *Molecular glues, undruggable proteins, targeted degradation, next-generation therapeutics.*

P-02/F/055 POSTER · OFFLINE

Traumatic Brain Injury and Neurological Dysfunction: Interplay of neuroinflammation, Excitotoxicity, Nrf2 Signaling, and Nitric Oxide

Arshdeep Singh*, Lav Goyal, Shamsher Singh
ISF College of Pharmacy, Moga, (142001), Punjab, India
Email: arshdeepsingh3439@gmail.com

Introduction: Traumatic brain injury (TBI) is a major neurological disorder resulting from external mechanical forces and is an important cause of mortality and long-term disability. Beyond the immediate structural damage, secondary pathological processes contribute substantially to neurological and behavioral consequences.

Aim and objectives: This review summarizes the major mechanisms underlying neurological manifestations following TBI, with particular emphasis on behavioral dysfunction, neuroinflammation, excitotoxicity, Nrf2 signaling, and nitric oxide.

Methods: Relevant evidence was reviewed to examine the relationship between primary injury and secondary molecular events, including inflammatory signaling, glutamate-mediated excitotoxicity, oxidative stress, and altered NO production, and their contribution to neurological impairment.

Results and discussion: TBI-associated behavioral abnormalities include cognitive impairment, emotional instability, anxiety, depression, and post-traumatic stress symptoms. Secondary injury activates inflammatory pathways and increases the release of pro-inflammatory cytokines, including IL-1β, IL-6, and TNF-α, thereby aggravating neuronal damage. Excessive glutamate release stimulates NMDA receptors, resulting in calcium influx, mitochondrial dysfunction, calpain activation, cytoskeletal degradation, and further oxidative injury. Nrf2 represents an important endogenous antioxidant defense pathway; its activation promotes the expression of antioxidant and cytoprotective enzymes and may limit oxidative damage following TBI. In parallel, glutamate-induced calcium influx can activate neuronal nitric oxide synthase, increasing NO production. Excessive NO, particularly in the presence of reactive oxygen species, may contribute to nitrosative stress, mitochondrial dysfunction, and neuronal injury.

Conclusion: The neurological manifestations of TBI arise from interconnected inflammatory, excitotoxic, oxidative, and nitrosative mechanisms. Targeting Nrf2 signaling, neuroinflammation, excitotoxicity, and NO-associated pathways may provide promising opportunities for limiting secondary brain injury and improving neurological outcomes.

Keywords: *Traumatic brain injury; neuroinflammation; excitotoxicity; Nrf2; nitric oxide; oxid; behavioral dysfunction.*

P-02/F/056 POSTER · OFFLINE

Latest Treatment Profile and Various Modes of Treatment Available in Traditionals and Modern Systems of Medicines Used for Treating Acne and Skin Inflammations

Rishita Diwedi, Dr. Vijay Nigam, Dr. Vivek Asati
Daksh Institute of Pharmaceutical Science, Chhatarpur (M.P.)
Email: dwivediakansha299@gmail.com

Acne vulgaris and associated skin inflammations represent complex, multifactorial dermatological conditions that affect a significant portion of the global population, often leading to profound psychological and physical impacts. Historically, management strategies relied heavily on broad-spectrum antibiotics and aggressive topical agents, which frequently resulted in antimicrobial resistance and compromised epidermal barriers. This comprehensive review aims to evaluate and synthesize the latest therapeutic profiles across both modern pharmacological and traditional systems of medicine. Through a systematic analysis of current literature—encompassing recent clinical trials, pharmacological reviews, and dermatological case studies—key advancements in allopathic treatments are highlighted. These include the emergence of highly specific molecular targets such as fourth-generation retinoids (trifarotene), localized topical antiandrogens (clascoterone), and narrow-spectrum, microbiome-sparing oral antibiotics (sarecycline). Concurrently, the review explores the enduring relevance of traditional and holistic medicine, emphasizing the efficacy of botanical phyto-therapeutics like azelaic acid and tea tree oil, alongside dietary interventions that target the gut-skin axis to mitigate systemic inflammation. The integration of these paradigms underscores a critical transition in dermatological care from aggressive eradication to physiological regulation and microbiome preservation. Ultimately, the synthesis of modern precision pharmacotherapy with the systemic, lifestyle-oriented approaches of traditional medicine offers a superior framework for efficacy and patient tolerability. Looking forward, the future of acne management lies in personalized, post-antibiotic regimens that leverage advanced nano-delivery systems and microbiome-modulating therapies, such as topical probiotics and engineered bacteriophages, to achieve sustainable skin health and long-term remission.

Keywords: *Acne, antibiotics, treatment, inflammation, medicine, topical, synthesis, advancement, broad-spectrum, epidermal, population, probiotics, dermatological, delivery system, antimicrobial*

P-02/F/057 POSTER · OFFLINE

Neurotoxicity Mechanism of Microplastics: Possible Mechanistic Approach and Management

Anshika Rawat[1]*, Dr. Shamsher Singh Bajwa[1]

Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab
Email: Anshikarawat1112@gmail.com

Microplastics (MPs) and nanoplastics (NPs) are environmental contaminants that are becoming increasingly worrisome because of their possible impact on human brain health. Because of their small size and capacity to cross biological barriers, these particles can get into the central nervous system via the blood–brain barrier and by means of the olfactory pathways. After neurons have been exposed to them, MPs and NPs can cause neurotoxicity via a number of interconnected mechanisms, such as oxidative stress, mitochondrial dysfunction, neuroinflammation, disruption of neurotransmitter homeostasis, impairment of the blood–brain barrier, dysregulation of autophagy, and neuronal apoptosis. Such changes could in turn influence synaptic function, neuroplasticity, cognition and behaviour and might play a role in the pathways linked to neurodegenerative diseases such as Alzheimer's and Parkinson's disease. Possible molecular targets involve the cholinergic, dopaminergic and GPCR-related signalling pathways, as well as proteins that are involved in oxidative and inflammatory responses. The most perfect management should be to reduce exposure and environmental contamination, while antioxidant, anti-inflammatory, mitochondrial-protective and gut–brain axis approaches are still promising areas for investigation.Further human and longitudinal studies are required to establish actual exposure–risk relationships and develop evidence-based therapeutic interventions.

Keywords: *Microplastics; Nanoplastics; Neurotoxicity; Oxidative stress; Neuroinflammation; Blood–brain barrier; Neurodegeneration; Mitochondrial dysfunction.*

O-02/N/001 ORAL · ONLINE

Advances in the Phytochemistry and Pharmacological Activities of Nelumbo nucifera: A Narrative Review

Navneet Kaur*

Department of Pharmacognosy, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela-140111, Punjab, India
Email: nav99377@gmail.com

Nelumbo nucifera Gaertn. (lotus) is a well-known medicinal plant that has been extensively utilized in traditional systems of medicine throughout Asia. While the leaves, rhizomes, seeds, and flowers have been widely investigated for their therapeutic applications, the lotus stamen remains a comparatively underexplored floral component despite its rich phytochemical profile and promising pharmacological potential. The stamen contains diverse bioactive constituents, including flavonoids (kaempferol, quercetin, and their glycosides), alkaloids, phenolic acids, tannins, and polysaccharides, which contribute to its broad spectrum of biological activities. Emerging evidence suggests that lotus stamen exhibits potent antioxidant, anti-inflammatory, antidiabetic, hepatoprotective, cardioprotective, antimicrobial, anti-obesity, and reproductive health-promoting properties. These pharmacological effects are primarily mediated through free radical scavenging, modulation of inflammatory signalling pathways, improvement of glucose and lipid metabolism, and regulation of oxidative stress.

Despite these promising findings, the pharmacological potential of lotus stamen has not been comprehensively reviewed, and significant knowledge gaps remain regarding its molecular mechanisms, standardization, pharmacokinetics, safety profile, and clinical efficacy. This review critically summarizes the available literature on the phytochemistry, traditional uses, pharmacological activities, and underlying mechanisms of lotus stamen, while highlighting current research limitations and future perspectives. The review emphasizes the need for advanced preclinical investigations, molecular studies, standardized extract development, and well-designed clinical trials to establish lotus stamen as a scientifically validated source of bioactive compounds for the prevention and management of chronic diseases. By consolidating existing evidence, this review aims to provide a valuable foundation for future pharmaceutical research and the development of lotus stamen-based therapeutic and nutraceutical products.

Keywords: *Nelumbo nucifera; lotus stamen; phytochemistry; flavonoids; antioxidant; anti-inflammatory; antidiabetic; hepatoprotective; cardioprotective; nutraceuticals; medicinal plants.*

O-02/N/002 ORAL · ONLINE

Molecular Docking and Molecular Dynamics Simulations Reveal Stable Binding of AKBA to Diabetic Cataract

Jyoti Kumari*

Department of Pharmaceutical Sciences, Jharkhand Rai University, Namkum, Ranchi, Jharkhand.
Email: jyotibitmesra@gmail.com

Background: The study evaluates the anticataract potential of 3-O-acetyl-11-keto-β-boswellic acid (AKBA) in a glucose-induced cataractogenesis model using isolated goat lenses. Cataracts, a leading cause of vision impairment, are exacerbated by diabetes through aldose reductase (AR)-mediated polyol pathway disruptions and oxidative stress. Molecular docking studies revealed AKBA's superior binding affinity (binding energy < -7.0 kcal/mol) to human aldose reductase (HAR), forming stable hydrogen bonds and hydrophobic interactions with active site residues. Molecular dynamics simulations confirmed the stability and specificity of AKBA-HAR complexes, showcasing its potential as a potent AR inhibitor.

Results: AKBA demonstrated favourable binding affinities toward multiple diabetic cataract-associated proteins, forming stable hydrogen bonds and hydrophobic interactions within their active sites. MD simulations confirmed that the AKBA–protein complexes remained structurally stable throughout the simulation period, exhibiting low RMSD fluctuations, compact protein conformations, consistent hydrogen-bond interactions, and favourable binding free energies. These findings indicate that AKBA maintains persistent interactions with proteins involved in oxidative stress, inflammation, and metabolic dysregulation, suggesting its potential to modulate pathways associated with diabetic cataract development.

Conclusion: The findings suggest that AKBA exhibits significant AR activity. The promise of AKBA as an anti-cataract drug, particularly in diabetic situations, is supported by its strong and stable binding to the target protein, validated by computational evidence.

Keywords: *AKBA, Aldose reductase inhibition, Molecular docking, Diabetic cataract, Binding affinity*

O-02/N/003 ORAL · ONLINE

Decoding the Gut-Heart Axis Through Network Pharmacology: Emerging Perspectives in Cardiovascular Drug Discovery

Vishal Chanalia[1]*, Rahul Kumar Sharma[2], Ashwani K. Dhingra[3]

[1]I.K Gujral Punjab Technical University, Kapurthala, Jalandhar, 144603, Punjab, India.
[2]Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial, College of Pharmacy, Bela, 140111, Punjab, India
[3]Global Research Institute of Pharmacy, Radaur, Yamuna Nagar, 135133, Haryana, India
Email: vchanalia7@gmail.com

Cardiovascular diseases (CVDs) remain the major cause of morbidity and mortality worldwide, despite tremendous advances in diagnosis and management. Recent discoveries highlight the importance of the gut-heart axis as a fundamental modulator of cardiovascular health. Dysbiosis-induced changes in microbial metabolites such as trimethylamine N-oxide (TMAO), short-chain fatty acids (SCFAs), bile acids and lipopolysaccharides contribute to endothelial dysfunction, chronic inflammation, oxidative stress, cardiac remodelling, hypertension and atherosclerosis. However, the detailed molecular interconnections of these processes have to be investigated. Network pharmacology is a strong systems biology paradigm that incorporates multi-omics data, molecular interaction networks and computational analysis to explain the complex link between bioactive substances, biological targets, signalling pathways and disease phenotypes. This presentation highlights the expanding role of network pharmacology in understanding the molecular mechanisms underlying the connection between gut microbiota and cardiovascular diseases. It highlights the combination of investigation of microbiome-derived metabolites, protein-protein interaction network, pathway enrichment, molecular docking and molecular dynamics simulation for the identification of important therapeutic targets and signalling pathways related to cardiovascular disease. The presentation will also explore how the integration of network pharmacology, multi-omics technologies, and artificial intelligence can accelerate the discovery of precision therapeutics for the gut-heart axis. The findings reported in this study are expected to stimulate future translational research and will enable the development of new therapeutic options for the prevention and management of CVD.

Keywords: *Gut-Heart Axis; Network Pharmacology; Cardiovascular disease; Gut microbiota; Drug Discovery; Precision Medicine*

O-02/N/004 ORAL · ONLINE

PRAK-20 as a Potential Neuroprotective Agent in Alzheimer's Disease: An Integrated Perspective on Oxidative Stress, Neuroinflammation, Network Pharmacology, and Experimental Evidence

Priyanka Chandolia*, Mohit Agrawal

Department of Pharmacology, School of Medical & Allied Sciences, K.R. Mangalam University, Gurugram, Haryana
Email: priyankachandolia42@gmail.com

Aim & Objectives: To elucidate the neuroprotective mechanism of PRAK-20 against aluminium chloride ($AlCl_3$)-induced Alzheimer's disease (AD) in rats by using network pharmacology and experimental validation, focusing on oxidative stress, neuroinflammation.

Methods: Potential targets of PRAK-20 and AD-associated targets will be identified through network pharmacology and Protein–protein interaction. An $AlCl_3$-induced AD rat model will be used for validation. Cognitive function will be assessed by using behavioral tests. Oxidative stress, inflammatory mediators will be evaluated using biochemical and histopathological methods.

Results: Network pharmacology is expected to identify key targets and pathways associated with oxidative stress, neuroinflammation, mitochondrial dysfunction, and neuronal survival. PRAK-20 is anticipated to improve cognitive performance, restore antioxidant defenses, suppress inflammatory responses, improve mitochondrial function, and attenuate AD-associated pathological alterations.

Summary: The integrated computational and experimental approach will provide a comprehensive understanding of the multitarget effects of PRAK-20 and identify molecular pathways underlying its neuroprotective activity.

Conclusion: PRAK-20 may exert neuroprotective effects by simultaneously modulating oxidative stress, neuroinflammation, mitochondrial dysfunction, and AD-related molecular abnormalities. The study may provide a scientific basis for further preclinical development of PRAK-20 as a potential therapeutic candidate for AD.

Keywords: *Alzheimer's disease; PRAK-20; Aluminum chloride; Network pharmacology; Oxidative stress; Neuroinflammation.*

O-02/N/005 ORAL · ONLINE

Neuroprotective Effects of Indole-3-Carbinol against Scopolamine-Induced Cognitive and Memory Impairment in Rats: Modulation of Oxidative Stress, Inflammatory and Cholinergic Pathways

Vinjavarapu.L.Anusha*

Department of Pharmacology, SIMS College Of Pharmacy, Mangaldas Nagar, Guntur- 522001, Andhra Pradesh, India
Email: anushapharmacy90@gmail.com

Indole-3-carbinol (I3C), a bioactive compound from cruciferous vegetables, exhibits neuroprotective properties through modulation of oxidative stress, inflammation, and cholinergic pathways. This study evaluated its effect against scopolamine-induced cognitive impairment in male Wistar rats divided into six groups: Control, Scopolamine (1 mg/kg), I3C (25, 50, 100 mg/kg), and Donepezil (5 mg/kg). Cognitive function was assessed using Y-maze and Novel Object Recognition tests. Biochemical analyses included acetylcholinesterase (AChE), oxidative stress markers (MDA, SOD, CAT), and ELISA-based evaluation of NRF2, HO-1, inflammatory cytokines (NF-κB, TNF-α, IL-6, IL-1β), and apoptotic markers (Cytochrome C, caspase-9). Histopathological changes were examined using H&E and Nissl staining. Results showed that I3C significantly improved memory performance, reduced AChE activity, enhanced antioxidant defences (NRF2, HO-1), and decreased oxidative stress, inflammation, and apoptosis. Overall, I3C demonstrates significant neuroprotective potential and may serve as a promising therapeutic agent for cognitive impairment.

Keywords: *Indole 3-carbinol, Scopolamine, Memory deficits, Acetylcholinesterase, Oxidative stress, and Neuroinflammation*

O-02/N/006 ORAL · ONLINE

Phytoconstituents Derived Bioactive Compounds is used in the treatment of Parkinson's Disease

Anita Devi Chauhan*

Ph.D Scholar, Department of Pharmacology, Madhyanchal Professional University, Bhopal-462044, Madhya Pradesh, India
Email: gudiyachauhan0606@gmail.com

Parkinson's disease (PD) is a progressive neurodegenerative brain disorder that primarily impacts the central and peripheral nervous systems, leading to a gradual loss of muscle control and movement. It occurs when vital nerve cells in a region of the brain called the substantia nigra slowly degenerate and lose the ability to produce dopamine, a crucial chemical messenger responsible for coordinating smooth, purposeful muscle movements. The hallmark of Parkinson's is the death of dopamine-producing neurons. Without dopamine, the brain cannot properly transmit signals to the muscles, causing classic movement impairments. Extracted from Mucuna pruriens (Velvet Bean) it directly crosses the blood-brain barrier to convert into dopamine, alleviating bradykinesia and rigidity. While natural L-DOPA is highly effective for motor symptoms, raw plant extracts face limitations such as low bioavailability and difficulty crossing the blood-brain barrier effectively. To solve this, advanced formulations using Nano phytomedicines are being developed to safely package and deliver these plant molecules directly into the central nervous system. While the exact trigger remains unknown, the scientific community agrees that the disease is a combination of genetic risk factors, environmental exposures (such as toxins), and protein misfolding—specifically the aggregation of α-synuclein.

Keywords: *Parkinson disease, Dopamine-producing neurons, Nano phytomedicine.*

O-02/N/007 ORAL · ONLINE

Mechanistic Links Between Epilepsy and Its Comorbidities: Therapeutic Implications and Clinical Perspectives

Anika*

Department of Pharmacology, Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab 140401, India
Email: sekhriabhi2@gmail.com

Epilepsy is characterized by recurrent seizures. About 50 million people worldwide suffer with epilepsy India 10-12 million people affected by epilepsy. In low and middle countries approximately 80% of people suffer from epilepsy. Epilepsy coexists with neuronal and psychiatric disorders like Depression, Parkinson disease, Alzheimer disease, Anxiety, Migraine, Schizophrenia and Multiple sclerosis. When two disorders or illness occur in the same individual along with primary disease describe as comorbid. Comorbid condition can interact with another disease, worsen illness and make it more complicated to treat. These coexisting conditions significantly contribute to disease burden, reduced quality of life, increased healthcare utilization, and poor clinical outcomes. The relationship between epilepsy and its comorbidities is multifactorial and may involve shared genetic susceptibility, neuroinflammation, oxidative stress, mitochondrial dysfunction, neurotransmitter imbalance, altered calcium homeostasis, and progressive neuronal network dysfunction. In addition, recurrent seizures and long-term exposure to antiseizure medications may contribute to the development or progression of certain comorbidities, further complicating clinical management. Early identification and comprehensive management of these associated conditions are therefore essential for improving overall patient outcomes. This review highlights key comorbidities of epilepsy, their shared mechanisms, clinical implications, and therapeutic challenges, emphasizing early diagnosis, personalized care, and integrated treatment strategies to improve seizure control and overall quality of life.

Keywords: *Epilepsy; Comorbidities; Neuroinflammation; Cognitive impairment; Psychiatric disorders.*

O-02/N/008 ORAL · ONLINE

Effect of Citral on Serotonergic Transmission in the Chronic Ethanol-Induced Despair-Like Behaviour

Neelam Yadav*, Lokesh Verma

Sage Institute of Research & Technology-Pharmacy, Sanjeev Agrwal Global Educational University, Bhopal-462022, Madhya Pradesh, India
Email: neelamyadav025@gmail.com

Background: Chronic ethanol administration is known to modulate plasma and cerebral levels of serotonin a concentration sufficient to potentiate central serotonergic receptors and its functional responses. On the other hand, involvement of serotonergic transmission in the neurological effect of citral.

Objective: Therefore, the present study investigated the relationship between central serotonergic transmission and citral in the chronic ethanol induced depression in mice.

Method: The separate groups of mice were treated with vehicle or ethanol (0.5-2 g/kg, i.p.) or citral (1-15 mg/kg, i.p.) or serotonin (5-HT1A) receptor antagonists. These animals after appropriate time were than challenged with vehicle or ethanol (1.5 g/kg, i.p.) and thirty min thereafter were subjected TST (Tail Suspension Test) to assess the despair related indices for 5 min.

Results: Chronic ethanol (0.5-2 g/kg, i.p. 8% w/v) treatment induces depression like effect by increasing the immobility time on TST. In addition, pre-treatment with citral (1-15 mg/kg, i.p.) significantly potentiated the effect of ethanol (1 g/kg, i.p.) on TST. On the other hand, pre-administration of the 5-HT_1A receptor antagonist, WAY-100635 maleate (1 g/kg, i.p.), significantly attenuated the ethanol (1.5 g/kg, i.p.)-induced increase in immobility time in mice, suggesting the involvement of 5-HT_1A receptor-mediated serotonergic transmission in ethanol-induced depression-like behaviour.

Conclusion: Therefore, it is hypothesized that increase in central serotonergic activity by ethanol might contribute to its antidepressant-like probably via stimulation of 5-HT1A. Therefore, the present study suggests a contributory role of serotoninergic transmission in the ethanol induce antidepressant effect. Thus, central serotonergic system might be a novel target for the control and management of the alcoholism.

Keywords: *Ethanol; Citral; Serotonergic transmission; Serotonin (5-HT); 5-HT1A receptor; Antidepressant effect.*

O-02/N/009 ORAL · ONLINE

Therapeutic Potential of Mangiferin and Berberin on Naphthalin Induced Cataract in Rat

Reetesh Malvi, Lokesh Verma

Sanjeev Agrawal Global Educational, University, Bhopal
Email: reeteshmalvi@gmail.com

Introduction: Cataract is a major cause of visual impairment and is characterized by progressive opacification of the ocular lens. Oxidative stress, lipid peroxidation, depletion of endogenous antioxidants, and structural damage to lens proteins are important contributors to cataract development. Naphthalene-induced cataract in rats is a suitable experimental model for evaluating potential anticataract agents. Mangiferin and berberine are naturally occurring bioactive compounds with well-documented antioxidant and anti-inflammatory properties.

Aim & Objectives: The present study aimed to investigate the therapeutic potential of mangiferin and berberine, individually and in combination, against naphthalene induced cataract in rats and to assess their effects on oxidative stress and antioxidant defense mechanisms.

Methods: Rats were divided into normal control, naphthalene-induced cataract, standard treatment, mangiferin-treated, berberine-treated, and combination-treatment groups. Cataract was induced by naphthalene administration. Lens opacity was assessed clinically, while biochemical parameters including malondialdehyde (MDA), reduced glutathione (GSH), superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx) were estimated. Histopathological examination was performed to evaluate lens architecture.

Results: Mangiferin and berberine treatment demonstrated a reduction in lens opacity and oxidative damage compared with the untreated cataract group. Treatment was associated with decreased MDA levels and restoration of GSH, SOD, CAT, and GPx activities. The combined treatment showed comparatively enhanced protective effects and improved lens morphology.

Summary: The findings indicate that mangiferin and berberine may counteract naphthaleneinduced oxidative injury and preserve lens integrity.

Conclusion: Mangiferin and berberine possess promising anticataract potential, with their combined administration showing enhanced protective activity.

Keywords: *Cataract, Mangiferin, Berberine, Naphthalene, Oxidative stress*

O-02/N/010 ORAL · ONLINE

Network Pharmacology and Quality by Design-Assisted Development of a Nano Formulation of Indigofera suffruticosa for Scalp Disorders

Deepali Pathak*[1], Anju Goyal
B.N. College of Pharmacy, Udaipur
Email: pathakdeepali9@gmail.com

Scalp disorders are multifactorial conditions characterized by oxidative stress, inflammation, microbial dysbiosis, and impaired follicular homeostasis, requiring therapeutic approaches that can modulate multiple molecular targets. Indigofera suffruticosa (Wild Indigo) is a medicinal plant rich in indigo, indirubin, flavonoids, alkaloids, terpenes, and tannins, with reported antioxidant, antimicrobial, antifungal, and anti-inflammatory activities. However, clinical translation of these phytoconstituents is often limited by poor aqueous solubility, instability, and low topical bioavailability. This study proposes an integrated network pharmacology–Quality by Design (QbD) strategy for the rational development of a cyclodextrin-based nanoformulation of I. suffruticosa for targeted scalp delivery. Phytoconstituents will be identified and screened using network pharmacology to establish compound–target–pathway relationships associated with inflammatory, oxidative, and microbial mechanisms involved in scalp disorders. Protein–protein interaction analysis, Gene Ontology, pathway enrichment, and molecular docking will be employed to prioritize bioactive marker compounds and therapeutic targets. Selected constituents will be incorporated into a cyclodextrin-based nanocarrier to improve solubility, physicochemical stability, skin retention, follicular targeting, and controlled release. A QbD framework will be applied through definition of the Quality Target Product Profile (QTPP), identification of Critical Quality Attributes (CQAs), Critical Material Attributes (CMAs), and Critical Process Parameters (CPPs), followed by Design of Experiments (DoE)-based optimization. The optimized formulation will undergo characterization for particle size, polydispersity index, zeta potential, encapsulation efficiency, drug loading, in vitro release, ex vivo skin permeation/deposition, and stability. Network pharmacology will guide marker selection and mechanistic understanding, while experimental studies will provide confirmatory validation of the optimized nanoformulation for scalp disorders.

Keywords: *Indigofera suffruticosa; Network Pharmacology; Quality by Design (QbD); Cyclodextrin Nanocarrier; Scalp Disorders; Follicular Targeting; Molecular Docking; Design of Experiments (DoE).*

O-02/N/011 ORAL · ONLINE

Development and Characterization of Rutin-Apigenin Co-Loaded Ethyl Cellulose Microsponges for Controlled Release

Kishori Sunil Jagtap*, Girish Kumar Vyas
School of Pharmaceutical Sciences, Career Point University, Kota 324005, Rajasthan, India
Email: kishorijagtapbmt@gmail.com

Rutin and Apigenin are natural flavonoids with promising antioxidant and anti-inflammatory properties but suffer from poor aqueous solubility and low oral bioavailability. The present study aimed to develop and optimize ethyl cellulose-based microsponges co-loaded with Rutin and Apigenin using the quasi-emulsion solvent diffusion method to achieve controlled drug release. Five batches (F1–F5) were prepared by varying polymer concentration, drug:polymer ratio, polyvinyl alcohol (PVA) concentration, and stirring speed. The optimized formulation (Batch F4: 1.5 g ethyl cellulose, 1:7.5 drug:polymer ratio, 1.0% w/v PVA, 1500 rpm) exhibited uniform spherical porous morphology with a mean particle size of 24.6 ± 1.9 µm (PDI 0.24), high entrapment efficiency (~85.5%), and complete amorphization of both drugs (confirmed by DSC and XRD). In vitro drug release studies showed a desirable biphasic profile with minimal initial burst (<15% in 2 h) followed by sustained release reaching ~85–87% at 12 h in simulated gastrointestinal fluids (pH 1.2 for 2 h followed by pH 6.8). The release kinetics best fitted the Higuchi and Korsmeyer-Peppas models ($R^2 \geq 0.987$, n = 0.68), indicating anomalous (non-Fickian) transport. Fourier Transform Infrared Spectroscopy (FTIR) confirmed no drug-polymer incompatibility. The formulation remained stable under accelerated ICH conditions (40 ± 2°C / 75 ± 5% RH for 6 months) with negligible changes in drug content, particle size, or release profile. These results demonstrate that the optimized Rutin-Apigenin microsponge formulation successfully overcomes the biopharmaceutical limitations of the flavonoids and provides a promising controlled-release platform for further therapeutic applications.

Keywords: *Microsponges, Rutin, Apigenin, Controlled release, Ethyl cellulose, Flavonoids*

O-02/N/012 ORAL · ONLINE

Hesperetin Ameliorates Depressive-Like Behaviour and Neurochemical Alteration in Ovariectomized Rats Exposed to CUMS

Aditya Rattan, Ritika Saini, Seema Bansal*

[1]Department of Pharmacology, M.M. College of Pharmacy, Maharishi Markandeshwar (Deemed to be University), Mullana-133207, Ambala, Haryana, India. Email: 2006.seema@gmail.com

Introduction: Estrogen deficiency during menopause can exacerbate the vulnerability of neurological dysfunction and these effects can be worsened in women by constant psychological and environmental stressors in daily life. The flavanone compound of the citrus fruit hesperetin has antioxidant, anti-inflammatory and possibly phytoestrogenic properties which could afford neuroprotection against these changes.

Methods: Bilateral ovariectomy (OVX) was performed in female Sprague-Dawley rats and they were subjected to chronic unpredictable mild stress (CUMS) for 28 days. Animals were given HES (10, 20 or 40 mg/kg, p.o.) and fluoxetine (10 mg/kg) were used as a reference drug. To investigate the role of estrogen receptor, fulvestrant (10 mg/kg) was used. Various behavioural, nociceptive, cognitive, biochemical, ELISA and histopathological parameters were evaluated.

Result: OVX+CUMS caused significant behavioural abnormalities, decreased recognition memory and nociception, elevated brain AChE and MDA levels, decreased SOD, CAT, GSH and TSH levels, decreased oestradiol and BDNF levels, and increased levels of TNF-α and NF-κB. These changes were significantly and dose-dependently modulated by HES treatment and thereby enhancing the neuronal morphology of the hippocampus. The estrogen receptor-related pathway partially contributed to the HES-mediated protection, as evidenced by the partial attenuation of the protection by fulvestrant.

Conclusion: Hesperetin exhibited noteworthy antioxidant, antidepressant, anxiolytic and neuroprotective activity in OVX+CUMS rats. The protective effects seem to be mediated by estrogen receptor-associated signalling, along with antioxidant and anti-inflammatory mechanisms, and thus HES is a potential natural therapeutic agent for neurological dysfunction during menopause.

Keywords: *Hesperetin, Ovariectomy, Chronic unpredictable mild stress, Menopause, Oxidative stress, Neuroprotection.*

O-02/N/013 ORAL · ONLINE

Pharmacological Potential of Hesperitin on metabolic dysregulation in ovariectomized chronic unpredictable mild stress rats

Sagar, Aryan Malik, Seema Bansal*

Department of Pharmacology, M.M. College of Pharmacy, Maharishi Markandeshwar (Deemed to be University), Mullana-133207, Ambala, Haryana, India. Email: 2006.seema@gmail.com

Introduction: Estrogen has a role in female reproductive function, metabolism, mitochondrial function and stress responses. The low level of estrogen after menopause may cause metabolic issues and increased risk to stress related conditions. While they do work, they may also have effects when used long-term that can affect the development of hormone-dependent cancers and disorders of the uterus. Hesperetin (HES) is a flavanone obtained from citrus fruits.

Methodology: Adult female rats that were ovariectomized (OVX) to create the estrogen deficiency and exposed them to the chronic unpredictable mild stress (CUMS). Animals were treated with HES for a specific time period. The body weight, adiposity markers, glucose and lipid profile, behavioural changes, hepatic and intestinal oxidative stress, antioxidant enzyme activity, inflammatory cytokines and lipid peroxidation were evaluated.

Result: HES would enhance insulin sensitivity in the body and maintain normal levels of blood sugar and lipid. A decrease in lipid peroxidation, inflammatory cytokines and an increase in endogenous antioxidant defence systems were also predicted by HES. Moreover, HES may be useful in diminishing the chronic nature of stress-related behavioural alterations that result from OVX and CUMS.

Summary: Chronic psychosocial stress is studied in combination with estrogen deficiency in postmenopausal using the OVX-CUMS model. HES could prevent metabolic, oxidative, inflammatory and behavioural abnormalities that are caused by OVX-CUMS.

Conclusions: HES may be a helpful non-hormonal treatment for stress induced metabolic dysfunction in the post-menopause female. Further mechanistic and clinical studies are needed.

Keywords: *Estrogen deficiency, Ovariectomized rats, CUMS, Hesperetin, Metabolic dysfunction, Oxidative stress.*

O-02/N/014 ORAL · ONLINE

Nanostructured Lipid Carrier-Based Dual-Drug Delivery for Enhanced Neuroprotection in Alzheimer's Disease: A Critical Review

Jagdeep Singh
PhD Research Scholar, Chitkara College of Pharmacy, Chitkara University, Punjab, India
Email: Jagdeepsinghynr7@gmail.com

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive impairment, synaptic dysfunction, oxidative stress, neuroinflammation, cholinergic deficits, and progressive neuronal loss. Despite the availability of symptomatic pharmacological therapies, limitations associated with poor bioavailability, inadequate brain penetration, adverse effects, and limited disease-modifying potential continue to restrict therapeutic outcomes. Nanostructured lipid carriers (NLCs) have emerged as promising lipid-based nanocarriers for improving drug solubility, stability, bioavailability, and delivery across the blood–brain barrier. This review critically examines the potential of a novel dual-drug NLC-based strategy for neuroprotection in Alzheimer's disease, with particular emphasis on the therapeutic rationale of combining agents possessing complementary pharmacological actions. The review discusses the principles of NLC formulation, physicochemical characteristics, drug encapsulation, controlled release, and mechanisms involved in enhanced brain delivery. Furthermore, the relevance of oxidative stress, neuroinflammation, cholinergic dysfunction, amyloid pathology, tau-associated neuronal injury, apoptosis, and synaptic impairment as therapeutic targets is explored. Evidence from experimental studies involving intracerebroventricular streptozotocin-induced Alzheimer's disease models is also discussed to evaluate the translational relevance of this approach. Particular attention is given to the potential advantages of co-delivery over conventional drug administration, including improved brain exposure, sustained drug release, and simultaneous modulation of multiple pathological pathways. Overall, NLC-mediated dual-drug delivery represents a promising approach for overcoming major limitations of conventional Alzheimer's disease therapy and warrants further preclinical investigation for the development of more effective neuroprotective interventions.

Keywords: *Alzheimer's disease; Nanostructured lipid carriers; Neuroprotection; Blood–brain barrier; Intracerebroventricular streptozotocin; Neuroinflammation.*

O-02/N/015 ORAL · ONLINE

Daidzein ameliorates brain dysfunction in ovariectomized rats exposed to chronic stress through ERβ activation

Sowvik Bag*, Rishabh Chaudhary, Seema Bansal
M.M. College of Pharmacy, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana-133207, India
Email: sowvikbag2@gmail.com

Estrogen is a gonadal hormone produced mainly by the granulosa cells of ovarian follicles. Estrogen deficiency and chronic stress both augment brain dysfunctions primarily via increasing inflammation, oxidative stress, and apoptosis. complications. To date, 17β-estradiol (17βE2) is the only hormonal replacement therapy available that improves brain dysfunctions in estrogen deficiency-stressed conditions but causes severe side effects like breast and endometrial cancer, primarily due to its binding with both estrogen receptors (ERα & ERβ). However, it is important to find some novel drugs that may improve post-menopausal health without exerting severe side effects. Daidzein (DAID), a soy isoflavone, may improve brain functioning in estrogen-deprived & stressed rats via targeting the ERβ receptor. Thus, the aim was to explore the neuroprotective effects of DAID in a hypoestrogenic stressed rat model. To mimic post-menopausal complications, female Sprague-Dawley animals underwent bilateral ovariectomy & were subjected to stress for 28 days. At the end, we assessed various physical, behavioral, biochemical, & molecular parameters. We observed that DAID at 10 & 20mg/kg modulates estradiol levels & activates ERβ. DAID also restores oxidative stress & neuroinflammation, ameliorates apoptosis, improves HPA communication, & promotes monoamine neurotransmission. With this, we also observed improvement in neurobehaviour as seen by a substantial attenuation in anxiety, depression, & memory improvement. Thus, it may be concluded that DAID restores brain health in estrogen-deprived-stressed rats specifically via activating the ERβ receptor & its downstream pathways.

Keywords: *Estrogen deficiency, Chronic unpredictable mild stress, Brain dysfunction, Daidzein, ERβ receptor, Neuroprotection.*

O-02/N/016 ORAL · ONLINE

Neuropharmacological Potential of Lagenaria Siceraria: A Review of Preclinical Evidence

Sonam Chaturvedi*, Deepika Gupta
Department of Pharmacy, Oriental University, Indore (M.P.)
Email: sonamchaturvedi054331@gmail.com

Lagenaria Siceraria (Molina) Standley, commonly known as bottle gourd, belongs to the family Cucurbitaceae and has traditionally been used for various therapeutic purposes. The plant contains several biologically active constituents, including flavonoids, saponins, sterols, terpenoids, and cucurbitacins, which may contribute to its pharmacological activities. The present review aims to summarize and critically evaluate the reported central nervous system (CNS) pharmacological potential of Lagenaria Siceraria, particularly its effects observed in experimental animal models.

Relevant published literature describing the neuropharmacological effects of Lagenaria Siceraria was reviewed. Studies involving experimental rodents were examined with emphasis on antidepressant-like, anxiolytic, sedative, anticonvulsant, and anti-compulsive activities, along with the experimental models and plant preparations investigated. Available preclinical evidence indicates that Lagenaria Siceraria extracts and fractions exhibit promising CNS-related activities. Behavioral models such as the Forced Swim Test, Elevated Plus Maze, locomotor activity assessment, and marble-burying test have demonstrated effects suggestive of antidepressant-like, anxiolytic, sedative, and anti-compulsive properties. These effects may be associated with the presence of biologically active phytoconstituents capable of modulating neurotransmitter-related pathways. Further research should focus on Lagenaria Siceraria seed extracts, isolation and characterization of active compounds, mechanism-based pharmacological investigations, pharmacokinetic studies, and comprehensive safety evaluation. Lagenaria Siceraria represents a promising source of neuroactive phytoconstituents and warrants systematic investigation for the identification of novel CNS-active compounds.

Keywords: *Lagenaria Siceraria; CNS; neuropharmacology; antidepressant; anxiolytic; phytoconstituents.*

O-02/N/017 ORAL · ONLINE

GABAergic Neurotransmission in Nicotine Dependence: Modulatory Effects of Chronic Antidepressant Treatment-A Review of Preclinical Evidence

Namrata Kushwaha*, Lokesh Verma
Sage University, Bhopal
Email: namratakushwaha06@gmail.com

Nicotine dependence is a chronic neurobehavioral disorder characterized by repeated nicotine intake, neuroadaptation, withdrawal and persistent drug-seeking behaviour. Although nicotine primarily acts through nicotinic acetylcholine receptors, its interaction with inhibitory and excitatory neurotransmitter systems contributes to the development and maintenance of dependence. Among these systems, γ-aminobutyric acid (GABA) plays an important role in regulating neuronal excitability and reward-related neurotransmission. Alterations in GABAergic signaling may influence behavioural and neurochemical responses to repeated nicotine exposure.

Depressive symptoms and nicotine dependence frequently coexist, while chronic antidepressant treatment can induce adaptive changes in neurotransmitter systems involved in nicotine-related behaviours. This review examines preclinical evidence on the role of GABAergic neurotransmission in nicotine dependence and the potential modulatory effects of chronic antidepressant treatment. Particular emphasis is placed on GABA-A and GABA-B receptor-mediated mechanisms and interactions between GABAergic, dopaminergic, glutamatergic and serotonergic systems.

Evidence from rodent studies suggests that repeated nicotine exposure can alter GABAergic neurotransmission and the balance between inhibitory and excitatory signaling in brain circuits associated with reward and dependence. Chronic antidepressant administration may further modify GABAergic function; however, the reported effects vary according to antidepressant type, dose, treatment duration and experimental model. Overall, GABAergic neurotransmission may represent an important link between antidepressant-induced neuroadaptation and nicotine dependence. Further controlled studies are required to clarify GABA-A and GABA-B receptor mechanisms underlying nicotine consumption following chronic antidepressant treatment.

Keywords: *GABAergic neurotransmission; GABA-A receptor; GABA-B receptor, nicotine consumption; antidepressant treatment; neuroadaptation.*

O-02/N/018 ORAL · ONLINE

Beyond JAK Blockade in Rheumatoid Arthritis: Non-JAK Signaling Networks, Stromal Persistence and Next-Generation Therapeutic Opportunities

Amruta S. Wagh[1]*, Aarti V. Belgamwar

SVKM NMIMS Global University School of Pharmacy and Technology Management, Dhule-424001, Maharashtra, India
Email: amrutaswagh.11@gmail.com

Introduction: Rheumatoid arthritis (RA) is increasingly recognized as a tissue-level network disease in which immune activation, pathogenic synovial fibroblast (FLS) activity, metabolic adaptation, and tissue remodeling work together to maintain chronic inflammation and promote structural damage. Although Janus kinase (JAK) inhibitors have improved RA management, clinical effectiveness varies among patients and long-term treatment requires attention to safety.

Aim & Objectives: This review examines non-JAK signaling networks that allow pathogenic cells to survive and remain active despite suppression of major cytokine signals.

Methods: Clinical, molecular, and experimental evidence was reviewed focusing on stromal signaling through Hippo–YAP and Notch, tissue remodeling involving Wnt/DKK1, immunometabolic pathways regulated by mTOR and HIF-1α, cellular stress and survival mechanisms involving autophagy and ferroptosis, and innate immune targets including BTK, SYK, IRAK4, and NLRP3. Emerging FLS-directed targets, particularly P2X7R, and approaches including synovial molecular stratification, single-cell profiling, and machine learning were also considered.

Results: Evidence indicates that synovial pathotypes, disease-associated fibroblast populations, kinase-network interactions, metabolic adaptations, and innate immune mechanisms contribute to persistent disease activity beyond JAK–STAT signaling.

Summary/Conclusion: These findings support a shift from pathway-by-pathway drug discovery toward mechanism-guided combination strategies that simultaneously suppress immune-mediated inflammation, stromal persistence, and tissue remodeling.

Keywords: *Rheumatoid arthritis; JAK inhibitors; Synovial fibroblasts; Hippo–YAP; Immunometabolism; Precision medicine*

O-02/N/019 ORAL · ONLINE

Evaluation of the Neuroprotective Potential of Cynandione: A Against Menopause-Associated Neurological Complication in Ovariectomized (OVX) Rats

Anjali Kumari*, Sakshi, Seema Bansal

Department of Pharmacology, M.M. College of Pharmacy, Maharishi Markandeshwar (Deemed to be University), Mullana-133207, Ambala, Haryana, India.
Email: 2006.seema@gmail.com

Background: Oxidative stress neuroinflammation is linked to neurological complications such as anxiety, depression, impaired motor and sensory functions associated with Menopause Related Estrogen Deficiency. Hormone replacement therapy may be used to treat these side effects, but its use is limited by side effects. Bio acetophenone Cynandione A (CYN), isolated from the flowers of Cyananchum wilfordii, shows promising antioxidant, anti-inflammatory and neuroprotective properties. However, its properties against Estrogen deficiency associated neurological dysfunction remain unexplored.

Methodology: Female Wistar rats were divided into nine groups: Control, Sham, OVX, OVX+Vehicle, OVX+Estradiol, OVX+CYN (5,15,30 mg/kg) and OVX+CYN (30) + Fulvestrant, treated for 28 days. Neurobehavioral parameters were evaluated using the rotarod, actophotometer, elevated plus maze test, tail immersion, hot plate, randall-sellito, passive avoidance and tail suspension tests, while biochemical parameters included LPO, SOD, CAT, GSH, ACHe and serum estradiol.

Results: Significant weight gain, uterine atrophy, decrease of serum estradiol and behavioural deficits were observed in OVX rats as compared to control group rats. Administration of CYN dose-dependently restored all parameters, showing maximal effects similar to estradiol: it reversed lipid peroxidation and increased antioxidant defenses, at 30 and 15 mg/kg, respectively. Fulvestrant co-treatment reduced CYN's neuroprotective and antioxidant activities, supporting ER involvement.

Conclusion: CYN administration improved neurological functions in estrogen deficient rats, with maximal efficacy particular at 15 and 30 mg/kg. These neuroprotective effects seem to be associated with the reduced oxidative stress, neuroinflammation and apoptosis. Overall, these results indicate that CYN may help to maintain brain function during menopause.

Keywords: *Cynandione A, Menopause, Ovariectomy, Neuroprotection, Estrogen Receptor*

O-02/N/020 ORAL · ONLINE

Role of GABAergic Transmission During Nicotine Consumption After Chronic Antidepressant Treatment

Namrata Kushwaha*, Lokesh Verma

Sage Institute of Research & Technology-Pharmacy, Sanjeev Agrwal Global Educational University, Bhopal, Madhya Pradesh
Email: namratakushwaha06@gmail.com

Background: Nicotine consumption produces neuroadaptive changes in several neurotransmitter systems, including cholinergic, dopaminergic, glutamatergic, serotonergic and GABAergic transmission. γ-Aminobutyric acid (GABA), the major inhibitory neurotransmitter in the central nervous system, plays an important role in regulating neuronal excitability, reward-related behavior and drug dependence. Chronic antidepressant treatment may also produce adaptive changes in GABAergic neurotransmission that could influence nicotine-related behavioural responses.

Objective: The present study was designed to investigate the role of GABAergic transmission in nicotine consumption following chronic antidepressant treatment in rats and to evaluate the possible involvement of GABA-A and GABA-B receptor mechanisms.

Method: Adult rats will be randomly divided into experimental groups (n=6–8/group). The control group will receive vehicle, while the nicotine group will receive nicotine (0.4 mg/kg/day, s.c.). The antidepressant group will receive fluoxetine (10 mg/kg/day, p.o.) for 21–28 days. A combined group will receive fluoxetine with nicotine to assess the effect of chronic antidepressant treatment on nicotine consumption. Additional groups may receive selective GABA-A or GABA-B receptor modulators at doses established from published preclinical studies. Nicotine-related behavioural responses and consumption will be assessed using validated paradigms. GABA levels and related neurochemical changes will subsequently be evaluated in selected brain regions.

Result: Chronic nicotine exposure may potentiate nicotine-induced behavioural responses and induce alterations in GABAergic neurotransmission. Fluoxetine treatment may modify these nicotine-induced changes. Pharmacological modulation of GABA-A and GABA-B receptors is expected to clarify their contribution to nicotine consumption. Biochemical analysis may demonstrate corresponding alterations in brain GABA levels.

Keywords: *GABAergic neurotransmission; GABA-A receptor; GABA-B receptor; nicotine consumption; nicotine dependence; chronic antidepressant treatment.*

O-02/N/023 ORAL · ONLINE

HEPATOPROTECTIVE POTENTIAL OF MEDICINAL PLANTS: ROLE OF BIOACTIVE PHYTOCONSTITUENTS

Kanchan Mishra*

United Institute of Pharmacy, AKTU
Email: kanchan200113@gmail.com

The liver is a vital organ involved in metabolism, detoxification and maintenance of physiological homeostasis and is highly susceptible to injury caused by drugs, chemicals, oxidative stress and other toxic agents. Due to the limitations associated with some existing hepatoprotective therapies, medicinal plants have attracted considerable attention as potential sources of bioactive hepatoprotective agents. A wide range of medicinal plants, including *Silybum marianum*, *Phyllanthus amarus*, *Curcuma longa*, *Glycyrrhiza glabra*, *Andrographis paniculata* and *Terminalia arjuna*, have been reported to exhibit hepatoprotective activity in various experimental studies. Their effects have been attributed to diverse phytoconstituents, including flavonoids, phenolic compounds, terpenoids, alkaloids and specific bioactive molecules such as silymarin, curcuminoids, phyllanthin, hypophyllanthin and glycyrrhizin. The reported mechanisms include antioxidant activity, inhibition of lipid peroxidation, modulation of inflammatory pathways and maintenance of hepatocellular membrane integrity. Various experimental models, including paracetamol-, carbon tetrachloride-, thioacetamideand D-galactosamine-induced liver injury models, have been employed to investigate these effects. This review summarizes the reported hepatoprotective potential of selected medicinal plants, with particular emphasis on their major phytoconstituents and proposed mechanisms of action. It also discusses the importance of phytochemical characterization, standardization and safety evaluation for future development of plant-derived hepatoprotective agents.

Keywords: *Hepatoprotection; Medicinal plants; Phytoconstituents; Flavonoids; Phenolic compounds; Oxidative stress; Liver injury.*

O-02/N/024 ORAL · ONLINE

To study the effect of Mercurius solubilis on scopolamine-induced memory deficits and motor coordination in mice

Simranjeet Kaur, Nitin Verma*
Chitkara College of Pharmacy, Chitkara University, Punjab, India.
Faculty of Pharmaceutical Sciences, PCTE Group of Institutes, Baddowal, Punjab, India
Email: simranjstl@gmail.com

Aim: The present study was designed to investigate the effect of Mercurius solubilis (merc sol) on scopolamine-induced memory deficits and motor coordination in mice.

Materials and methods: Three different formulations of merc sol (30X, 200M, 1M) were screened for their in vitro antioxidant potential through DPPH (2, 2-diphenyl-1-picrylhydrazyl) and nitric oxide scavenging activity using response surface methodology. Memory impairment was induced by the administration of scopolamine (1mg/kg i.p.) for 3 days to mice and assessment of memory acquisition and retention was done using Morris water maze test, passive avoidance test, elevated plus maze test, light and dark box test, motor coordination was evaluated using rotarod test and inclined plan test. The involvement of ion channels and nitric oxide pathway in the observed effect of merc sol was elucidated by administration of veratrine (0.125 mg/kg, i.p.), A23187 (20 mg/kg, i.p.), L- arginine (40 mg/kg, i.p.), aminoguanidine (50 mg/kg, i.p.) 30 min prior to merc sol. Acute toxicity studies were performed in accordance with the OECD (Organisation for Economic Co-operation and Development) guidelines.

Results: In vitro studies have revealed merc sol 30 X to have maximum free radical and nitric oxide scavenging activity. Administration of merc sol 30 X to mice significantly reduced scopolamine induced memory deficits and motor incoordination in all the performance tasks. The calcium ionophore, A23187 significantly altered the effect of merc sol in mice. No major signs of toxicity were observed.

Conclusion: Merc sol has antiamnesic effect in scopolamine induced deficits and motor coordination in mice.

O-02/N/025 ORAL · ONLINE

Network Pharmacology-Based Investigation of the Potential Anti-Arthritic Mechanism of *Ajuga bracteosa*

Madhu Raghav*, Dr. Praveen Kumar Dixit
Krishna Institute of Engineering & Technology (KIET), Ghaziabad, India
Email: madhuraghav6788@gmail.com

Introduction: Rheumatoid arthritis (RA) is a chronic inflammatory disorder involving multiple molecular targets and signaling pathways. Ajuga bracteosa is a medicinal plant containing diverse bioactive phytoconstituents with reported pharmacological potential. Its multi-target mechanism in RA requires systematic investigation.

Aim & Objectives: To investigate the potential anti-arthritic mechanism of A. bracteosa by identifying its phytoconstituent-associated targets, RA-related overlapping targets, and key biological pathways using network pharmacology.

Methods: Reported phytoconstituents of A. bracteosa were identified from literature and relevant databases. Potential phytoconstituent targets were collected and compared with RA-associated targets. Common targets were used to construct compound–target and protein–protein interaction networks. Functional and pathway enrichment analyses were performed to identify biological processes and signaling pathways associated with the predicted anti-arthritic activity.

Results: The analysis revealed multiple interactions between A. bracteosa phytoconstituents and RA-associated targets. Key inflammatory targets, including TNF-α, IL-6, NF-κB, COX-2, JAK-3 and MMP-9, were identified within the predicted therapeutic network. Enrichment analysis indicated involvement of inflammation- and immune-response-related pathways.

Summary: The network pharmacology findings indicate that A. bracteosa may exert potential anti-arthritic effects through multiple phytoconstituents acting on interconnected molecular targets and signaling pathways.

Conclusion: Network pharmacology provides a systematic approach for understanding the multi-component, multi-target mechanism of A. bracteosa in RA and identifies potential molecular targets for further experimental validation.

Keywords: *Ajuga bracteosa; rheumatoid arthritis; network pharmacology; phytoconstituents; molecular targets; pathway enrichment*

O-02/N/026 ORAL · ONLINE

Network Pharmacology-Guided Repurposing of SGLT2 Inhibitors as Dual Modulators of Neuroinflammation and Mitochondrial Dysfunction: An Integrated In- Silico and In -Vitro Discovery Approach

Bhanu Pratap Singh*, Dr. Praveen Kumar Dixit

Department of Pharmacology, Krishna Institute of Engineering and Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh, India
Email: bhanu.26spd00111@kiet.edu

Background: Neurodegenerative and neuroinflammatory disorders remain poorly served by single-target therapies, and conventional drug discovery pipelines are slow and costly. Sodium-glucose cotransporter-2 (SGLT2) inhibitors, widely used in type 2 diabetes, have shown pleiotropic effects on oxidative stress, inflammasome signalling, and cellular energy metabolism, which suggests they could be repurposed for central nervous system indications. Their polypharmacological mechanisms, however, have not been systematically mapped.

Objective: To identify and validate the multi-target mechanisms by which SGLT2 inhibitors may attenuate neuroinflammation and mitochondrial dysfunction, using an integrated computational and experimental workflow.

Methods: Potential targets of dapagliflozin, empagliflozin, and canagliflozin were predicted using SwissTargetPrediction and SuperPred, and intersected with disease-associated genes from GeneCards, DisGeNET, and OMIM. A protein-protein interaction network was built in STRING and analysed in Cytoscape to identify hub targets, followed by GO and KEGG pathway enrichment. Molecular docking (AutoDock Vina) and 100 ns molecular dynamics simulations (GROMACS) assessed binding stability at the top-ranked hub proteins. ADMET and blood-brain barrier permeability were predicted in silico. Key predictions were then tested in LPS-stimulated BV-2 microglial cells, evaluating cell viability, nitric oxide release, pro-inflammatory cytokines (TNF-α, IL-1β, IL-6), mitochondrial membrane potential, and NLRP3 and AMPK pathway expression.

Results: Network analysis identified 42 shared targets, with AKT1, TNF, IL-6, PTGS2, and NLRP3 emerging as hub nodes. Enrichment analysis highlighted the PI3K-Akt, AMPK, and NF-κB signalling pathways. Docking showed favourable binding energies (−7.8 to −9.6 kcal/mol), and molecular dynamics confirmed stable ligand-protein complexes with low RMSD fluctuation. In vitro, treatment significantly reduced nitric oxide and cytokine release in a concentration-dependent manner, restored mitochondrial membrane potential, and suppressed NLRP3 inflammasome activation, with partial involvement of AMPK activation.

Conclusion: This integrative study provides mechanistic evidence that SGLT2 inhibitors act as multi-target modulators of neuroinflammatory and mitochondrial pathways, supporting their repurposing potential. The workflow also offers a rapid, cost-effective template for rational drug repositioning in early-stage discovery.

Keywords: *Network pharmacology, drug repurposing, SGLT2 inhibitors, neuroinflammation, molecular docking, mitochondrial dysfunction*

O-02/N/027 ORAL · ONLINE

Targeting the SRGAP2-RAC1-Actin Axis in Parkinson's Disease: Emerging Therapeutic Opportunities for Synaptic and Dopaminergic Neuroprotection

Shivani*, Dr. Sandhya Jaiswal

IEC School of Pharmacy, IEC University, Baddi, H.P. 174103
Chandigarh College of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali 140307
Email: 98shivani16@gmail.com

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized primarily by the degeneration of dopaminergic neurons in the substantia nigra, resulting in progressive motor and non-motor dysfunction. Although α-synuclein aggregation, mitochondrial dysfunction, oxidative stress, and neuroinflammation are established contributors to PD pathogenesis, increasing evidence suggests that disruption of cytoskeletal organization and synaptic architecture may contribute to neuronal vulnerability. The SRGAP2-RAC1-actin axis represents an emerging signaling framework connecting Rho-family GTPase regulation with actin remodeling, dendritic spine organization, synaptic maturation, and neuronal structural integrity. SRGAP2 regulates RAC1-associated signaling and cytoskeletal dynamics, whereas dysregulated RAC1 activity and actin remodeling have been associated with neuronal dysfunction and α-synuclein-related neurotoxicity. However, the integration of this signaling axis into Parkinson's disease pathophysiology remains insufficiently characterized. This review explores the molecular biology of SRGAP2, RAC1, and actin cytoskeletal signaling and examines their potential interactions with α-synuclein pathology, synaptic dysfunction, oxidative stress, mitochondrial impairment, neuroinflammation, and dopaminergic neuronal degeneration. Particular emphasis is placed on the SRGAP2-RAC1-actin pathway as a potential therapeutic framework, focusing on modulation of Rho-family GTPase signaling, cytoskeletal remodeling, synaptic stability, and neuronal survival. Emerging pharmacological, natural-product, molecular, and drug-repurposing strategies targeting components of this network are also discussed. Finally, current evidence gaps and experimental approaches required to validate SRGAP2-centered interventions are highlighted. This pathway may provide a novel mechanistic perspective for developing therapeutic strategies aimed at preserving synaptic integrity and dopaminergic neuronal function in Parkinson's disease.

Keywords: *Parkinson's disease; SRGAP2; RAC1; actin cytoskeleton; synaptic dysfunction; α-synuclein; dopaminergic neurons; neuroprotection; neuroinflammation; drug discovery*

O-02/N/028 ORAL · ONLINE

Anxiety Disorders in the Modern World: Emerging Challenges and Innovative Approaches to Prevention and Management

Shasta Jain*, Parv Makkar, Yuvraj Singh, Deepika Sharma

Amity Institute of Pharmacy, Amity University Punjab-140306
Email: shastajain2305@gmail.com

Anxiety is a normal human response that helps us recognise and respond to uncertainty or threat. However, when fear and worry persist beyond the situation that triggers humans, they can develop into anxiety disorders that interfere with everyday life, relationships, sleep, physical health, and overall well-being. Today, anxiety disorders represent a growing global mental-health concern, with the World Health Organization reporting a 25% increase in anxiety and depression. Driven by modern pressure such as constant digital connectivity, social comparison, academic and occupational pressures, economic uncertainty, disrupted sleep, and chronic stress are creating an environment in which emotional distress can be increasingly difficult to escape. Vulnerability is further shaped by childhood and adolescent traumatic experiences, genetic predisposition, altered amygdala activity, and dysregulation of neurotransmitter systems such as GABA and dopamine. Consequently, anxiety extends far beyond worry, manifesting through palpitations, breathlessness, gastrointestinal disturbances, disturbed sleep, racing thoughts, impaired concentration, and avoidance, often affecting both physical and social functioning. Addressing this complexity requires a shift from treating established symptoms to recognising vulnerability earlier. Strengthening primary-care screening, promoting resilience through physical activity, mindfulness, healthy sleep, and supportive relationships, alongside responsible use of digital tools for early identification, may strengthen prevention. For those affected, evidence-based psychotherapy, particularly cognitive behavioural and exposure-based approaches, complemented by individualized pharmacological treatment when appropriate, can improve functioning and quality of life. The future of anxiety care therefore lies in moving from reactive treatment to proactive prevention, recognising vulnerability earlier, responding with empathy, and building resilience before anxiety becomes an obstacle to living fully.

Keywords: *anxiety, mental health, emotional distress, trauma, mental health, vulnerability*

O-02/N/029 ORAL · ONLINE

Cyclodextrins as Emerging Therapeutics for Myelin Debris-Induced Foam Cell Formation

Priyanka Sharma*
Chandigarh College of Pharmacy, landran
Email: psharma7318@gmail.com

Multiple sclerosis (MS) is a chronic neurological disorder which results in the accumulation of myelin debris within affected regions of the central nervous system due to demyelination. Microglia and macrophages actively eliminate this debris via phagocytosis; however, extended uptake can lead to the formation of lipid-rich "foamy" macrophages. These cells are linked to chronic inflammatory responses and may interfere with remyelination, thereby contributing to disease advancement. Despite their potential importance in MS pathology, effective approaches for reducing lipid accumulation in these cells are currently insufficient. The present study aimed to characterize the time-dependent uptake and processing of myelin debris by human and murine microglia/macrophages and to develop an in vitro model that mimics foamy phagocytes observed in MS lesions. Additionally, we investigated cyclodextrins as potential therapeutic candidates because of their reported ability to promote lipid removal in other neurological conditions. Multiple internally synthesized cyclodextrins were assessed for their impact on lipid accumulation and macrophage phenotype.

Prolonged exposure to myelin debris in conjunction with inflammatory cytokines generated macrophages with a marked inflammatory phenotype and an MS-related molecular signature, as demonstrated by bulk transcriptomic analysis. Treatment with specific cyclodextrins decreased the intracellular build-up of ingested and processed lipids and modified the expression of genes involved in inflammatory responses and tissue repair. Overall, our findings indicate that cyclodextrins may modulate lipid-laden inflammatory macrophages and potentially foster a more favourable cellular environment for remyelination, highlighting their therapeutic potential in MS.

Keywords: *Multiple sclerosis (MS); Myelin debris; Microglia; Macrophages; Foamy macrophages; Lipid accumulation; Phagocytosis; Inflammation; Remyelination; Cyclodextrins; Transcriptomics; Neuroinflammation*

O-02/N/030 ORAL · ONLINE

Therapeutic Potential of *Dimocarpus longan* in Neurological and Behavioural Disorders: A Preclinical Review

Sonam Chaturvedi*, Sunil Kumar Dwivedi
Sri Aurobindo Institute of Pharmacy, Indore (M.P.)
Email: sonam.chaturvedi@saip.ac.in

Neurological and behavioral disorders, including anxiety, cognitive impairment, neurodegenerative diseases, and pain-related conditions, represent major therapeutic challenges and have stimulated interest in plant-derived bioactive compounds. *Dimocarpus longan* Lour. (longan), a member of the Sapindaceae family, has traditionally been used in Asian medicine for conditions associated with insomnia, forgetfulness, fatigue, and nervous disorders. The present review summarizes the available preclinical evidence regarding the neuropharmacological potential of *D. longan* and its different plant parts, including aril, seed, pericarp, and flowers. Published studies indicate that longan contains diverse bioactive constituents, particularly polyphenols, flavonoids, polysaccharides, nucleosides, and other phenolic compounds, which may contribute to its biological activities. Experimental investigations have demonstrated antioxidant, anti-inflammatory, memory-enhancing, anxiolytic, analgesic, and neuroprotective effects. In particular, longan flower extract has demonstrated neuroprotective activity in experimental models of dopaminergic neurotoxicity, with effects associated with attenuation of oxidative stress, inflammation, and neuronal apoptosis. Evidence from animal and experimental studies also suggests potential modulation of pathways involved in neuronal survival and cognitive function. However, the available evidence remains predominantly preclinical, with considerable variation in plant material, extraction methods, doses, experimental models, and outcome measures. Therefore, standardized extracts, identification of active constituents, pharmacokinetic investigations, mechanistic studies, and well-designed clinical trials are required to establish its therapeutic relevance. Overall, *D. longan* represents a promising source of neuroactive phytoconstituents and warrants further investigation as a potential candidate for the development of natural neuropharmacological agents.

Keywords: *Dimocarpus longan; longan; neuropharmacology; antioxidant; phytoconstituents; neurological disorders*

O-02/N/031 ORAL · ONLINE

To Investigate the Neuroprotective Effects of Arbutin Against Behavioural, Molecular and Histopathological Alterations in A Prenatal Valproic Acid (VPA) Induced Rat Model Of ASD

Abhishek*

KE Institute of Pharmaceutical Sciences, Pandoga Una, Himachal Pradesh
Email: abhishekneuropharma@gmail.com

Introduction: Autism spectrum disorder (ASD) is a multifactorial neurodevelopmental disorder characterized by impaired social interaction, repetitive behaviours, oxidative stress, neuroinflammation, neurotransmitter imbalance and dysregulated intracellular signalling. Arbutin, a naturally occurring hydroquinone glycoside, has demonstrated antioxidant and anti-inflammatory properties, suggesting its potential as a neuroprotective agent.

Methods: Autism like alterations were induced by a single intraperitoneal (*i.p.*) injection of VPA (600 mg/kg) on gestational day 12.5. Male offspring were treated with arbutin (50 and 100 mg/kg, *i.p.*) or risperidone (0.5 mg/kg, *p.o.*). Behavioural assessments included the morris water maze, three-chamber social interaction, open field and rotarod test. Oxidative stress biomarkers (LPO, SOD, GSH and GPx), neurotransmitters (GABA, glutamate and serotonin), inflammatory cytokines (TNF-α, IL-1β and IL-6) and PI3K, AKT and Nrf2 levels were determined using biochemical assays and ELISA. Hippocampal histopathology was evaluated by H&E staining.

Results: Arbutin significantly improved social interaction, learning and memory, locomotor activity and motor coordination in VPA-exposed rats. Treatment restored neurotransmitter homeostasis and molecular levels of PI3K, AKT and increase Nrf2 activity, reduced oxidative stress and neuroinflammation and ameliorated hippocampal neuronal damage.

Conclusion: Arbutin attenuated behavioural, biochemical, molecular and histopathological abnormalities in experimental rats. These findings indicate that arbutin exert significant neuroprotective effects which are associated with the modulation of PI3K/AKT and Nrf2 signalling, highlighting its potential as therapeutic candidate for ASD.

Keywords: *Autism Spectrum Disorder (ASD); Arbutin; Valproic Acid (VPA); Neuroprotection; Oxidative Stress; Neuroinflammation; PI3K/AKT Signalling; Nrf2 Pathway; Neurotransmitters; Behavioural Deficits.*

O-02/N/032 ORAL · ONLINE

Ferroptosis In Diabetic Cardiomyopathy - Molecular Mechanisms, Therapeutic Targets And Pharmacological Perspectives

Nandini Gupta*, Dr. Ashish Kumar Sharma

[1]*Student, Master of Pharmacy (Pharmacology), NIMS Institute of Pharmacy, NIMS University, Rajasthan, Jaipur, 303121, India*
[2]*Professor, Department of Pharmacology, NIMS Institute of Pharmacy, NIMS University Rajasthan, Jaipur, 303121, India*
Email: nandini.7240@gmail.com

Introduction: Diabetic cardiomyopathy (DCM) is a cardiovascular complication of diabetes mellitus (DM) which is associated with metabolic dysfunction, oxidative stress, mitochondrial damage, inflammation and myocardial fibrosis. Recent findings suggest that ferroptosis, the iron dependent regulated cell death associated with lipid peroxidation, is involved in the development of diabetic myocardial injury.

Aim & Objective: The purpose of this review is to clarify the molecular mechanism of ferroptosis in DCM, and to review possible therapeutic targets and the pharmacological approaches to control ferroptosis.

Methods: The present study identified and critically evaluated recent original research articles studying ferroptosis in experimental models of DCM, focusing on molecular pathways, ferroptosis associated biomarkers, therapeutic targets and pharmacological interventions.

Results: All of the evidence points to hyperglycemia and metabolic stress mediating ferroptosis via iron dysregulation, mitochondrial dysfunction, lipid remodelling, and loss of antioxidant defences. The NRF2/SLC7A11/GPX4 axis, ACSL4 mediated lipid peroxidation, ferritinophagy via NCOA4, and mitochondrial quality control via AMPK and Parkin are major pathways to regulate. In addition, emerging mechanisms such as m6A modification, FTO, SPOP/VDAC3 and mitochondrial regulatory proteins further add to the molecular landscape. Experimental studies with pharmacological agents have shown the ability of sulforaphane, nicorandil, empagliflozin, artemisinin and glabridin to induce cardioprotective effects by preventing ferroptosis.

Conclusion: Ferroptosis is a potential target mechanism and therapeutic approach for DCM. But the validation of ferroptosis specific biomarkers, mechanisms at the level of the cells, therapeutic selectivity and clinical translation is still needed.

Keywords: *Diabetic cardiomyopathy, Ferroptosis, Oxidative stress, GPX4, NRF2, Pharmacotherapy*

O-02/N/033 ORAL · ONLINE

Effect of Quercetin and Chrysin on the Pharmacokinetics and Hepatotoxicity of Cabozantinib in Rats

Nikita Mukhare*, Bhagyashri Patil, Ravindra Babu Pingli

Department of Pharmacology, School of Pharmacy & Technology Management, SVKM's Narsee Monjee Institute of Management Studies, Shirpur-425405, Maharashtra, India

Email: nikitamukhare17@gmail.com

Cabozantinib is an oral multikinase inhibitor employed in the therapy of advanced cancers such as renal cell carcinoma and medullary thyroid carcinoma. Nonetheless, there may be hindered application because of its side effects particularly liver toxicity. Quercetin and chrysin are naturally occurring flavonoids known to have impact on drug metabolism and hepatic protection. This study aimed to evaluate the effects of quercetin and chrysin on the pharmacokinetics and hepatotoxicity of cabozantinib using a preclinical model with rats as subjects. Fifteen male Wistar rats, based on the treatment received, were allocated into control, cabozantinib-treated alone and cabozantinib coadministered with quercetin and chrysin at doses 10mg/kg and 20 mg/kg. Pharmacokinetic parameters were measured 24 hours after oral administration of cabozantinib on days 1st and 28th. Liver and kidney function parameters and histopathological examination of liver tissues were performed after treatments. The results showed alteration of pharmacokinetic profile of cabozantinib after coadministration of flavonoids. The flavonoid groups had their liver function parameters better than cabozantinib alone. Thus, it is concluded that quercetin and chrysin may potentially modulate metabolism of cabozantinib and exert hepatoprotective properties. This gives a ground for further study of drug-flavonoids interactions to enhance therapy and use of cabozantinib.

Keywords: *Cabozantinib; Quercetin; Chrysin; Pharmacokinetics; Hepatotoxicity*

O-02/N/034 ORAL · ONLINE

Ferroptosis in Glioblastoma: Molecular Mechanisms, Therapeutic Vulnerabilities and Drug Development

Shreyash Raj*, Piyush Kanwar, Ashish Kumar Sharma

Department of Pharmacology, Nims Institute of Pharmacy, Nims University Rajasthan, Jaipur 303121, India

Email: shreyashraj4753@gmail.com

Background: Glioblastoma (GBM) is an aggressive primary brain tumour characterized by extensive cellular heterogeneity, glioblastoma stem-cell (GSC) persistence, therapeutic resistance, and poor clinical outcomes. Temozolomide (TMZ), the standard chemotherapeutic agent, is frequently limited by acquired or intrinsic resistance. Ferroptosis, an iron-dependent form of regulated cell death characterized by excessive lipid peroxidation, has emerged as a potential therapeutic vulnerability in GBM.

Objective: This review aims to elucidate the molecular mechanisms underlying ferroptosis in GBM and evaluate its potential for overcoming therapeutic resistance and identifying novel pharmacological targets.

Methods: Relevant primary research studies investigating ferroptosis in GBM and glioma models were analysed, with particular emphasis on the SLC7A11/system Xc^-–glutathione–GPX4 axis, iron metabolism, reactive oxygen species, lipid peroxidation, NRF2 signalling, mitochondrial metabolism, GSC biology, and TMZ resistance.

Results: Available evidence indicates that disruption of cystine uptake, glutathione depletion, GPX4 inhibition, iron accumulation, and increased reactive oxygen species can promote lipid peroxidation and ferroptosis cell death. Pharmacological modulation of SLC7A11, GPX4, cysteine availability, iron metabolism, and mitochondrial ferroptosis regulators has demonstrated promising activity against GBM cells, including therapy-resistant populations. Ferroptosis induction may additionally enhance TMZ sensitivity and target GSC-associated resistance mechanisms.

Conclusion: Ferroptosis represents a promising pharmacological strategy for targeting GBM and overcoming therapeutic resistance. However, tumour selectivity, blood–brain barrier penetration, biomarker identification, and validation in clinically relevant models remain critical challenges for successful translation.

Keywords: *Glioblastoma; Ferroptosis; GPX4; SLC7A11; Temozolomide; Glioblastoma stem cells; NRF2; Iron metabolism; Lipid peroxidation.*

O-02/N/035 ORAL · ONLINE

NECROPTOSIS IN MYOCARDIAL ISCHEMIC REPERFUSION INJURY

Aman Kumar*, Ashish Kumar Sharma

Department of Pharmacology, NIMS Institute of Pharmacy, NIMS University Rajasthan, Jaipur 303121, India
Email: amansahu.cmfr012@gmail.com

Introduction: Myocardial ischemia–reperfusion (I/R) injury is a major pathological process that contributes to myocardial damage following restoration of coronary blood flow. Although apoptosis and necrosis have traditionally been considered important forms of cardiomyocytes death, Necroptosis, a regulated form of necrotic cell death, has emerged as an important contributor to myocardial I/R injury.

Aim & Objectives: This review aims to elucidate the molecular mechanisms involved in Necroptosis during myocardial I/R injury and to evaluate its potential as a therapeutic target for cardio protection.

Methods: Relevant experimental and review literature was evaluated focusing on the receptor-interacting protein kinase 1 (RIPK1), receptor-interacting protein kinase 3 (RIPK3), and mixed lineage kinase domain-like protein (MLKL) signaling pathway, oxidative stress, mitochondrial dysfunction, calcium dysregulation, and inflammatory responses associated with myocardial I/R injury.

Results: Ischemia followed by reperfusion promotes oxidative stress, intracellular calcium overload, mitochondrial dysfunction, and inflammatory signaling, which can activate the RIPK1/RIPK3/MLKL axis. Phosphorylated MLKL disrupts plasma membrane integrity, resulting in cardiomyocytes rupture and release of damage-associated molecular patterns, thereby amplifying myocardial inflammation and tissue injury. Pharmacological or genetic inhibition of necroptotic signaling has demonstrated cardio protective potential in experimental models.

Conclusion: Necroptosis represents a mechanistically distinct and therapeutically relevant pathway of cardiomyocytes death during myocardial I/R injury. Targeting the RIPK1/RIPK3/MLKL pathway may provide a promising strategy for limiting myocardial injury and improving post-reperfusion cardiac outcomes.

Keywords: *Necroptosis; Myocardial ischemia–reperfusion; RIPK1; RIPK3; MLKL; Cardio protection*

O-02/N/036 ORAL · ONLINE

Preclinical Screening Models ENRAnti-Anginal Drugs: From Traditional Pathophysiological Approaches in Emerging Human-Relevant Technologies – A Critical Review of Principles, Applications, and Translational Challenges

Shaurya Kumari*, Ashish Kumar Sharma

Department of Pharmacology, NIMS Institute of Parmacy, NIMS University, Rajasthan, Jaipur 303121, India
Email: trivedishaurya61@gmail.com

Angina pectoris is a clinical symptom of myocardial ischemia, which still bears a major cardiovascular burden worldwide. Symptoms can be relieved with drugs such as nitrates, β-blockers, calcium channel blockers, and more recent agents such as ranolazine, ivabradine, nicorandil, and trimetazidine. However, due to the multifactorial nature of ischemic heart disease, many patients remain with chronic angina. Therefore, robust and translationally relevant preclinical screening models that mimic the complex mechanisms underlying angina, such as coronary vasospasm, oxygen supply–demand imbalance, oxidative stress, endothelial dysfunction, calcium overload, inflammation, microvascular abnormalities, and metabolic disturbances, are required to discover more effective anti-anginal therapies. The present study provides a detailed review of the spectrum of preclinical models used in the development of anti-anginal drugs, covering in vitro, ex vivo, and in vivo experimental systems. We critically assess the experimental principles, pharmacological applications, outcome measures, and translational limitations of traditional approaches, including cardiomyocyte hypoxia-reoxygenation assays, endothelial dysfunction studies, Langendorff isolated heart preparations, vascular ring assays, isoproterenol-induced myocardial injury, coronary artery ligation, and ischemia-reperfusion models. Special focus is on the ongoing disconnect between preclinical efficacy and clinical success, driven by species-specific physiology, the use of young, healthy animals, and the failure to model human comorbidities and microvascular angina. Recent advances include human-induced pluripotent stem cell (hiPSC)-derived cardiomyocytes, organ-on-a-chip technologies, three-dimensional cardiac organoids, and AI-assisted predictive modelling, all of which are promising human-relevant platforms for high-throughput, mechanistic, and patient-specific screening. This review, as a whole, promotes an integrated, multi-level, human-centric approach toimprove prediction accuracy and accelerate the development of novel anti-anginal treatments.

Keywords: *Angina pectoris; Myocardial ischemia; Preclinical models; Isoproterenol; Coronary artery ligation; Ischemia–reperfusion; Organ-on-chip; hiPSC*

O-02/N/037 ORAL · ONLINE

Role of Serotonergic Neurotransmission in Regulating Sociability: Evidence from 5-HTP

Lokesh Verma *

Sage Institute of Research & Technology-Pharmacy, Sanjeev Agrwal Global Educational University, Bhopal, Madhya Pradesh
Email: lokeshvns.verma@gmail.com

Background: Social behavior deficits are hallmark features of neuropsychiatric and neurodevelopmental disorders such as autism spectrum disorder, schizophrenia, and social anxiety disorder. Serotonin (5-hydroxytryptamine; 5-HT) is a key neurotransmitter regulating social cognition and behavior, but its precise role in sociability remains incompletely understood.

Objective: To investigate the role of serotonergic neurotransmission in social interaction behavior using the sociability test in Swiss albino mice.

Method: Mice were treated intraperitoneally with the serotonin precursor 5-hydroxy-L-tryptophan (5-HTP; 1, 5, 25, and 75 mg/kg), the serotonergic receptor antagonist metergoline (1, 5, and 10 mg/kg), or the serotonin-releasing agent fenfluramine (1, 5, and 10 mg/kg). Social behavior was assessed using the three-chamber sociability apparatus. Data were analyzed using one-way analysis of variance (ANOVA) followed by Newman–Keuls post hoc testing.

Results: Administration of 5-HTP produced a significant enhancement of sociability at 75 mg/kg, whereas lower doses were ineffective. Metergoline significantly reduced social interaction, indicating the involvement of endogenous serotonergic activity in maintaining normal social behavior. Fenfluramine significantly altered social interaction behavior and modified the effects of 5-HTP. Furthermore, fenfluramine significantly influenced 5-HTP-induced sociability, whereas metergoline failed to alter the effect of 5-HTP.

Conclusion: Serotonergic neurotransmission plays a crucial role in regulating social behavior in mice. Enhancement of central serotonin levels improves sociability, while serotonergic receptor modulation significantly influences social interaction. The serotonergic system may represent a promising therapeutic target for social deficits associated with neuropsychiatric disorders.

Keywords: *Serotonin; 5-Hydroxy-L-tryptophan (5-HTP); Sociability; Social Interaction*

O-02/N/038 ORAL · ONLINE

Utilisation of Smartphone application to assess the outcome in Ankylosing Spondylitis

Amanpreet Kaur* (GNIP, Dalewal), Amanpreet Kaur (Max Hospital, mohali), Nidhi Garg (Chitkara University)

Guru Nanak Institute of Pharmacy, Dalewal

Email: aman090896@gmail.com

Background/Purpose: Ankylosing spondylitis (AS) is a chronic inflammatory disease that primarily affects the axial skeleton and characterized by inflammatory back pain, leading to decreased mobility, function, and quality of life. Management of the disease includes the use of DMARDs, physical therapy, and other lifestyle remedies. There is a global challenge in meeting patients' needs and discrepancies in access to AS care, highlighting the urgent need to implement cost-effective disease management programs and deliver equal access to care. In modern era, most people having access to smart phones create opportunities for patient care in chronic diseases. This study aims to investigate the impact of smart phone application (HealthCius) on inflammatory disease activity and quality of life in AS patients.

Methods: A total of 100 patients were recruited in this observational study fulfilling the Modified New York Criteria, 1984 for AS. These patients were allocated to two groups: Intervention group (n=60) and Control group (n=40). The ones having ` application were assigned to the Intervention group and patients who did not have the facility of smart phones were grouped as Control. The patients in the two groups received standard treatment of AS. The application was designed after obtaining feedback from health care providers, patient counselors and AS patients using a questionnaire. To the patients, the app was their individual treatment plan. It helped them comply with the plan by providing an easy to refer checklist, reminders, alerts and a visual dashboard of their progress through the day. The app served as the doctor's virtual assistant inside the patient's smart phone. For the doctor, it was a live dashboard of all patients and their real time compliance levels. The data reported by the patients was available to the doctor in the form of time sliced charts and trend lines. Therefore, this app is designed to leverage technology to shift the patients' focus every day on to their treatment plan thereby driving up compliance and better health outcomes. Outcome measures included Erythrocyte sedimentation rate (ESR), C- Reactive protein (CRP), Ankylosing Spondylitis disease activity score (ASDAS), Bath Ankylosing Spondylitis disease activity score (BASDAI), bath ankylosing spondylitis functional index (BASFI) and health assessment questionnaire disability index (HAQ-DI) at baseline and at 24 weeks.

Results: Baseline characteristics were similar between groups with no significant difference. There was a significant difference between the control and intervention group for ASDAS ($p \leq 0.05$), BASDAI ($p \leq 0.05$), BASFI ($p \leq 0.05$), ESR ($p \leq 0.05$), CRP ($p \leq 0.05$) and HAQ-DI ($p \leq 0.05$) after 24 weeks in favor of smart phone application. Analysis within the groups revealed significant improvement in BASDAI ($p \leq 0.05$), ESR ($p=0.02$), CRP ($p=0.01$) and HAQ-DI ($p=0.01$) in the application group as compared to control group. Impact of DMARDs usage was also evaluated at the end of the study and it was found that the average drug usage of DMARDs was more in control group than the intervention group.

Conclusion: The study suggested that there was greater improvement in inflammatory disease activity and quality of life in smart phone application assisted AS patients suggesting that smart phone technology can be used to leverage health benefits in AS

O-02/N/039 ORAL · ONLINE

Natural Products as Multi-Target Modulators in Diabetic Cardiomyopathy Molecular Mechanisms and Therapeutic Perspectives

Khushbu*

Amar Shaheed Baba Ajit singh Jujhar singh memorial college of Pharmacy, Bela Ropar, Punjab
Email: khushichouhan030@gmail.com

Diabetic cardiomyopathy (DCM) is a major cardiovascular complication of diabetes mellitus, characterised by structural and functional abnormalities of the myocardium in the absence of primary coronary artery disease or hypertension. Prolonged hyperglycaemia, insulin resistance, metabolic disturbances, oxidative stress, mitochondrial dysfunction, chronic inflammation, endoplasmic reticulum stress, apoptosis, and cardiac fibrosis collectively contribute to the development and progression of DCM. Although conventional pharmacological therapies provide substantial cardiovascular benefits, the complex and interconnected pathophysiology of DCM highlights the need for therapeutic strategies capable of simultaneously targeting multiple disease-associated mechanisms.

Natural products have emerged as promising multi-target therapeutic candidates because of their diverse molecular actions and ability to modulate interconnected cellular signaling pathways. This review examines the mechanistic basis of natural product mediated cardio protection in experimental diabetic cardiomyopathy, with particular emphasis on oxidative stress, Nrf2/Keap1 signaling, NF-κB-mediated inflammation, NLRP3 inflammasome activation, AMPK and PI3K/Akt signaling, mitochondrial dysfunction, AGE/RAGE signaling, endoplasmic reticulum stress, apoptosis, autophagy/mitophagy, and TGF-β/Smad-mediated cardiac fibrosis. Evidence from preclinical studies involving flavonoids, polyphenols, terpenoids, alkaloids, and other bioactive phytochemicals is evaluated to identify recurring molecular targets and convergent mechanisms of cardioprotection.

The review further explores the emerging concept of multi-target phytopharmacology, in which individual natural products may simultaneously influence metabolic, redox, inflammatory, mitochondrial, and fibrotic pathways. Translational challenges including bioavailability, pharmacokinetic variability, dose standardization, mechanistic validation, safety, and limited clinical evidence are also discussed. Understanding these interconnected mechanisms may facilitate the development of natural products as complementary or lead therapeutic strategies for DCM and provide a framework for future mechanism driven and clinically relevant investigations.

Keywords: *Diabetic cardiomyopathy, natural products, phytochemicals, oxidative stress, Nrf2/Keap1, mitochondrial dysfunction, inflammation, multi-target pharmacology and cardiac fibrosis.*

P-02/N/001 POSTER · ONLINE

Targeting the Microbiota-Gut-Brain Axis: Therapeutic Potential of Gut Microbiota Modulation in Kindling Epilepsy

Kunal* and Ashwani Kumar Jangra

Department of Pharmacology, Gurukula Kangri (Deemed to be University), Haridwar, Uttarakhand, India
Email: kunal.rana1364@gmail.com

Epileptogenesis and seizure susceptibility are closely linked to the microbiota-gut-brain (MGB) axis. Recent evidence indicates that intestinal dysbiosis promotes systemic inflammation, alters blood-brain barrier permeability, and exacerbates seizure thresholds. This study investigates the impact of gut microbiota modulation on kindling epileptogenesis and seizure control. Using kindling animal models (e.g., pentylenetetrazole or electrical kindling), subjects were evaluated for microbial composition changes. Experimental groups received microbiota-targeted interventions, including probiotic supplementation (e.g., Lactobacillus and Bifidobacterium strains), specific dietary interventions, and fecal microbiota transplantation (FMT) from healthy donors. Seizure severity, kindling acquisition rates, and MGB axis markers (e.g., short-chain fatty acid [SCFA] levels, inflammatory cytokines, and GABA/glutamate ratios) were monitored. Modulation of the gut microbiota significantly delayed the progression of kindled seizures and reduced seizure frequency. Treated subjects exhibited restored intestinal barrier integrity, decreased systemic inflammation, and a normalization of excitatory/inhibitory neurotransmitter balance in the central nervous system. Furthermore, microbiome restoration counteracted pro-epileptic metabolites, directly increasing the seizure threshold. Gut microbiota modulation exhibits robust, disease-modifying potential in kindling epilepsy models by interrupting pathogenic signaling along the MGB axis. These findings suggest that targeted microbiome interventions could serve as a novel, adjunctive therapeutic strategy for refractory epilepsy and epileptogenesis.

Keywords: *Microbiota-gut-brain axis, Gut microbiota, Epilepsy, Pathogenesis, Therapy*

P-02/N/002 POSTER · ONLINE

Molecular Consequences of β-Carbon Stereochemistry on Proteins

Khaled Hoseyni,*Mehdi Irani

Department of Chemistry, University of Kurdistan, Sanandaj, 66177-15175, Iran
Email: kh.hoseini@uok.ac.ir

Side-chain stereochemistry influences protein structure and dynamics, but the effects of β-carbon configuration are not well understood. Here, we examined the impact of β-carbon inversion in isoleucine and threonine by replacing the canonical residues with their allo diastereomers (L-allo-isoleucine and L-allo-threonine) in glyoxalase I (GlxI), glyoxalase II (GlxII), and myrosinase. All-atom molecular dynamics simulations (1 μs) were performed for the native and stereochemically modified systems. Structural stability, conformational flexibility, and collective motions were analyzed using RMSD, RMSF, hydrogen-bond analysis, and principal component analysis. The results reveal protein-dependent responses to β-carbon inversion. GlxI shows reshaped conformational sampling with increased dynamical heterogeneity, GlxII exhibits reduced fluctuations and restricted motions, and myrosinase displays pronounced sensitivity to threonine inversion with expanded conformational space. These results demonstrate that β-carbon stereochemistry can modulate protein energy landscapes and collective dynamics without altering the peptide backbone, highlighting an underappreciated role of side-chain stereochemistry in protein architecture. In addition, we introduce a program for analyzing PDB files and performing β-carbon stereochemical inversion, available on GitHub (https://github.com/iranimehdi/protein_setup).

Keywords: *β-carbon stereochemistry; allo-amino acids; protein dynamics; molecular dynamics simulation; protein engineering*

P-02/N/003 POSTER · ONLINE

Machine-Learning-Assisted Virtual Screening of Indian Medicinal-Plant Phytochemicals Targeting the NLRP3 Inflammasome: Molecular Docking and ADMET-Based Identification of Potential Anti-Alzheimer's Candidates

Harjot Kaur*, Navpreet Kaur

G.H.G Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana-141104, Punjab, India.
Email: kaur.20harjot@gamil.com

Alzheimer's disease (AD) is a progressive neurodegenerative disorder associated with memory loss and cognitive decline. Neuroinflammation plays an important role in AD progression, and the NLRP3 inflammasome has emerged as a promising therapeutic target because its activation can promote the release of inflammatory mediators and contribute to neuronal damage. Phytochemicals obtained from medicinal plants may provide potential candidates for modulating NLRP3 due to their diverse biological activities. The present study aims to identify potential NLRP3-targeting phytochemicals from selected Indian medicinal plants using a computer-aided drug discovery approach. A phytochemical library will be prepared from reported compounds of selected medicinal plants and screened using a machine-learning model to prioritize compounds with potential NLRP3 inhibitory activity. The shortlisted compounds will then be evaluated by molecular docking to study their binding affinity and interactions with the NLRP3 target. ADMET analysis will subsequently be performed to predict important pharmacokinetic and toxicity properties, including drug likeness and potential blood–brain barrier penetration. The integrated results are expected to identify promising phytochemical candidates with favorable predicted binding and pharmacokinetic profiles. These findings may provide a preliminary basis for further experimental investigation of Indian medicinal-plant compounds as potential NLRP3-targeted approaches for Alzheimer's disease. The study also demonstrates the usefulness of machine learning combined with virtual screening for the early-stage identification of natural-product drug candidates.

Keywords: *Alzheimer's disease; NLRP3 inflammasome; Indian medicinal plants; Phytochemicals; Molecular docking; ADMET.*

P-02/N/004 POSTER · ONLINE

Cyclodextrin-Enabled Cancer Immunotherapy: Advancing Targeted Delivery an Antitumor Immune Responses

Harshpreet Kaur*

GHG Khalsa college of pharmacy, Gurusar Sadhar
Email: hk2068661@gmail.com

Tumor immunotherapy offers a key advantage over many conventional treatment approaches: it can produce durable antitumor responses that help limit metastasis and tumor recurrence. Despite this potential, its clinical effectiveness is often hindered by the poor aqueous solubility of immunomodulatory agents and by tumor immune-evasion mechanisms.

Cyclodextrins (CDs) are promising materials for addressing these limitations because they combine a hydrophobic internal cavity with a hydrophilic outer surface. This unique structure enables them to improve the solubility, stability, delivery, and therapeutic performance of poorly water-soluble immune modulators. Consequently, CD-based systems have opened new possibilities for strengthening cancer immunotherapy and overcoming barriers associated with tumor immune escape.

Although cyclodextrins have been extensively explored in cancer therapy, reviews specifically focused on their role in cancer immunotherapy remain limited. This review therefore presents a comprehensive overview of CD applications in tumor immunotherapy, highlighting their functions, mechanisms, and reported delivery strategies. It also summarizes recent progress in the development of CD-based immunotherapeutic systems and their potential to improve anticancer efficacy.

Keywords: *Cyclodextrins, Immunotherapy, Immunomodulatory agents, Tumor, Antitumor*

P-02/N/005 POSTER · ONLINE

Antidiabetic Screening Methods: A Comprehensive Review of In Vitro, In Vivo, and In Silico Models

Vaishnavi Dadarao More*, Vishnu Neharkar

Savitribai Phule Pune University, Rasiklal M Dhairiwal Institute of Pharmaceutical Education and Research, Chinchwad
Email: morevaishnavi68@gmail.com

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels due to impaired insulin secretion or insulin action. The increasing prevalence of diabetes highlights the need for safe and effective antidiabetic therapies. Antidiabetic screening methods are essential for identifying and evaluating potential therapeutic agents. Various approaches, including in vitro, in vivo, ex vivo, and in silico methods, are used in the drug discovery process. In vitro assays provide rapid preliminary screening of compounds through enzyme inhibition, glucose uptake, and insulin-related studies. In vivo animal models help evaluate antidiabetic efficacy, systemic effects, and toxicity. Ex vivo studies using isolated tissues and cells provide information about specific biological mechanisms, while in silico approaches help predict molecular interactions and potential drug targets. Each method has specific advantages and limitations. Therefore, combining these approaches provides a comprehensive understanding of potential antidiabetic agents and supports the development of safer and more effective treatments for diabetes.

Keywords: *Diabetes mellitus, Antidiabetic activity, Screening models, In vitro assays, In vivo models, Streptozotocin, Alloxan, Drug discovery, Insulin resistance, Hyperglycemia.*

P-02/N/006 POSTER · ONLINE

Diabetic Cardiomyopathy, Current Epidemiology, Pathophysiology and Therapeutic Landscape

Sumair Farooq*, Ms Khushbu

Amar Shaheed baba Ajit Singh Jujhar Singh Memorial, College of Pharmacy, Bela, 140111, Punjab, India
Email: sketchmadebyme@gmail.com

Diabetic cardiomyopathy (DCM) is an important cardiovascular complication of diabetes mellitus, characterized by structural and functional abnormalities of the myocardium that cannot be fully explained by coronary artery disease or other primary cardiac conditions. Diabetes substantially increases the risk of heart failure, with DCM developing through interconnected metabolic, oxidative, inflammatory, mitochondrial, and fibrotic mechanisms. The current evidence on the epidemiology, pathophysiology, diagnosis, and therapeutic management of DCM. Chronic hyperglycemia, insulin resistance, dyslipidemia, mitochondrial dysfunction, oxidative stress, inflammation, advanced glycation, apoptosis, and myocardial fibrosis contribute to progressive cardiac remodelling and dysfunction. Echocardiography and cardiac magnetic resonance provide important tools for detecting structural and functional abnormalities, although standardized diagnostic criteria remain limited. Current management focuses on glycemic and cardiovascular risk factor control and guideline directed heart-failure therapy. SGLT2 inhibitors and GLP-1 receptor agonists have demonstrated important cardiovascular benefits, while emerging approaches targeting oxidative stress, inflammation, mitochondrial dysfunction, and myocardial remodelling remain under investigation. Further research is needed to establish validated diagnostic criteria, identify DCM at an earlier stage, and develop therapies specifically targeting its underlying mechanisms.

Keywords: *Diabetic cardiomyopathy, diabetes mellitus, heart failure, oxidative stress, inflammation; myocardial fibrosis, SGLT2 inhibitors, GLP-1 receptor agonists*

P-02/N/007 POSTER · ONLINE

Dopamine D1 Receptor Blockade With SKF-83566 Reverses Olanzapine-Induced Inhibition Of Gastric Acid Secretion

Navpreet Kaur[1]*, Anuja Chopra, Sonia Singla

G.H.G Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana, 141104
Email: navpreetrandhawa756@gmail.com

Gastric acid secretion and the vulnerability of gastric mucosa to experimental injury are modulated by dopaminergic agents. We have previously demonstrated that Olanzapine, considered to be a novel antagonist at dopamine D4 receptors, markedly attenuates both basal gastric acid secretion and gastric lesions induced by restraint stress. However, since the D4 selectivity of Olanzapine has been challenged in recent literature, the present study evaluated whether the anti-secretory action of Olanzapine could be influenced by SKF-83566, a prototypical D1 receptor antagonist. At doses devoid of any intrinsic effect on acid secretion, S KF-83566, administered via either intraperitoneal or intracerebroventricular route, significantly abolished the acid-inhibitory effect of Olanzapine given peripherally or centrally. These findings indicate that the receptor selectivity of Olanzapine for D4 and of SKF-83566 for D1 receptors is less stringent than previously assumed.

Keywords: *dopamine D4 receptors, SKF-83566, Olanzapine, gastric lesions, stress.*

P-02/N/008 POSTER · ONLINE

Preclinical Screening Models and Methods for Evaluation of Antidiabetic Activity of Medicinal Plants: Current Perspectives

Shubham Rajebhau Ballal*

Department of Pharmacology, Rasiklal M. Dhariwal Institute of Pharmaceutical Education and Research, (RMDIPER), Chinchwad, Pune, Maharashtra, India
Email: shubhamballal93@gmail.com

Diabetes mellitus is a major metabolic disorder characterized by persistent hyperglycemia and associated complications. Medicinal plants are extensively investigated as potential sources of antidiabetic agents due to their diverse bioactive constituents. This review aims to summarize commonly used preclinical screening models and methods for evaluating the antidiabetic activity of medicinal plants and their phytoconstituents. Relevant in-vitro and in-vivo approaches were reviewed with emphasis on their principles, applications, evaluation parameters, and limitations. Commonly employed in-vitro methods include α-amylase and α-glucosidase inhibition, glucose uptake, dipeptidyl peptidase-4 inhibition, and antioxidant assays, whereas in-vivo studies frequently use streptozotocin-, alloxan-, and diet-induced diabetic models. Key evaluation parameters include blood glucose, oral glucose tolerance, serum insulin, body weight, lipid profile, oxidative stress markers, and histopathological changes. The reviewed approaches indicate that complementary in-vitro and in-vivo models provide progressive evidence of antidiabetic potential. However, variations in plant material, extraction methods, doses, treatment duration, animal models, controls, and endpoints may affect interpretation and reproducibility. Overall, appropriate model selection and standardized experimental design are essential for reliable pharmacological evaluation of medicinal plants and identification of promising candidates for further mechanistic and therapeutic investigations.

Keywords: *Diabetes mellitus; Medicinal plants; Antidiabetic activity; Preclinical screening; In-vitro models; In-vivo models*

P-02/N/009 POSTER · ONLINE

Screening Models for Central Nervous System Stimulants and Depressants: Advances, Applications, and Future Perspectives

Bhokare Sanchit Shantinath*

Rasiklal M. Dhariwal Institute of Pharmaceutical Education & Research, Chinchwad Pune 411019
Email: sanchitbhokare@gmail.com

Central nervous system (CNS) stimulants and depressants profoundly affect neuronal activity and are widely used to treat neurological, psychiatric, and sleep-related disorders. The discovery and development of these agents require reliable screening models to evaluate their pharmacological activity, efficacy, and safety. This review summarizes the major in vivo, in vitro, and emerging in silico screening models used to assess CNS stimulants and depressants. For CNS stimulants, commonly employed animal models include locomotor activity tests, amphetamine-induced hyperactivity, open-field tests, and electroencephalographic (EEG) evaluations, which assess arousal, motor activity, and behavioral activation. Screening of CNS depressants primarily involves models such as pentobarbital-induced sleep time, rotarod performance, actophotometer studies, elevated plus maze, and EEG-based assessments to measure sedation, anxiolytic effects, and motor impairment. In vitro approaches, including receptor-binding assays, neuronal cell cultures, neurotransmitter release studies, and ion-channel analyses, provide mechanistic insights into drug action. Recent advances in computational modeling, artificial intelligence, and high-throughput screening have further enhanced the identification and optimization of CNS-active compounds. The integration of traditional pharmacological methods with modern molecular and computational techniques offers a comprehensive framework for evaluating CNS stimulants and depressants, accelerating drug discovery while improving predictive accuracy and reducing reliance on animal experimentation. This review highlights the strengths, limitations, and applications of current screening models and discusses future directions for developing more translational and ethically sustainable approaches in CNS drug research.

Keywords: *Central Nervous System, CNS Stimulants, CNS Depressants, Drug Screening Models, Neuropharmacology, In Vivo Screening, In Vitro Screening, In Silico Modeling.*

P-02/N/010 POSTER · ONLINE

Microglial SHIP1 (INPP5D) Inhibition as a Novel Approach for Modulating Neuroinflammation in Alzheimer's Disease

Pallavi Duggal*

Shivalik College of Pharmacy, Nangal
Email: pallaviduggal03@gmail.com

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive impairment and complex pathological changes, including amyloid-β accumulation, tau hyperphosphorylation, synaptic dysfunction, oxidative stress, and chronic neuroinflammation. Increasing evidence indicates that dysregulated microglial activity plays a critical role in the progression of AD. Src homology 2-containing inositol 5-phosphatase 1 (SHIP1), encoded by the INPP5D gene, is a lipid phosphatase predominantly expressed in microglia and is involved in the regulation of phosphoinositide-dependent signaling pathways that control microglial activation, survival, phagocytosis, and inflammatory responses. Alterations in INPP5D/SHIP1 signaling have been associated with AD risk and impaired microglial responses to pathological stimuli. SHIP1 inhibition may modify PI3K-dependent signaling and potentially enhance microglial phagocytic activity while altering inflammatory signaling. Therefore, pharmacological modulation of SHIP1 represents a potential strategy for restoring beneficial microglial functions and reducing detrimental neuroinflammation. However, the precise consequences of SHIP1 inhibition may depend on disease stage, cellular context, and the specific signaling pathways affected.The proposed research aims to investigate the neuroprotective potential of SHIP1 inhibition in an experimental model of AD, with particular emphasis on microglial activation, neuroinflammatory signaling, oxidative stress, amyloid pathology, tau hyperphosphorylation, and cognitive function. The study may provide mechanistic insights into the role of SHIP1 in AD-associated microglial dysfunction and establish whether SHIP1 represents a viable therapeutic target for modulating neuroinflammation and neurodegeneration in AD.

Keywords: *Alzheimer's disease; SHIP1 inhibitors; INPP5D; microglia; neuroinflammation, PI3K/Akt signaling*

P-02/N/011 POSTER · ONLINE

Design And Development of Polyherbal Micellar Galactagogue For Maternal Wellness

Aaliya Almaas.S, Priyadharshini

Department of Pharmacognosy and Phyto Pharmacy, JSS College of Pharmacy, JSS Academy of Higher Education and Research, Ooty, Nilgiris, Tamil Nadu, India.
Email: aaliyaalmaas@gmail.com

Introduction: Hypogalactia is an extremely prevalent problem in lactating women that can significantly impact the nutritional intake of infants and adversely affect mothers' health status. Galactagogues derived from natural plants have been extensively used because of their high efficacy, safety profile, and effectiveness in lactogenic applications.

Aim And Objective: To formulate and evaluate a polyherbal micellar formulation of Asparagus racemases, Moringa oleifera and Trigonella foenum-graecum to improve the bioavailability of phytoconstituents and galactagogue activity.

Methods: Hydroalcoholic extracts of the selected plants were incorporated into a micellar system using suitable surfactants and cosurfactants. The optimized formulation was evaluated for its physicochemical properties, entrapment efficiency, and stability. Its galactagogue activity was assessed in lactating animals by monitoring milk production, pup weight, mammary gland changes, and the expression of lactation-related genes using qRT-PCR.

Results: The optimized polyherbal micellar formulation showed small, uniform droplets with good stability and high entrapment efficiency. Treatment improved milk production, pup growth, and mammary gland development compared with the control group ($P < 0.0001$). It also increased the expression of lactation-related genes, including β-casein and PRLR.

Summary: The developed polyherbal micellar formulation showed promising potential in enhancing lactation. The formulation improved milk production, pup growth, and mammary gland development, suggesting its possible use as a natural approach for managing hypogalactia.

Conclusion: The developed polyherbal micellar formulation showed promising galactagogue activity and may provide a natural approach for supporting lactation and managing hypogalactia. Further clinical studies are needed to establish its safety and effectiveness in humans.

Keywords: *Galactagogue, Micellar formulation, Hypogalactia, Shatavari, Fenugreek, Moringa.*

P-02/N/012 POSTER · ONLINE

Decoding the Gut Microbiome–PMOS Connection: Molecular Mechanisms, Metabolic Crosstalk and Therapeutic Opportunities

Navin Kumar P*, Priya Dharshini

Department of Pharmacology, JSS College of Pharmacy, JSS Academy of Higher Education & Research, Ooty, Nilgiris, Tamil Nadu – 643001, India.
Email: navinkumarp4539@gmail.com

Introduction: Polyendocrine metabolic ovarian syndrome (PMOS), previously known as polycystic ovary syndrome (PCOS), is a heterogeneous endocrine–metabolic disorder associated with hyperandrogenism, insulin resistance, ovulatory dysfunction and chronic inflammation. Increasing evidence suggests that alterations in the gut microbiome may contribute to these interconnected abnormalities.

Aim & Objectives: To examine the association between the gut microbiome and PMOS, with emphasis on microbial changes, gut-derived metabolites, metabolic–endocrine interactions and emerging microbiome-based therapeutic strategies.

Methods: A literature review of studies published between 2020 and 2026 was conducted using electronic database systems like PubMed, Scopus and Google Scholar. Studies addressing gut microbiome composition, microbial metabolites, host–microbe interactions and microbiome-targeted interventions were evaluated.

Results: Current evidence suggests that gut microbial alterations may affect intestinal barrier function, insulin sensitivity, inflammation, lipid metabolism and steroid hormone regulation. Metabolites such as short-chain fatty acids and bile acids may act as key mediators of communication between the gut, metabolic pathways, endocrine system and ovaries. Dietary interventions, prebiotics, probiotics, symbiotic and phytochemicals have demonstrated potential benefits. Maternal and early-life microbiome factors may also contribute to later PMOS susceptibility. Nevertheless, differences among populations and study designs limit definitive conclusions regarding causality.

Summary: Evidence points to a complex and potentially bidirectional gut–metabolism–endocrine–ovary axis in PMOS.

Conclusion: The gut microbiome may play an important role in linking metabolic, endocrine and ovarian disturbances in PMOS. Further longitudinal and well-controlled clinical studies are required to clarify causality and therapeutic potential.

Keywords: *Gut Microbiome; PMOS; PCOS; Microbial Metabolites; Insulin Resistance; Probiotics*

P-02/N/013 POSTER · ONLINE

Bradykinin: Synthesis, Mechanism of Action, Physiological Functions, and Clinical Significance

Dhanika Goyal

GHG Khalsa College Of Pharmacy, Gurusar Sudhar
Email: dhanikagoyal@gmail.com

Bradykinin is a biologically active peptide that plays an important role in inflammation, vascular regulation, and pain perception. It is generated from kininogen by the action of kallikrein and exerts its effects mainly through B1 and B2 bradykinin receptors. Bradykinin promotes vasodilation and increases vascular permeability by stimulating the release of mediators such as nitric oxide, prostaglandins, and endothelium-derived factors. These actions contribute to the development of pain, redness, swelling, and inflammatory responses. Bradykinin also has important clinical relevance because excessive bradykinin activity is associated with conditions such as angioedema, inflammation, and certain adverse effects of ACE inhibitor therapy. Understanding the synthesis, mechanism of action, physiological functions, and clinical significance of bradykinin provides valuable insight into its role in health and disease and highlights its potential as a therapeutic target.

Society of Pharmaceutical Education & Research (SPER)

ADVANCING KNOWLEDGE, ENHANCING CARE.

Empowering Innovations. Transforming Lives.

Advancing healthcare through knowledge, evidence, innovation & collaboration.



The **Society of Pharmaceutical Education & Research (SPER)** is one of India's leading professional organizations dedicated to advancing pharmaceutical education, scientific research, healthcare innovation, and academic excellence. Through a dynamic network of researchers, academics, healthcare professionals, industry leaders and students, SPER creates impactful opportunities that bridge the gap between academia, industry, and patient care.

SCIENCE & RESEARCH
Advancing research, evidence generation and scientific publications.

EDUCATION & DEVELOPMENT
Quality education, training, mentorship and professional growth.

COLLABORATION
Uniting academia, clinical practice, industry, research and healthcare stakeholders for greater impact.

LEADERSHIP & IMPACT
Fostering scientific dialogue, leadership forums, innovation and better healthcare outcomes.

4,500+ Members | **19** State Branches | **National Scientific Platform** For Education, Research & Healthcare Innovation

OUR KEY INITIATIVES

SPER Leadership Summits
Thought leadership forums on emerging trends and future opportunities.

SPER Annual Conferences
International platform for scientific exchange and professional networking.

Research Funding
Support for innovative research and young investigators.

JAPTR & Scientific Publications
Dissemination of high-quality research and scientific knowledge.

Women's Forum
Empowering women in pharmaceutical sciences and healthcare.

Student Forum
Nurturing future leaders through learning, mentoring and engagement.

Join SPER

Connect Knowledge • Inspire Research • Create Impact

www.sperpharma.org

Academia | Industry | Healthcare | Global Community

CATEGORY 3 | 128 ABSTRACTS

Pharmaceutics & Industrial Pharmacy



O-03/F/001 ORAL · OFFLINE

Targeted Colorectal Cancer Therapy Using Biomolecule-Functionalized Nanocarriers

Pradhi Srivastava*, Nitin Sharma

Centre of Pharmaceutics, Amity Institute of Pharmacy, Amity University Uttar Pradesh, Noida, Uttar Pradesh, 201313, India
Email: pradhisri@gmail.com

Introduction: Colorectal cancer remains a major cause of cancer-related morbidity and mortality worldwide. Conventional chemotherapy is limited by poor selectivity, systemic toxicity, inadequate tumour accumulation and drug resistance. Surface functionalization of nanocarriers with targeting biomolecules offers a promising strategy for improving treatment precision.

Aim & Objective: This review aimed to evaluate recent advances in biomolecule-functionalized nanocarriers for colorectal cancer treatment, focusing on targeting mechanisms, therapeutic outcomes, theranostic potential and barriers to clinical translation.

Methods: A detailed literature search was conducted across PubMed, Scopus and Web of Science for studies published between 2015 and 2025, using keywords related to functionalized nanocarriers, surface biomolecule ligation, colorectal cancer and targeted drug delivery.

Result: Biomolecule ligation enhanced receptor-mediated internalization, tumour-specific accumulation, controlled drug release, cellular uptake and anticancer activity while reducing off-target toxicity. Polymeric nanoparticles, PEGylated liposomes, micelles, dendrimers, solid lipid nanoparticles and inorganic platforms demonstrated improved outcomes in colorectal cancer models. Theranostic systems can help detect and treat tumours at the same time. However, their clinical use remains limited by problems such as reduced stability, immune reactions, rapid removal from the body, difficult manufacturing, differences among tumours and insufficient testing in animal models.

Summary & Conclusion: Surface modification of nanocarriers with antibodies, aptamers, peptides and folic acid enhances tumour-specific drug delivery, cellular uptake and controlled release while reducing damage to healthy tissues. These systems also support combined diagnosis and treatment. Overall, they offer a promising approach for colorectal cancer therapy but require preclinical and clinical validation.

Keywords: *Colorectal cancer, Functionalized nanocarriers, Surface biomolecule ligation, Targeted drug delivery, Nanomedicine.*

O-03/F/002 ORAL · OFFLINE

Development of a Research-Driven Experimental Learning Framework for Cyclodextrin-Based Drug Delivery: An NEP-2020 Approach

Nandini*, Raj Kumar Narang, Amandeep Singh

Department of Pharmaceutics, ISF College of Pharmacy, Moga 142001, Punjab, India
Email: nshar755@gmail.com

Introduction: The rapidly evolving pharmaceutical sector requires graduates with strong conceptual knowledge, practical competencies, research aptitude, critical thinking, and innovation skills. The National Education Policy (NEP)-2020 promotes experimental, multidisciplinary, skill-based, research-oriented, and learner-centric education. Cyclodextrin-based drug delivery provides an interdisciplinary platform through which pharmaceutical chemistry, pharmaceutics, drug delivery, analytical characterization, and formulation development can be integrated into experimental learning.

Aim & Objectives: The present work aimed to develop a research-driven experimental learning framework for integrating cyclodextrin-based drug delivery into pharmaceutical education in alignment with NEP-2020. The objectives were to integrate theoretical and practical CD concepts, develop research-oriented laboratory activities, incorporate Quality by Design (QbD) and formulation optimization, and establish measurable learning outcomes related to scientific knowledge, practical skills, critical thinking, research, and innovation.

Methods: A structured five-stage educational framework was developed comprising conceptual learning, experimental learning, research-based learning, innovation and application, and outcome-based assessment. Learning activities included cyclodextrin structure and complexation, phase-solubility studies, inclusion complex preparation, and characterization using FTIR, DSC, XRD, SEM, and dissolution studies. Problem-based learning, QbD, mini-projects, scientific presentations, and innovation-oriented activities were incorporated.

Results: The proposed framework established a progressive pathway from classroom learning to laboratory experimentation, formulation optimization, research, and innovation. It enabled mapping of cyclodextrin-related learning activities with NEP-2020 outcomes, particularly experimental learning, multidisciplinary knowledge, critical thinking, research aptitude, scientific communication, and innovation.

Summary: The framework provides a structured model for transforming cyclodextrin technology from a conventional theoretical topic into an application-oriented research-learning platform.

Conclusion: Integration of cyclodextrin-based drug delivery with experimental and research-driven pedagogy may strengthen pharmaceutical education and develop future-ready graduates equipped for academic, industrial, and translational research. The proposed framework offers a scalable approach for implementing NEP-2020 principles within pharmaceutical education.

Keywords: *Cyclodextrin; NEP-2020; Pharmaceutical Education; Experimental Learning; Research-Based Learning.*

O-03/F/003 ORAL · OFFLINE

Advanced Targeted Drug Delivery Systems

Mir Ashfaq Ali*, Mir Mushtaq Ali

Aurangabad Pharmacy College mitmita, Chatrapati Sambhaji nagar, Maharashtra India.
Email: mirashfaqali0@gmail.com

Targeted drug delivery systems (TDDS) represent a fundamental change in pharmacology, moving from systemic delivery to site-specific therapeutic action. By delivering therapeutic agents directly to target tissues while minimizing exposure to healthy tissues, TDDS improves drug absorption, reduces side effect, and improve therapeutic effectiveness. This paper reviews covers the primary mechanisms behind drug targeting including passive, active, and stimulus-responsive strategies along with evaluates key nano and micro-carriers, explores primary clinical applications and future outlook for bringing these technologies to clinical practice. Targeted drug delivery helps in precise medication delivery to specific organs while minimizing adverse effects on healthy tissues. The evolution of nanocomposite materials has significantly enhanced drug delivery capabilities, offering improved drug-loading efficiency, biocompatibility, and controlled release properties. Various delivery vehicles, including colonspecific systems, liposomes, hydrogels, microfluidics, niosomes, biodegradable particles, microalgae-based carriers, artificial DNA nanostructures, quantum dots, microspheres, and modified plasma proteins, have demonstrated promising results in therapeutic applications. These systems exhibit unique characteristics that facilitate targeted drug administration through different physiological barriers. The integration of smart delivery mechanisms with conventional therapeutic approaches has led to enhanced drug efficacy and reduced systemic toxicity. Recent developments in carrier design and fabrication techniques have improved drug solubility, stability, and bioavailability. Incorporating targeting moieties and stimuli-responsive elements has enabled precise control over drug-release kinetics and tissue specificity. This review work presents recent developments in targeted drug delivery systems, highlighting their mechanisms, applications, and potential impact on future therapeutic strategies.

Keywords: *Targeted drug delivery; Nanocarriers; Biocompatibility; Drug release kinetics; Therapeutic efficacy.*

O-03/F/004 ORAL · OFFLINE

Smart Biosensor for Real Time Cancer Therapy: A Next Generation Approach to Tumor Microenvironment Modulation

Saksham Sharma*, Amit Sharma

Department of Pharmaceutics ISF College of Pharmacy, Moga, Punjab, India
Email: sakshamsharma5238@gmail.com

The tumor microenvironment (TME)—basically the environment surrounding a cancer tumor—isn't static. It's a complex, constantly shifting ecosystem that plays a huge role in how cancer grows, evolves and responds to treatment. Conventional cancer therapies usually struggle to accurately and rapidly target tumors. This review explores using smart biosensors and antimicrobial peptides (AMPs) together for better tumor treatment. AMPs may exhibit anticancer activity, and biosensors can monitor the tumor environment as it changes. This system uses various biosensors to detect biomarkers of tumor growth, such as low oxygen (hypoxia), pH changes, and specific enzyme activity. When these biomarkers are found, the system may activate or trigger the localized release of AMPs to eliminate cancer cells while protecting healthy cells. This represents a shift from standard treatments toward therapies that adapt to the cancer's changing environment. This approach could improve therapeutic efficacy, reduce side effects, and enhance patient outcomes through tailored treatment. In this review, we examine how the biosensors are being used to activate AMPs for treating cancer. We cover the main research findings so far, the challenges that researchers are still addressing, recent progress in the field, and what might come next.

Keywords: *Tumor, Antimicrobial peptides, biosensors, malignancy, tumor microenvironment.*

O-03/F/005 ORAL · OFFLINE

Nanoparticles encapsulated in Abelmoschus esculentus polysaccharide-based pellets as colon targeting approach

Akshita

ISF College of Pharmacy, Moga, 142001, Punjab, India
Email: akshita1913@gmail.com

Ulcerative colitis is a colonic disease characterized by the disruption of the mucosal epithelial layer and inflammation. Mesalazine (MLZ), an anti-inflammatory drug of the amino salicylates class is recognised as a promising agent for UC. When used orally as a conventional formulation, MLZ has a few shortcomings, notably, long-term usage is linked with undesirable side effects. Secondly, when administered orally it abruptly gets absorbed in the upper GI tract and peripheral organs, where it is not required. Furthermore, an insufficient amount of drug reaching the colon or low bio availability necessitates multiple dosing which affects compliance with the therapy. To circumvent these aforementioned issues associated with the oral administration of conventional dosage forms, the application of mesalazine loaded nanoparticles (MLZ-NPs) encapsulated in Abelmoschus esculentus plant polysaccharide-based pellets (MLZ-NPs-Pellets) for ulcerative colitis. MLZ-NPs were prepared and evaluated for diameter, PDI, and entrapment efficiency. In-vitro efficacy study was conducted on Caco-2 cells. MLZ-NPs were encapsulated in polysaccharides to form MLZ-NPs-Pellets and characterized (in vitro, in vivo) for efficacy in animals and targeting efficiency in human volunteers. Gamma scintigraphy revealed that the formulation can effectively target the colon within 600 min. MLZ-NPs-Pellets can be effectively used for microbial-triggered colon targeting approach in treating ulcerative colitis.

Keywords: *Colon Targetting, Pellets, Abelmoschus esculentus, Nano particles.*

O-03/F/006 ORAL · OFFLINE

Development and Investigation of a Herbal Extract for Diabetic and Non-Diabetic Wound Healing

Muinur Rahman*, Sant Kumar Verma, Ghanshyam Das Gupta

ISF ISF College of Pharmacy, Moga, Punjab, India
Email: muinurrehman@isfcp.org

Introduction: Wound healing is impaired in diabetes due to oxidative stress, chronic inflammation, microbial infection, and altered tissue repair. Grewia asiatica L. is traditionally used for medicinal purposes and contains bioactive phytoconstituents with antioxidant, anti-inflammatory, antimicrobial, and wound-healing potential.

Methodology: G. asiatica leaves were shade-dried, powdered, and continuously extracted in a Soxhlet apparatus using methanol:water (70:30, v/v) at 65 °C. The extract was subjected to qualitative phytochemical screening, total phenolic content (TPC), total flavonoid content (TFC), DPPH radical scavenging, bovine serum albumin (BSA) protein denaturation, and agar well diffusion assays against Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans.

Results: The hydroalcoholic extract showed a 12.46% (w/w) yield and contained flavonoids, phenolics, tannins, alkaloids, terpenoids, saponins, glycosides, proteins, and carbohydrates. TPC and TFC were 15.21 mg GAE/g and 102.97 mg QE/g extract, respectively. DPPH scavenging increased from approximately 87% at 10 µg/mL to 96% at 100 µg/mL. BSA protein denaturation inhibition increased from approximately 80% to 92% across 50–250 µg/mL and exceeded diclofenac under the tested conditions. Antimicrobial activity was highest against P. aeruginosa (12.50 ± 0.50 mm at 200 mg/mL).

Summary and Conclusion: The findings demonstrate that G. asiatica leaf extract possesses substantial antioxidant, anti-inflammatory, and antimicrobial activities. Its phytochemical profile and biological activities support its potential as a natural ingredient for topical wound-healing formulations, particularly for diabetic and infected wounds.

Keywords: *Grewia asiatica L.; wound healing; antioxidant; anti-inflammatory; antimicrobial; phytochemical.*

O-03/F/007 ORAL · OFFLINE

Development and Optimization of Microneedle System(s) for Targeted Delivery of Anti-Rheumatic Drugs

Charanjeet Singh[1,3], Preeti Patel[2*]

[1]Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India, 142001
[2]Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India, 142001
[3] Research Scholar, I.K. Gujral Punjab Technical University, Jalandhar, India.
Email: singhcharanjeet1991.cs@gmail.com

Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by persistent synovial inflammation, cartilage degradation, and progressive joint destruction. Methotrexate (MTX) remains a cornerstone disease-modifying antirheumatic drug; however, conventional administration is associated with systemic exposure and dose-related adverse effects. Apigenin, a naturally occurring flavonoid, possesses anti-inflammatory, antioxidant, and immunomodulatory properties and may provide complementary therapeutic activity. The present research aims to develop a microneedle system for targeted transdermal co-delivery of MTX and Apigenin to improve localized drug delivery in RA. Preformulation studies were performed to characterize MTX and establish its physicochemical properties relevant to formulation development. MTX exhibited a yellow crystalline appearance, with an experimentally observed partition coefficient of −1.82 ± 0.02, melting range of 194–197°C, and UV absorption maximum at 302 nm. Solubility studies demonstrated that MTX was insoluble in water, ethanol and chloroform, while showing solubility in pbs (pH 6.8) and 0.1 N NaOH. FTIR analysis demonstrated characteristic functional-group peaks consistent with the drug structure. UV calibration curve for MTX in PBS pH 6.8 showed good linearity over 5–25 µg/mL (R^2 = 0.9997). Furthermore, molecular docking was performed using the cDOCKER protocol in BIOVIA Discovery Studio 2024 against PDB ID 4TWT. Apigenin and MTX demonstrated docking scores of −17.206 and −36.154 kcal/mol, respectively, indicating favorable interactions with the selected target. The formulation will subsequently be optimized using a Quality by Design approach and evaluated for drug loading, entrapment efficiency, mechanical characteristics, in-vitro drug release, ex-vivo skin permeation and deposition, in-vivo anti-arthritic efficacy, and stability.

Keywords: *Rheumatoid arthritis; Methotrexate; Apigenin; Microneedles; Preformulation.*

O-03/F/008 ORAL · OFFLINE

Carboplatin Co-loaded 5-Fluorouracil Nanoparticles Conjugated with Trastuzumab for Targeted Therapy in HER2+ Heterogeneity Breast Cancer

Mahima Devi[1, 2], Akshay Kumar Lunawat[1], Shubham Thakur[1]

[1]Department of Pharmaceutics, ISF College of Pharmacy, Moga 142001, Punjab, India
[2]Research Scholar, Department of Pharmaceutics, ISF College of Pharmacy, Moga 142001, Punjab, India
Email: pathaniamahima07@gmail.com

Breast cancer, the second-most common cause of cancer-related deaths among women, remains a significant global health challenge. This study focuses on developing trastuzumab (TmAb)-functionalized chitosan nanoparticles (CS-NPs) co-loaded with carboplatin and 5-fuorouracil (5-FU) for targeted treatment of HER2-positive breast cancer. The NPs were prepared via the ionic gelation method, optimized using Design of Experimentation (DoE), and characterized for particle size, zeta potential, PDI, and entrapment efficiency. TmAb conjugation was achieved using NHS and EDC, and further characterization included TEM, syringeability, hemolytic toxicity, in-vitro release, ex-vivo cell line study, and in vivo anti-cancer activity using the Ehrlich ascites carcinoma (EAC) model. The in vitro release studies indicated enhanced drug release at pH 5.5 over 32 h and showed first-order kinetics. The TmAb-conjugated NPs demonstrated specificity and targeting in the SK-BR-3 cell line and significant anti-cancer activity in the EAC model, with the highest tumor inhibition rate of 85.19% compared to 58.12% for the drug solution. These findings highlight the potential of TmAb-conjugated NPs for targeted breast cancer therapy, offering improved drug delivery and therapeutic efficacy, paving the way for future clinical applications to reduce side effects and overcome the limitations of conventional chemotherapy.

Keywords: *carboplatin · chitosan nanoparticles · HER2+ breast cancer · trastuzumab · 5-Fluorouracil.*

O-03/F/009 ORAL · OFFLINE

Current Trends in Cyclodextrin-Mediated Chiral Separation and purification: A Review on AI-Enabled Molecular Modeling and Quality by Design (QbD) in Next-Generation Healthcare

Parul

Khalsa University, Amritsar
Email: parulak2k3@gmail.com

The homo-chiral nature of living systems demands single-enantiomer drugs, as optical isomers of chiral drugs often show very different therapeutic potencies and toxicological profiles. Therefore, chiral separation and precise purification of enantiomers is a vital prerequisite in nextgeneration healthcare. Due to the hydrophobic cavities and asymmetric pockets of cyclodextrins, they show an exceptional enantiomeric selectivity. However, optimisation of host-guest matrix traditionally relied on trial-and-error method that was evidence based and resource intensive process. This review outlines the shift of current technological trends from emipirical testing by reviewing how computational AI-enabled modelling and QbD principles are integrated in recent literature to transform enantiomeric separation and purification with the help of cyclodextrins. After analysing recent breakthroughs- specifically density function theory (DFT) on cyhalothrin enantiomer, molecular dynamic simulations on propanolol, and high-throughput docking (HTD) on naproxen libraries- this review demonstrates how modern algorithms predict the binding affinities, host-guest inclusion, chiral mechanics, and elucidate special configurations of specific cyclodextrin-enantiomer complexes. Concurrently, the Qbd frameworks from literature are also examined that translates virtual molecular insights into robust critical quality attributes (CQA) for high performance liquid chromatography (HPLC) and capillary separation systems. Conclusively, this review indicates that an integrated AI-QbD approach systemically replaces empirical screening. By compiling these existing literature benchmarks, this work gives a comprehensive summary on rapid and cost-effective development of high-purity chiral therapeutics by the means of computational methodologies.

O-03/F/011 ORAL · OFFLINE

Development of Chitosan Nanoparticles for Improved Drug Delivery

Shalini Raj

Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, India
Email: shaliniraj0505@gmail.com

Nanoparticle-based drug delivery has emerged as a promising approach to overcome limitations associated with conventional dosage forms, including poor aqueous solubility, low bioavailability and rapid drug elimination. Chitosan is particularly attractive as a nanocarrier because of its biodegradability, biocompatibility, mucoadhesive properties and ability to facilitate controlled drug release. The present study aims to develop and optimize chitosan nanoparticles for improved drug delivery and to investigate the influence of formulation variables on their physicochemical and drug-release characteristics. Chitosan nanoparticles will be prepared using the ionic gelation method, employing sodium tripolyphosphate as a cross-linking agent. The formulation variables will be optimized to obtain nanoparticles with desirable characteristics. The developed formulations will be evaluated for particle size, polydispersity index, zeta potential, morphology, drug entrapment efficiency and drug-loading capacity. Fourier-transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC) will be employed to investigate drug–polymer compatibility and physicochemical interactions. In-vitro drug-release studies will be performed using an appropriate dissolution medium, and release kinetics will be evaluated using suitable mathematical models. Chitosan nanoparticles offer a versatile and biocompatible platform for improving drug delivery. Systematic optimization and characterization may provide a promising formulation strategy for enhancing therapeutic performance.

Keywords: *Chitosan, Nanoparticles, Drug delivery, Ionic gelation, Controlled release, Nanocarrier*

O-03/F/012 ORAL · OFFLINE

Nanocarrier-Enabled Brain Delivery of Piperine: From Enhanced Bioavailability to Neuroprotection in Parkinson's Disease

[1]Puneet Nirmal*,[2]Neelam Singh, [3]Ravindra Pal Singh

[1]PhD Scholar, Nims Institute of Pharmacy, Nims University Rajasthan, Jaipur 303121 India.
[1]Assistant Professor, Lloyd Institute of Management and Technology, Greater Noida, Uttar Pradesh, India-201306
[2]Professor, HR Institute of Pharmacy, HRIT University, Delhi-Meerut Road, Ghaziabad, 201003, India.
[3]Professor, Nims Institute of Pharmacy, Nims University Rajasthan, Jaipur 303121 India.
Email: puneetnirmal1335@gmail.com

Background: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized predominantly by degeneration of dopaminergic neurons in the substantia nigra pars compacta and subsequent depletion of striatal dopamine. Piperine, a bioactive alkaloid of *Piper nigrum*, possesses reported antioxidant, anti-inflammatory and neuroprotective properties; however, its poor aqueous solubility and limited systemic and cerebral availability restrict its therapeutic potential. The present study was undertaken to develop and evaluate Piperine-loaded nanostructured lipid carriers (Piperine-NLCs) as a lipid-based nanocarrier system for improving systemic exposure and brain delivery of Piperine. The research was progressively conducted through five six-monthly research phases.

Methods: Pre-formulation studies included physicochemical characterization, determination of absorption maximum, lipid screening, solubility studies and drug–excipient compatibility assessment using FTIR and DSC. Piperine-NLCs were subsequently developed and optimized using a Box–Behnken experimental design by evaluating formulation and process variables. Seventeen experimental batches (F1–F17) were prepared, followed by optimization and comprehensive characterization. The optimized formulation was evaluated for particle size, polydispersity index (PDI), zeta potential, entrapment efficiency, drug loading, surface morphology, solid-state characteristics, in-vitro drug release and cytocompatibility. In-vivo pharmacokinetic and brain biodistribution studies were conducted in Wistar rats, followed by evaluation in a 6-hydroxydopamine (6-OHDA)-induced Parkinson's disease model using behavioral, biochemical, neurochemical and histopathological parameters.

Results: The optimized Piperine-NLC formulation demonstrated a particle size of 145.2 ± 3.4 nm, PDI of 0.21 ± 0.02, zeta potential of −32.4 ± 1.5 mV, and entrapment efficiency of 88.5 ± 1.2%. The formulation exhibited a biphasic drug-release profile, with approximately 55.8% release within 4 h and 94.5% release over 48 h, compared with only 27.2% release from pure Piperine suspension. The optimized NLC significantly improved systemic exposure following oral administration. Cmax increased from 320.14 ± 28.54 to 845.62 ± 42.15 ng/mL, while AUC_0–t increased from 1420.50 ± 105.20 to 5840.35 ± 215.60 ng·h/mL. The elimination half-life increased from 3.2 ± 0.4 to 8.5 ± 0.6 h, and relative oral bioavailability increased to 411.1%.

Brain biodistribution studies demonstrated a marked increase in cerebral Piperine exposure. Brain Cmax increased from 45.24 ± 5.12 to 284.15 ± 22.35 ng/g, while brain AUC_0–t increased from 185.60 ± 18.40 to 1640.85 ± 115.50 ng·h/g, representing approximately an 8.8-fold enhancement in brain exposure. The brain-to-plasma partition coefficient increased from 0.13 ± 0.02 to 0.34 ± 0.05, with a drug targeting index of 8.84 and drug targeting efficiency increasing from 13.06% to 28.09%. In the 6-OHDA-induced PD model, Piperine-NLC treatment reduced oxidative stress, with MDA decreasing to 3.25 ± 0.41 nmol/mg protein, while SOD, catalase and GSH were restored to 8.95 ± 0.72 U/mg protein, 28.45 ± 2.15 U/mg protein and 36.85 ± 3.10 µg/mg protein, respectively. Striatal dopamine increased from 25.42 ± 3.15 ng/mg protein in the disease-control group to 92.35 ± 6.45 ng/mg protein following Piperine-NLC treatment ($p < 0.001$). DOPAC and HVA were also significantly restored. Histopathological evaluation demonstrated preservation of substantia nigra architecture and reduced neuronal damage. The optimized formulation also exhibited favorable neuronal cytocompatibility, maintaining 86.4 ± 2.1% cell viability at 200 µg/mL in the PC12 cell-based MTT assay. Six-month stability assessment showed minimal changes under refrigerated conditions, with particle size increasing from 145.2 ± 3.4 to 148.6 ± 4.1 nm and entrapment efficiency remaining at 86.2 ± 1.5%.

Conclusion: The developed Piperine-NLC formulation demonstrated improved physicochemical characteristics, sustained drug release, enhanced systemic bioavailability, substantially increased brain exposure and measurable neuroprotective effects in an experimental model of Parkinson's disease. The findings support Piperine-loaded NLCs as a promising nanocarrier-based strategy for improving the delivery of poorly water-soluble neuroactive compounds to the brain.

Keywords: *Piperine; Nanostructured Lipid Carriers; Parkinson's Disease; Brain Targeting; Blood–Brain Barrier; Neuroprotection; Pharmacokinetics; Nanotechnology.*

O-03/F/013 ORAL · OFFLINE

Plant-Mediated Synthesis of Zinc Oxide Nanoparticles and Evaluation of Their Physicochemical Properties and Antimicrobial Coating Potential

Gupta Vaishnavi , Panwar Deepesh, Malviya Sapna, Joshi Ankur, Kharia Anil

Modern Institute of Pharmaceutical Sciences, Modern Campus, Indore, Madhya Pradesh 453111
Email: vaishnavigupta01420@gmail.com

Background: Plant-mediated synthesis of zinc oxide nanoparticles (ZnO NPs) represents a promising approach for developing functional nanomaterials using phytochemicals as stabilizing and structure-directing agents. Their potential antimicrobial properties make them attractive candidates for incorporation into protective surface coatings.

Objective: The present study aimed to synthesize ZnO NPs using an aqueous *Azadirachta indica* (neem) leaf extract, optimize the synthesis conditions, characterize the resulting nanoparticles, and evaluate their antimicrobial activity and potential application in surface coatings.

Methods: ZnO NPs were synthesized using neem leaf extract and zinc acetate as the precursor. Synthesis conditions were optimized by varying extract concentration, precursor concentration, pH, and reaction temperature. The nanoparticles were characterized using UV–visible spectroscopy, X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and dynamic light scattering (DLS). Antimicrobial activity was evaluated against *Staphylococcus aureus* and *Escherichia coli* using an appropriate antimicrobial assay. Nanoparticle-incorporated coatings were assessed for microbial reduction, coating stability, and zinc release.

Results: In this illustrative dataset, the optimized synthesis condition was pH 10, a reaction temperature of 70°C, and a zinc precursor concentration of 0.05 M. UV–visible spectroscopy showed an absorption maximum at 368 nm. XRD analysis indicated a crystalline wurtzite ZnO structure, with an estimated crystallite size of 24.6 nm. SEM revealed predominantly quasi-spherical to irregularly spherical particles, while DLS indicated an average hydrodynamic diameter of 96.4 ± 8.7 nm and a polydispersity index of 0.24 ± 0.03. FTIR analysis indicated the presence of phytochemical-associated functional groups and Zn–O-related vibrations. At a test concentration of 100 µg/mL, the nanoparticles produced illustrative inhibition-zone diameters of 18.2 ± 1.1 mm against *S. aureus* and 15.6 ± 0.9 mm against *E. coli*. The nanoparticle-containing coating demonstrated an illustrative 2.1-$\log_{10}$ reduction in viable *S. aureus* counts and a 1.6-$\log_{10}$ reduction in *E. coli* counts after 24 hours compared with the unmodified coating control. These results would require confirmation through independent experiments, appropriate controls, and statistical analysis.

Conclusion: Plant-mediated synthesis using neem leaf extract may offer a practical approach for producing crystalline ZnO NPs for investigation in antimicrobial surface coatings. The illustrative findings highlight the importance of correlating nanoparticle properties with antimicrobial performance. Further experimental validation of coating durability, zinc leaching, environmental safety, and mammalian-cell compatibility is necessary before practical or biomedical application.

Keywords: *Azadirachta indica, green synthesis, zinc oxide nanoparticles, antimicrobial coatings, X-ray diffraction, nanoparticle characterization, nanotechnology.*

P-03/F/001 POSTER · OFFLINE

Development and Evaluation of Microsponge-Loaded Topical Drug Delivery Systems for the Management of Rheumatoid Arthritis

Harpreet Kaur*, Rajeev Garg
I.K. Gujral Punjab Technical University Kapurthala
Email: reetk1333@gmail.com

Rheumatoid Arthritis (RA) is an autoimmune disease of chronic inflammatory nature that causes progressive joint pain, swelling, stiffness, and joint destruction, causing a marked impact on the quality of life of affected individuals. Although conventional systemic therapy can effectively manage RA, such drugs are characterized by the presence of side effects caused by long-term treatment. The present research aims to develop and evaluate a microsponge-loaded topical gel for the effective management of RA. Microsponges represent porous polymeric carriers able to provide controlled and sustained drug delivery, enhanced drug penetration into inflammatory tissue, improved stability of formulations, and reduced frequency of administration. Microsponges of the specified type will be prepared by quasi-emulsion solvent diffusion technique and optimized using Box-Behnken Design. Characterization of obtained microsponges will include their particle size, surface morphology, zeta potential, loading, entrapment efficiency, and in vitro drug release. Optimised microsponges will be used to prepare Carbopol gel and studied for their physicochemical properties, rheological behaviour, stability, ex vivo skin permeation, and in vitro drug release using Franz diffusion cells. The efficiency of the developed formulation for anti-inflammatory and anti-arthritis purposes will be tested on the animal model of arthritis induced by Freund's Complete Adjuvant, along with histological analysis to prove the safety and efficiency of the developed formulation. The developed microsponge formulation for topical administration will be capable of providing a sustained release of the drug, increasing anti-inflammatory efficiency, reducing systemic toxicity, and ensuring higher patient compliance compared to traditional RA treatment.

Keywords: *Rheumatoid arthritis, Microsponge drug delivery system, Topical drug delivery, Quasi-emulsion solvent diffusion, Drug entrapment efficiency.*

P-03/F/002 POSTER · OFFLINE

Antibiotic Resistance in India: Drivers and Opportunities for Actions

Saloni Guleria*, Sourabh Kosey
Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2216753@isfcp.org

Antibiotic resistance (AMR) is a major public health challenge in India, leading to increased illness, mortality, prolonged hospital stays, and higher healthcare costs. The rapid emergence and spread of resistant microorganisms are driven by the irrational use of antibiotics in humans and animals, over-the-counter availability without prescription, poor infection prevention and control practices, inadequate sanitation, and environmental contamination from pharmaceutical and healthcare waste. These factors reduce the effectiveness of commonly used antibiotics, making the treatment of infectious diseases increasingly difficult. Addressing AMR requires a coordinated, multidisciplinary approach that includes antimicrobial stewardship programs, strict antibiotic prescribing regulations, improved surveillance systems, enhanced diagnostic facilities, public awareness campaigns, vaccination, better hygiene and sanitation, and continued research into new antimicrobial agents. Strengthening national policies and promoting rational antibiotic use through collaboration among healthcare professionals, policymakers, researchers, and the public are essential to slow the spread of antibiotic resistance and protect the effectiveness of existing antibiotics for future generations.

Keywords: *Empirical antibiotic therapy, culture guided therapy, deescalation, antimicrobial stewardship, rapid diagnostics, procalcitonin, concordance, bloodstream infection.*

P-03/F/003 POSTER · OFFLINE

Transferosomes as Next-Generation Carriers for Transdermal Drug Delivery: Formulation, Characterization, and Applications

Ayush Raniyal

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Ropar, Punjab, India
Email: ayushraniyal5@gmail.com

Transferosomes are ultra-deformable vesicles that Gregor Cevc introduced in the early 1990s to solve a stubborn problem in transdermal delivery: the stratum corneum simply won't let most drugs through. What sets these vesicles apart from ordinary liposomes is the addition of an edge activator — a surfactant like sodium cholate or Span 80 — worked into the phospholipid bilayer. This single addition loosens the membrane just enough that the vesicle can squeeze through skin pores much smaller than itself, pulled along by the skin's own hydration gradient. They are typically prepared by thin-film hydration, ethanol injection, or reverse-phase evaporation, and evaluated for size, zeta potential, entrapment efficiency, and deformability. Because they can carry hydrophilic, lipophilic, and even large peptide molecules, transferosomes have been explored for delivering NSAIDs, anticancer drugs, hormones, and vaccine antigens. Storage stability and scale-up remain open problems, but transferosomes are still among the more versatile tools for pushing drugs through skin without needles.

Keywords: *Transferosomes, Transdermal Drug Delivery, Reverse-Phase evaporation.*

P-03/F/004 POSTER · OFFLINE

Formulation And Evaluation of Spanlastics Loaded Thermosenstive Insitu Gel for Glaucoma Therapy

Sahil Sankhyan

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy. Bela, Ropar, Punjab, India
Email: sahilsankhyan4142@gmail.com

Glaucoma is a progressive ocular disorder characterized by increased intraocular pressure (IOP), which may cause optic nerve damage and irreversible vision loss. Conventional ophthalmic eye drops often show poor ocular bioavailability because of rapid precorneal elimination, short ocular residence time, and frequent dosing requirements. The present work focuses on the formulation and evaluation of spanlastics-loaded thermosensitive in situ gel as a novel approach for sustained ocular drug delivery in glaucoma therapy. Spanlastics are deformable elastomeric nanovesicles that can enhance drug encapsulation, corneal penetration, and ocular retention. The thermosensitive in situ gel remains in a liquid state during administration and undergoes sol-to-gel transition at ocular temperature, thereby prolonging drug residence and providing controlled drug release. The formulation may be prepared using suitable surfactants, edge activators, cholesterol, and thermosensitive polymers such as Poloxamer 407. The developed formulation can be evaluated for sol-gel transition temperature, gelation time, clarity, rheological properties, gelling capacity, isotonicity, ocular biocompatibility, mucoadhesion, in vitro drug release, and ocular retention. The combined system is expected to improve drug loading and corneal penetration, sustain drug release, reduce dosing frequency, and enhance patient compliance. Thus, spanlastics-loaded thermosensitive in situ gel represents a promising drug delivery platform for prolonged and effective glaucoma therapy.

Keywords: *Glaucoma, Mucoadhesion, In Situ Gel, Spanlastics*

P-03/F/005 POSTER · OFFLINE

Development and Characterization of an Oral Proniosomal Drug Delivery System for Enhanced Delivery of a Poorly Water-Soluble Drug

Nitish Sharma*, Sandeep Kumar

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy Bela, Ropar, Punjab, India
Research Scholar, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy Bela, Ropar, Punjab, India
Email: sharmanitish68903@gmail.com

Poor aqueous solubility and limited oral bioavailability are major challenges associated with conventional formulations of Albendazole. The present study aims to develop and evaluate an Albendazole-loaded oral proniosomal suspension as a novel approach to improve drug delivery and therapeutic performance. Proniosomes were prepared using suitable non-ionic surfactants, cholesterol, and other formulation components to obtain a stable dry system capable of forming niosomal vesicles upon hydration. The prepared formulations were evaluated for drug content, vesicle size, polydispersity index, entrapment efficiency, surface morphology, reconstitution properties, in-vitro drug release, and physical stability. The optimized formulation is expected to exhibit suitable vesicle characteristics, satisfactory drug entrapment, improved drug dissolution, and controlled release compared with the conventional formulation. The proniosomal system may also provide improved stability and ease of handling due to its dry nature before reconstitution. Overall, the developed oral proniosomal suspension is expected to offer a promising and stable drug-delivery platform for enhancing the oral delivery of Albendazole. The findings of this study may support the potential application of proniosomal technology for improving the performance of poorly water-soluble drugs and developing patient-friendly oral dosage forms.

Keywords: *Albendazole; Proniosomes; Oral suspension; Niosomal drug delivery; Solubility enhancement; Oral drug delivery.*

P-03/F/006 POSTER · OFFLINE

Implementation of Process Analytical Technology (PAT) and Quality by Design (QbD) Frameworks for Real-Time Quality Assurance in Continuous Solid Dosage Manufacturing

Lakshya Yadav*, Ashish Sharma, Junaid Ashraf khan

School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan
Email: lakshyayadav336@gmail.com

Traditional pharmaceutical batch manufacturing relies heavily on end-product testing, leading to extended-release times, potential batch rejections, and high operational costs. The shift toward continuous manufacturing necessitates proactive quality control frameworks that monitor critical process parameters in real time to ensure consistent final -product quality. This study demonstrates the integration of Process Analytical Technology (PAT) tools within a Quality by Design (QbD) framework to optimise continuous wet granulation and tabletting processes for solid oral dosage forms. A Quality Target Product Profile (QTPP) was established to define Critical Quality Attributes (CQAs), including blend uniformity, granule moisture content, and tablet hardness. Critical Process Parameters (CPPs), such as impeller speed and spray rate, were mapped using a Design of Experiments (DoE) approach. Near-Infrared (NIR) spectroscopy and inline Focused Beam Reflectance Measurement (FBRM) were integrated into blending and drying stages to monitor blend homogeneity and particle size distribution continuously. Implementation of real-time inline PAT analysers enabled instant feedback control, narrowing parameter variations within the defined Design Space. NIR monitoring reduced offline analytical lag time by >90%, enabling real-time release testing (RTRT). The QbD-driven process optimisation yielded a 15% increase in process capability index (Cpk > 1.33) and significantly reduced batch-to-batch content variability (RSD < 2.0%). Coupling PAT tools with systematic QbD protocols provides a robust paradigm for continuous solid dosage manufacturing, significantly improving process understanding, reducing production downtime, and ensuring consistent product quality.

Keywords: *Process Analytical Technology, Quality by Design, Design of Experiment.*

P-03/F/007 POSTER · OFFLINE

Formulation and Characterisation of Amorphous Solid Dispersions Prepared via Hot-Melt Extrusion for Bioavailability Enhancement of a BCS Class II Drug using Thermal Extrusion

Shubham Prajapat
School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan
Email: shubhamprajapat6898@gmail.com

Poor aqueous solubility poses a major bottleneck in drug candidate development, with nearly 40% of marketed compounds and 90% of pipeline molecules belonging to Biopharmaceutics Classification System (BCS) Class II. Amorphous solid dispersions (ASDs) enhance dissolution profiles by converting crystalline active pharmaceutical ingredients (APIs) into higher-energy amorphous states, but physical recrystallisation during processing and storage remains a key source of instability. This study investigates the formulation, thermal stability, and dissolution kinetics of amorphous solid dispersions produced via Hot Melt Extrusion (HME) using hydrophilic polymeric matrices to prevent drug recrystallisation. A model BCS Class II API was co-extruded with amphiphilic polymers (Soluplus and Copovidone) at varied drug-to-polymer ratios (1:2, 1:3, and 1:4) using a co-rotating twin-screw extruder across temperature zones of 120–160°C. Solid-state characterisation was performed using Differential Scanning Calorimetry (DSC) and Powder X-Ray Diffraction (PXRD) to confirm the conversion to an amorphous phase. In vitro dissolution testing was conducted in simulated gastric fluid (pH 1.2) and phosphate buffer (pH 6.8). Thermal and crystalline analysis confirmed complete transformation of the API into a molecularly dispersed amorphous state, with PXRD showing the complete disappearance of characteristic crystalline diffraction peaks. The optimised extrudate (1:3 API-to-Soluplus) demonstrated an eightfold increase in saturation solubility and achieved >85% cumulative drug release within 30 minutes, compared to <15% for the pure crystalline API. Accelerated stability studies (40°C/75 % RH) confirmed physical stability for six months without phase separation. Hot Melt Extrusion offers an efficient, solvent-free continuous manufacturing strategy for formulating stable amorphous solid dispersions, significantly enhancing the dissolution rate and industrial scale-up viability of poorly soluble drugs.

Keywords: *Solid Dispersion, Hot melt extrusion, Solubility enhancement*

P-03/F/008 POSTER · OFFLINE

Development of a QbD-Based Transethosomal Gel with Eco – Friendly RP – HPLC for Dual – Alzheimer's Therapy

Sneha*, Anchal Thakur
ISF College of pharmacy and Research, Moga-142001, Punjab, India
Email: snehag310104@gmail.com

Neuronal dysfunction and cognitive decline are hallmarks of Alzheimer's disease, a progressive neurodegenerative illness. Poor drug solubility, restricted permeability through biological barriers, and systemic side effects are just a few of the problems that conventional drug delivery methods frequently face. The goal of the current project is to create a transethosomal gel based on Quality by Design (QbD) for the dual topical delivery of anti-Alzheimer's medications. The QbD method was used to pinpoint important quality characteristics and optimize formulation factors affecting drug release, vesicle size, and drug entrapment effectiveness. To increase stability, skin retention, and patient acceptability, transethosomes—which are made of phospholipids, ethanol, and edge activators—were added to an appropriate gel base. The physicochemical characteristics, drug content, in vitro drug release, and skin penetration of the improved formulation were assessed. Using ecologically sustainable analytical principles, an environmentally friendly reverse-phase high-performance liquid chromatography (RP-HPLC) method was concurrently designed and validated for the estimation of both medicines. The new formulation and analytical technique may offer a dual-drug delivery strategy for Alzheimer's disease that is efficient, secure, and long-lasting.

Keywords: *Quality by Design (QbD), Transethosomal gel, Dual-drug therapy, Alzheimer's disease, Transethosomes, Eco- friendly RP-HPLC*

P-03/F/009 POSTER · OFFLINE

Role of Silver Nanoparticles in the Nanomedicine of Mycoses Management

Aditya Thakur*, Anchal Thakur
ISF College of pharmacy and Research, Moga-142001, Punjab, India
Email: adityathakur176025@gmail.com

Introduction: Dermatophyte and opportunistic fungi e.g. Candida and Aspergillus are challenging to treat due to antifungal resistance, toxicity, long treatment durations, and less effective drug delivery. Nanoparticulate silver (AgNPs) is a promising nanomedicine approach. The aim of present review is to emphasize the antifungal activity of AgNPs, formulation strategies, advantages, and problems associated with its application in the treatment of mycosis.

Methods: Relevant literature concerning the use of AgNP in the treatment of fungal diseases has been reviewed, focusing on the mechanisms of action, topical formulations, delivery systems and application of AgNP to combat fungal diseases.

Results: AgNPs exhibit antifungal activity with multiple mechanisms of action such as generation of ROS, disruption of cell membrane and cell wall, inactivation of proteins, damage to nucleic acids and disruption of biofilms. They can be incorporated into a variety of hydrogel, cream and nanocomposite formulations with drug delivery applications to enhance drug stability, controlled release and therapeutic efficacy.

Conclusion: AgNPs are a promising approach to enhancing the treatment of mycosis and tackling the challenges faced by traditional antifungal treatment. But, there are issues of long-term safety, toxicity, standardization of synthesis, and regulation that need to be explored.

Keywords: *Silver nanoparticles, Mycoses, Antifungal resistance, Nanomedicine, Targeted drug delivery.*

P-03/F/010 POSTER · OFFLINE

Therapeutic Potential of Allium Cepa and Yucca Schidigera in Rheumatoid Arthritis

Krishaant Marorria*, Anchal Thakur
ISF College of pharmacy and Research, Moga-142001, Punjab, India
Email: krishaant26@gmail.com

Introduction: Rheumatoid arthritis (RA): Chronic autoimmune inflammatory disorder with synovial inflammation, progressive destruction, pain and stiffness of the joint. While traditional treatments like NSAIDs, corticosteroids, and DMARDs work, they come with side effects and inconsistent responses from patients over an extended period. This review looks at the therapeutic potential of Allium cepa and Yucca schidigera in the treatment of RA due to their anti-inflammatory and antioxidant activities.

Methods: The literature was reviewed on the phytochemical composition, the pharmacological mechanisms, the topical application possibilities, the safety profile of Allium cepa and Yucca schidigera in RA, as well as the gaps in the research. No experimental, clinical or laboratory investigations were undertaken.

Results: Allium cepa contains flavonoids especially quercetin and sulfur compounds with antioxidant and anti-inflammatory properties, according to literature These phytoconstituents offer encouraging evidence of a rationale for the formulation of a topical polyherbal product for localized RA therapy. The evidence so far, however, is limited to preclinical, review-based evidence, with only limited clinical validation.

Conclusion: Both the Allium cepa and Yucca schidigera possess interesting pharmacological properties related to RA. However, to make therapeutic claims, standardized formulations and standard preclinical studies and well-designed clinical trials are essential.

Keywords: *Rheumatoid arthritis, Allium cepa, Yucca schidigera, Anti-inflammatory activity, Topical drug delivery.*

P-03/F/011 POSTER · OFFLINE

Cyclodextrin-Based Strategies for Enhancing the Dissolution and Oral Bioavailability of BCS Class II Drugs

Adarsh Raj[1]*, Mohammad Azahruddin[2]

[1]*Department of Pharmaceutical Sciences, ISF College of pharmacy and Research, Moga-142001, Punjab, India*
[2]*Department of Pharmaceutics, ISF College of pharmacy and Research, Moga-142001, Punjab, India*
Email: adarshraj.909780@gmail.com

Introduction: BCS Class Ⅱ drugs often present significant formulation challenges due to their low aqueous solubility, which may result in slow dissolution and variable oral absorption. Cyclodextrins (CDs), with their hydrophilic outer surface and hydrophobic inner cavity, can form reversible inclusion complexes that enhance both apparent solubility and dissolution rates of BCS Class Ⅱ Drugs.

Aim and Objective: The aim is to analyze the use of cyclodextrins (CDs) in improving the dissolution and oral bioavailability of BCS Class Ⅱ Drugs. The objective of this study will focus on the selection of CD types, the techniques for complexation, the design of formulations, and the evaluation of pharmaceutical performance.

Methods: A targeted evaluation of the literature was conducted, drawing on peer-reviewed research concerning β-cyclodextrin and its hydrophilic derivatives. The evidence was assessed in terms of phase-solubility behavior, efficiency of complexation, enhancement of dissolution, alterations in solid-state, and documented oral bioavailability.

Result: Evidence from published studies indicates that forming CD complexes can greatly enhance the apparent solubility and dissolution of drugs by including molecules and reducing their crystallinity. Performed complexes generally show better performance compared to simple physical mixtures.

Summary: To ensure optimal performance, it is crucial to select the right CD and understand the drug- CD interaction. Therefore, the formulation should be based on the physiochemical properties and dosage requirements, rather than simply adding CDs.

Conclusion: Cyclodextrin-based formulations represent a dynamic pharmaceutical method to tackle the challenges associated with the dissolution-limited oral delivery of BCS Class Ⅱ Drugs. The most appropriate Cyclodextrin can be selected and the complexation process can be optimized and the use of modern multicomponent systems can effectively translate improvements in the solubility into more reliable oral drug performance.

Keywords: *Cyclodextrin, bioavailability, solubility, dissolution, drug delivery system.*

P-03/F/012 POSTER · OFFLINE

A Better Carrier, A Better ASD: Co-Processed Polymers for Aprepitant Delivery

Prakash k. Amate*, Abhay T. Sangamwar

[1]*Department of Pharmaceutics, National Institute of Pharmaceutical Education and Research (NIPER), S.A.S. Nagar, Punjab, India.*
Email: prakashamate25@gmail.com

Poor aqueous solubility and rapid precipitation remain major limitations in the oral delivery of BCS class II drugs. Aprepitant was used as a fast-crystallizing model drug to examine whether polymer co-processing can produce a functional carrier superior to conventional ternary polymer blending. HPMCAS MF and HPC were co-processed by spray drying to prepare CP MFHPC, followed by development of a 25% drug-loaded co-processed amorphous solid dispersion (25MFHPC CD). A corresponding ternary dispersion (25MFHPC TD) was prepared using the same polymers as a physical blend. The systems were evaluated by DSC, PXRD, PLM, SEM, FT-IR, ^{1}H NMR, contact angle, Karl Fischer analysis, supersaturation assay, non-sink and biorelevant dissolution, rat pharmacokinetics, and Gastro Plus simulation. CP MFHPC showed better supersaturation maintenance than the corresponding physical mixture, with AUCss of 2.23×10^{6} compared with 1.56×10^{6}. In the final ASD, co-processing produced a more rigid and less moisture-sensitive matrix, shown by higher Tg (112.39 °C vs 102.56 °C), lower residual moisture (1.91% vs 3.90%), improved wetting (67.52° vs 93.90°), and absence of crystalline aprepitant by PXRD and PLM. The 25MFHPC CD formulation provided rapid and sustained dissolution, with 77.74% release at 5 min under non-sink conditions and 89.59% release at 5 min in FaSSIF. In vivo, 25MFHPC CD increased Cmax to 3019.1 ng/mL and AUC0- t to 23191.2 ng·h/mL, outperforming crystalline aprepitant, marketed formulation, and ternary dispersion. Gastro Plus simulation supported higher and sustained drug availability. These findings show that polymer co-processing can move beyond simple excipient blending and serve as a practical carrier-engineering strategy for bio enabling poorly soluble drugs.

Keywords: *Aprepitant; amorphous solid dispersion; co-processed polymer; supersaturation; HPMCAS; oral bioavailability; complex formulation; Gastro Plus*

P-03/F/013 POSTER · OFFLINE

Cyclodextrins: A Versatile Approach For Advanced Drug Delivery Systems

Neeraj, Dimple Kumari*, Vinay Pandit, M. S. Ashawat

Department of Pharmaceutics, Laureate Institute of Pharmacy, Kathog, Jawalamukhi, Himachal Pradesh, 176031
Email: dimple2691@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides. They exhibit a hydrophilic external surface and a lipophilic internal cavity and can form inclusion complexes with other drugs. CDs have the potential to improve the water solubility, stability, dissolution, and bioavailability of poorly water-soluble drugs. This review describes how CDs and CD derivatives can be utilized for pharmaceutical drug delivery (to date, to be discussed with the inclusion complex, solubilization, controlled release, bioavailability, and toxicity). A literature-based review on the structure of CD, derivatives, inclusion complex formation, pharmaceutical applications, drug delivery system, pharmacokinetic effects and toxicity was done; as well as evaluation techniques including phase-solubility studies, nuclear magnetic resonance (NMR) spectroscopy and X-ray crystallography for inclusion complex formation. The results showed that the CD inclusion complex could be used for the purposes of enhancing the water solubility, stability, dissolution and bioavailability. The water-soluble CD derivatives such as hydroxypropyl--CD showed good aqueous solubility, thus effectively used for drug solubilization and advanced drug delivery system. Furthermore, CDs are compatible with supporting controlled drug release. CD structures also have numerous applications in the pharmaceutical field, particularly in the design of drug delivery systems with potential applications for poorly water-soluble drugs; however, the type, dose and route of administration should be closely monitored.

Keywords: *Cyclodextrins; Inclusion complexes; Drug delivery; Solubility; Bioavailability; Controlled release*

P-03/F/014 POSTER · OFFLINE

3D Printing of Pharmaceuticals: Enabling Point of Care Personalization

Prince Baloria*, Dev Raj, Vinay Pandit, MS Ashawat

Department of Pharmaceutics, Laureate Institute of Pharmacy, Kangra, Himachal Pradesh
Email: princebaloria08@email.com

Introduction: Three-dimensional printing (3DP) of pharmaceuticals is moving from a research concept toward practical use in individualized dosing, allowing precise control over drug dose, release profile, and dosage-form geometry directly at the site of care.

Aim & Objectives: To summarize current advances, translational challenges, and future directions of point of care (POC) 3D-printed medicines and to assess their readiness for routine clinical use.

Methods: A narrative review of recent peer-reviewed literature, hospital and pharmacy case studies, and regulatory developments relating to point-of-care, community pharmacy and decentralized 3DP manufacturing was established now a days.

Results: Several printing platforms, including fused-deposition modelling, semi-solid extrusion, binder jetting, and vat photo polymerization, are being adapted for clinical dosage-form production. Hospital pilots and pharmacy-based programs show feasibility, patient acceptability, and pharmacokinetic bioequivalence for personalized tablets and polypills, particularly for pediatric and geriatric patients needing dose titration. Industrial supply of pre-qualified, drug-loaded cartridges is emerging as a strategy to simplify decentralized manufacturing while preserving quality control and AI-assisted dose design together with real-time release testing is increasingly used to support quality assurance outside centralized facilities.

Conclusion: Despite encouraging early clinical signals, the evidence base remains limited in scale and regulatory frameworks for point-of-care manufacturing are still evolving across jurisdictions. Point-of-care 3D printing holds strong potential to enable truly individualized pharmacotherapy, but wider clinical adoption will depend on regulatory clarity, standardized quality-control tools, and multi-center, clinical validation.

Keywords: *3D printing; personalized medicine; point of care manufacturing; Pharmaceutical compounding; decentralized manufacturing*

P-03/F/015 POSTER · OFFLINE

Comprehensive Overview of Cyclodextrin Chemistry: Fundamentals, Historical Development, and Industrial Applications

Aryan Bharti

Department of Pharmaceutics, Laureate Institute of Pharmacy, Kangra, Himachal Pradesh
Email: aryanbhartihp@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides composed of \alpha-1,4-linked glucopyranose units derived from enzymatic degradation of starch. First reported by Villiers in 1891 and extensively characterized by Schardinger in the early 1900s, CD research evolved from basic structural identification to systematic inclusion complexation studies, ultimately enabling large-scale industrial manufacturing using cyclodextrin glucosyltransferase (CGTase) enzymes. Conformational arrangement gives CDs a truncated cone (torus) geometry with a hydrophilic external rim formed by primary and secondary hydroxyl groups and a hydrophobic internal cavity lined with glycosidic oxygen bridges and hydrogen atoms. While larger cyclic homologs exist, their collapsed central cavity structures generally reduce inclusion efficiency relative to native forms. CDs act as host molecules capable of forming non-covalent inclusion complexes with less polar guest entities in aqueous environments. The primary driving force for complexation is the displacement of high-enthalpy polar water molecules from the hydrophobic CD cavity by suitable guest molecules. Inclusion complexation yields key physicochemical enhancements, including: Significant enhancement of aqueous drug solubility and dissolution rate. Improved thermal, oxidative, and photochemical stability of labile active ingredients. Volatility reduction, masking of undesirable organoleptic properties, and altered drug pharmacokinetics. Cyclodextrin derivatives have overcome toxicity and solubility constraints associated with parent CDs, expanding their utility as safe functional excipients for oral, parenteral, and topical delivery systems. Beyond pharmaceutical formulations, cyclodextrins are widely applied in analytical separations, food processing, cosmetics, and environmental remediation technologies.

Keywords: *Cyclodextrins, Host-Guest Chemistry, Inclusion Complexes, Molecular Encapsulation, Drug Delivery*

P-03/F/016 POSTER · OFFLINE

Formulation And Evaluation of Ketoconazole Loaded Invasomes for Topical Drug Delivery

Gurpreet Singh*, Shailesh Sharma, Barsha Deb

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Ropar, Punjab
Email: ssinghgurpreet94@gmail.com

Invasomes are innovative lipid-based vesicular drug delivery systems developed to enhance transdermal and topical drug delivery. They primarily consist of phospholipids, ethanol, and terpenes, which provide flexibility to the vesicles and enhance drug permeation through the stratum corneum. Ethanol and terpenes can modify the lipid organization of the skin, while the deformable nature of invasomes facilitates deeper penetration and improved drug deposition. The incorporation of ketoconazole into invasomal vesicles can therefore provide a promising strategy for enhancing its skin permeation and retention at the site of infection. Invasomes may also provide controlled and sustained drug release, potentially prolong the therapeutic effect and reduce the need for frequent application. Hence, ketoconazole-loaded invasomes represent a promising advanced topical drug delivery system that may overcome the limitations of conventional formulations and improve the efficacy of ketoconazole in the treatment of fungal skin infections. Keywords: Invasomes, drug delivery system, ketoconazole, vesicles, skin infection.

Keywords: *Invasomes, Ketoconazole, Topical Delivery.*

P-03/F/017 POSTER · OFFLINE

Polymer Swelling as a Key Determinant of Lag Time in Oral Pulsatile Drug Delivery

Garima Kabdal

Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Email: kabdalgarima1834@gmail.com

Pulsatile drug delivery systems are developed to exhibit a specific lag time followed by a rapid drug release, which makes them suitable for chronotherapy and the treatment of time-dependent diseases. Polymer swelling is considered a key formulation attribute controlling the lag period of oral pulsatile systems. Upon exposure to gastrointestinal fluid, swellable polymers imbibe water molecules causing the polymeric matrix to expand. This hydrated barrier controls water penetration, drug diffusion, erosion, or rupture of the polymeric coating by regulating the rate and extent of swelling. In fact, the characteristics of lag time could be tuned using this property of polymers. This study reviews various pharmaceutical approaches and recent advances in oral pulsatile formulations that exhibit predictable, consistent pulsatile release profiles. Some of the formulation factors affecting lag time include the polymer type, concentration, coating thickness, swelling capacity, and polymer-drug interaction. Recent chronotherapeutic formulations have demonstrated the potential of using a lag-time strategy in the development of oral dosage forms for the synchronization of drug availability with circadian physiological rhythms. A better understanding of polymer swelling, hydration, and lag-time development is essential in the rational design of oral pulsatile drug delivery systems. Optimising polymer composition and coating properties may offer greater control over the temporal drug-release profile and help synchronise drug release with the endogenous circadian clock.

Keywords: *Polymer swelling; Lag time; Pulsatile drug delivery; Oral drug delivery; Swellable polymers; Chronotherapy.*

P-03/F/018 POSTER · OFFLINE

Alginate-Based Hydrogels for Wound Healing and Drug Delivery

Nirupam Thakur*, Vema Kiran

Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Email: tnirupam15@gmail.com

This review examines alginate-based hydrogel system as advanced biomaterials for wound dressing and drug delivery applications. Alginate, an anionic bio polysaccharide from brown algae, has gained prominence in wound care due to its biocompatibility, biodegradability, and hemostatic properties. The review explains wound classification as acute, chronic and complex followed by an analysis of the sequential healing phases hemostasis, inflammation, migration, proliferation, and maturation. Alginate demonstrated superior wound healing efficacy through its ability to absorb body fluids up to twenty times its weight while maintaining and optimal moist microenvironment. Calcium alginate's inherent hemostatic capacity facilitates rapid blood clotting via platelet activation. The material is extensively employed in various pharmaceutical and biomedical formulation including hydrogels, films, and microparticles. Recent advances highlight alginate composite formulations such as alginate pectin and alginate chitosan systems, which exhibit enhanced mechanical strength and controlled drug release kinetics. Several marketed alginate-based dressings have demonstrated clinical efficacy in delivering therapeutics including simvastatin and hesperidin. Cross-linking strategies, both ionic and covalent optimize formulation properties, In vitro and In vivo studies substantiate the therapeutic potential of this system in wound management and tissue regeneration, establishing alginate-based hydrogels as viable alternatives to conventional wound treatment modalities,

Keywords: *Alginate; Hydrogels; Wound Healing; Wound Dressing; Drug Delivery; Controlled Release.*

P-03/F/019 POSTER · OFFLINE

Emerging Bone-Preserving Interventions for Breast Cancer Therapy-Induced Osteoporosis in Pre- and Postmenopausal Women

Sreejit Roy Chowdhury, Shubham Thakur

Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Email: sreejitroychowdhury366@gmail.com

The rising trends in breast cancer survivorship have elevated the clinical burden of Breast Cancer Therapy-Induced Osteoporosis (BCTIO). This is a skeletal complication of aromatase inhibitors, ovarian suppression, and new agents (such as CDK4/6, PI3K inhibitors, antibody-drug conjugates) that cause bone loss due to estrogen deprivation. The conventional bone-preserving strategies, which include calcium/vitamin D, bisphosphonates, and denosumab, are limited due to their unsatisfactory effects as monotherapy, osteonecrosis of the jaw, poor compliance, renal toxicity and vertebral rebound fractures after denosumab withdrawal. The present review focuses on clinical and mechanistic evidence for alternative and emerging bone-preserving interventions along the BCTIO. The non-pharmacological strategies, which include resistance and weight-bearing exercises, digital/AI-assisted rehabilitation, nutraceuticals and gut microbiome-targeting approaches (probiotics, prebiotics, postbiotics, estrobolome modulation), have mechanistic rationale and low toxicity. However, sufficiently powered oncology-specific randomized evidence is lacking. New drugs like the sclerostin inhibitor romosozumab, PTH analogues (teriparatide, abaloparatide), and sequential or combination regimens have been proposed that have potential anabolic-antiresorptive effects. However, their oncological safety and bone remodelling activity are still not explored. Tools of precision medicine (e.g. FRAX, trabecular bone score, bone turnover biomarkers, AI-based fracture prediction) are poised to enable individualized risk stratification. Notably, rapid premenopausal bone loss has a distinct pathophysiology from postmenopausal baseline osteoporosis. Translational strategies awaiting large-scale clinical evaluation are regenerative techniques such as mesenchymal stem cell therapy, exosome-based therapeutics, and biomaterial scaffold tissue engineering. Combining these modalities could bridge translation gaps created by delays in initiation, under-screening, and under-personalization in BCTIO.

Keywords: *Aromatase inhibitors; Bone-preserving interventions; Romosozumab; Gut microbiome; Exosome therapy; Precision medicine; Bone regeneration.*

P-03/F/020 POSTER · OFFLINE

Gellan Gum-Based Ion-Activated Ocular In-Situ Gels for Dry Eye Disease: Formulation Strategies and Ocular Retention - A Focused Review

Anju Bankoti*

Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: anjubankoti02@gmail.com

Dry Eye Disease (DED) is a multifactorial ocular surface syndrome characterized by tear film instability and associated discomfort. Traditional eye drops have limited precorneal residence time, leading to reduced ocular drug exposure. Gellan gum ion-activated in-situ forming gels are promising due to their ability to undergo sol-to-gel transition in response to ions in tear fluid, improving ocular drug retention and delivery. This focused review aimed to investigate the formulation design, gelation, rheology, drug release, and ocular retention of gellan gum based in-situ gel for the management of DED. Relevant research literature was reviewed to identify the formulations of gellan gum, polymer blends, drug incorporation approaches and their performance characteristics. The reviewed studies reported that low-acyl gellan gum enables rapid ionic triggered gelation and shear-thinning behavior on interaction with artificial tear fluid. Formulations containing arabinogalactan, tofacitinib citrate, and ruxolitinib showed improved precorneal retention and enhanced ocular exposure. The formulation parameters such as viscosity, mucoadhesiveness, drug diffusion and biocompatibility impact the performance of ocular in-situ gels. Gellan gum based ion activated, in-situ forming gels holds promise as an advanced ocular drug delivery system for improved residence time and ocular exposure of therapeutic agents for the management of DED. However, further research is needed to evaluate the long-term safety and formulation consistency for clinical translation.

Keywords: *Gellan gum; Dry eye disease; Ion-activated in-situ gel; Ocular drug delivery; Precorneal retention; Formulation strategies.*

P-03/F/021 POSTER · OFFLINE

Microfluidic-Assisted Microencapsulation: Optimisation of Liposomal Carrier Systems for Controlled Anti-Inflammatory Delivery

Himanshu Pareta*

School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan
Email: himanshupreta6086@gmail.com

Liposomal nanocarriers offer immense potential for targeted drug delivery; however, conventional batch manufacturing methods—such as thin-film hydration—frequently suffer from high batch-to-batch variability, broad size distributions, and poor encapsulation efficiencies. Microfluidic synthesis has emerged as a transformative continuous-flow technique to overcome these limitations through precise control of fluid dynamics at the microscale. This study aims to optimise the microfluidic-assisted synthesis of liposomal nanocarriers to achieve uniform particle size, high drug encapsulation efficiency, and controlled release kinetics for lipophilic anti-inflammatory therapeutics. Liposomes were synthesised using a microfluidic hydrodynamic focusing chip by varying the Total Flow Rate (TFR: 5" to " 20" mL/min") and Flow Rate Ratio (FRR: 3:1" to " 9:1) of the aqueous-to-solvent phases. Dipalmitoylphosphatidylcholine (DPPC) and cholesterol served as the lipid matrix. Liposomes were characterised for hydrodynamic size, polydispersity index (PDI), and zeta potential via Dynamic Light Scattering (DLS). Entrapment efficiency (EE%) was determined using high-performance liquid chromatography (HPLC), while in vitro release was evaluated across physiological pH environments. Increasing the FRR to 5:1 at a TFR of 10" mL/min" produced highly monodisperse liposomes with an average diameter of 85.4" nm" and a low PDI (<0.12). Microfluidic processing achieved a superior drug entrapment efficiency (>91%) compared to traditional methods (<65%). In vitro dissolution assays showed a sustained, zero-order release profile over 36 hours without an initial burst effect. Microfluidic-assisted microencapsulation provides a robust, reproducible, and scalable platform for formulating monodisperse liposomal carriers, offering significant advantages for commercial-scale nanomedicine production and targeted delivery.

Keywords: *Liposome, Nanocarriers, Targeted drug delivery, Microfluidic.*

P-03/F/022 POSTER · OFFLINE

Advanced MOF–ZIF Nanocomposites for Pharmaceutical and Heavy Metal Removal from Wastewater

Jai Prakash Soni

School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan
Email: jaiprakashsoniji@gmail.com

Pharmaceutical residues and toxic heavy metals in wastewater are emerging environmental pollutants that pose serious risks to human health and aquatic ecosystems. This poster presents the development of MOF/ZIF-based nanocomposites, particularly ZIF-8 and ZIF-67, combined with aluminium ferrite (AlFenOn) and biomass-derived materials such as sawdust. These nanocomposites offer high surface area, tunable porosity, excellent stability, and reusable adsorption properties. The proposed approach involves biomass preparation, MOF/ZIF synthesis, nanocomposite formation, and calcination/activation. The nanocomposites are designed to remove pharmaceutical contaminants such as ciprofloxacin, ofloxacin, tetracycline, diclofenac, and ibuprofen, along with heavy metals including Pb^{2}n, Cd^{2}n, Crnn, Hg^{2}n, and arsenic species. Pharmaceutical pollutants can undergo photocatalytic degradation under UV/visible light through the generation of hydroxyl radicals, while heavy metals are removed mainly through ion exchange, surface complexation, electrostatic attraction, chelation, and pore filling. Characterization techniques such as XRD, SEM/TEM, FTIR, BET, UV-Vis spectroscopy, and ICP-OES are proposed to evaluate structural, morphological, surface, degradation, and metal-removal properties. The expected outcomes include high pharmaceutical degradation efficiency, effective heavy-metal adsorption, fast kinetics, and good recyclability. Overall, MOF/ZIF nanocomposites represent a promising, sustainable, and low-cost nanotechnology for advanced wastewater treatment and environmental remediation.

Keywords: *MOF, ZIF-8, ZIF-67, nanocomposites, wastewater treatment, pharmaceutical pollutants, heavy metals, adsorption, photocatalytic degradation, environmental remediation.*

P-03/F/023 POSTER · OFFLINE

Review on Berberine-Loaded Herbosomal Gel: A Promising Phospholipid-Based Topical Delivery System for the Management of Fungal Skin Infections

Harmanpreet Kaur*, Shweta Kamboj, Loveleen Preet Kaur, Mohit Kumar

Department of Pharmaceutics, Jan Nayak Ch. Devi Lal Memorial College of Pharmacy, Barnala Road, Sirsa-125055, Haryana, India
Email: harmanpreetkaur6332@gmail.com

Fungal skin infections are common dermatological problems that can cause considerable discomfort, irritation, itching and inflammation. Conventional topical antifungal treatments can be associated with poor skin penetration, limited drug retention at the site of infection, frequent application, and reduced therapeutic efficacy. Berberine is a naturally occurring bioactive alkaloid isolated from several medicinal plants and exhibits promising antifungal, antimicrobial, anti-inflammatory and antioxidant properties. However, its poor water solubility and limited bioavailability may restrict its effective topical application. Herbosomal delivery systems for drugs have been found to be a promising approach for the improvement of topical delivery of plant derived bioactive compounds. These systems utilize the herbal or phytoconstituent molecules along with phospholipids to enhance drug inclusion, skin interaction, permeation and retention.

Herbosomal gel of berberine can offer the dual benefits of herbosomal delivery and topical formulation of gel which may enhance the solubility, stability, skin permeation and localized delivery of berberine. Encapsulation of berberine in a phospholipid-based vesicular system may allow its deposition in the skin and provide sustained drug release at the site of the fungal infection. The gel formulation can also enhance patient convenience, spreadability, adherence and residence time on the skin. Such a delivery system may have application in the treatment of superficial fungal skin infections with limited systemic exposure. Although it has promising potential, the challenges of formulation stability, vesicle characteristics, drug–phospholipid interactions, skin irritation, scalability and regulatory issues should be carefully evaluated. To summarize, berberine-loaded herbosomal gel is a phospholipid-based promising topical drug delivery approach to enhance the therapeutic potential of berberine in the management of fungal skin infections.

Keywords: *Berberine, Herbosomes, Phospholipid based delivery, Topical drug delivery, Fungal skin infections, Skin permeation, Antifungal activity.*

P-03/F/024 POSTER · OFFLINE

Cyclodextrin-Based Therapeutic Delivery Systems: A Review of Current Clinical Trials

Amandeep*, Dimple Kumari, Vinay Pandit, M S Ashawat, Ruchika Sharma

Laurate Institute of Pharmacy, Dehra Gopipur, HP
Email: amanchoudhary2405@gmail.com

CDs are applicable as efficient excipients and drug delivery systems because of their lipophilic interior and hydrophilic exterior to induce solubilization, stabilization, permeability, and retardation. Chemically modified CD nanocarriers and polymers have paved the way to CDs nanosponges, and several formulations have already undergone clinical trials. Commercially available Hydroxypropyl CD was well tolerated in Phase I clinical trials for Niemann-Pick disease, whereas CD polymer systems such asCRLX101 attained prolonged camptothecin exposure with tumor targeting and CALAA01 exhibited favorable biodistribution without any renal and hepatic toxicity. CD based systems can be applied in a wide range of treatments including cancer, hypercholesterolemia, ocular disorders, pain, epilepsy, and anesthesia; however, most are in initial clinical trials and the CD nanosponges are at a preclinical stage. CD-based drug delivery systems and polymers offer a versatile delivery platform and improvements in pharmacokinetic and targeted drug delivery. The combination of three-dimensional structure, high entrapment capacity, bioavailability enhancement, suitable pharmaceutical properties, and functional group modifiability makes CD complex as drug delivery systems and polymers capable of the dual function of biopharmaceutical optimizing and delivery. Integrating AI and physiologically based pharmacokinetic modelling will further rationalize new nano systems. Larger multicentric trials are critically required to address the safety and efficacy of CD based polymers to expedite their clinical translations and commercialization

Keywords: *cyclodextrins; drug delivery systems; cyclodextrin polymers; nanocarriers; clinical trials; therapeutic efficacy.*

P-03/F/025 POSTER · OFFLINE

Sustainable and Smart Pharmaceutical Packaging: Emergence Trends and Future Perspective

Gaurav Kumar Singh
ISF College of Pharmacy, Moga, Punjab, India-142001

Introduction: The pharmaceutical sector is increasingly facing the need to reduce its environmental impact while maintaining the quality, safety, stability, and effectiveness of medicines. Conventional packaging materials, synthetic excipients, and non-biodegradable polymers can contribute to waste generation and dependence on non-renewable resources. Recent developments in biodegradable materials, green excipients, intelligent packaging, and circular-economy approaches provide opportunities for more sustainable pharmaceutical systems.

Aim: The aim of this is to explore recent advances in sustainable pharmaceutical materials and smart packaging systems, with emphasis on biodegradable and renewable materials, green excipients, intelligent packaging technologies, environmental sustainability, and their potential applications in the pharmaceutical industry.

Methodology: A review-based approach was adopted by analyzing the provided literature on sustainable packaging, green excipients, biodegradable drug-delivery carriers, and next-generation pharmaceutical packaging. The reviewed studies were examined with respect to material selection, sustainability, packaging functionality, smart technologies, life-cycle considerations, and challenges associated with pharmaceutical applications.

Result: The materials such as cellulose, starch, and other biodegradable polymers have considerable potential as sustainable alternatives. Green excipients and biodegradable carriers may provide renewable, biodegradable, and biocompatible options for pharmaceutical formulations and drug delivery systems. However, limitations including higher costs, scale-up difficulties, mechanical and barrier property requirements, regulatory concerns, material standardization, and inadequate end of life infrastructure may restrict large-scale implementation.

Conclusion: Sustainable and intelligent pharmaceutical packaging represents a promising approach for reducing environmental impact while improving product protection, traceability, and patient safety. Successful implementation will require the development of high-performance biodegradable materials, coast effective manufacturing processes, appropriate regulatory frameworks, and effective recycling or disposal systems. Integrating life-cycle assessment and circular-economy principles into pharmaceutical development can further support the transition toward environmentally responsible and sustainable pharmaceutical practices.

P-03/F/026 POSTER · OFFLINE

Closed Loop Bioelectronic Implants for On Demand, Organ Specific Drug Delivery: Toward Self-regulating Therapies

Priyanshu Bhadu*,Vema Kiran
Department of Pharmaceutics ISF College of Pharmacy, Moga, Punjab, India
Email: princebhadu0029@gmail.com

Bioelectronic medicines use electronic interfaces to monitor and modulate physiological processes. Whereas current platforms focus on neural stimulation, next-generation strategies integrate continuous biosensing with spatially and temporally controlled drug delivery. We describe device designs that incorporate flexible bioelectronic sensors, microfluidic drug storage, and stimuli-responsive release systems into a unified implantable platform. These systems have the potential to continuously monitors biomarkers like glucose inflammatory mediators or tumor metabolites and automatically adjust drug dose and timing through the feedback-controlled actuation. Potential applications include smart insulin delivery for diabetes, targeted anti-inflammatory in the gut and localized chemotherapy with reduced systemic side effects. By adjusting therapy in real time, such devices may enhance efficacy and reduce adverse events relative to conventional dosing regimens. Major design complication involve achieving biocompatibility and durable function of sensing and actuation elements, meeting power demands, and embedding fail-safe logic to avert dosing mistakes. Over time, performance can be further degraded by sensor signal drift, biofouling of electrode surfaces, and fibrotic tissue encapsulation. Regulatory pathways for these combination products remain complex, necessitating standards for closed-loop algorithms, cybersecurity of wireless implants, and post-market surveillance, together with multidisciplinary collaboration to establish testing and risk-management frameworks. Closed-loop bioelectronic drug-delivery systems offer a promising route to autonomous, patient-specific therapies that combine electronic precision with pharmaceutical flexibility.

Keywords: *Bioelectronic medicine; Closed-loop drug delivery; Personalized Therapy; Regulatory Challenges.*

P-03/F/027 POSTER · OFFLINE

Sublingual spray: An innovative approach for rapid and efficient drug delivery

***Fanishwar Kumar, MD Azahruddin**
ISF College Of Pharmacy and Research, Moga, Punjab
Email: fanishwar@outlook.com

Introduction: Sublingual drug delivery is an attractive alternative to conventional oral administration for drugs requiring rapid therapeutic action. The sublingual mucosa is highly vascularized, allowing drugs to be absorbed directly into the systemic circulation and reducing the impact of gastrointestinal degradation and hepatic first-pass metabolism. Sublingual sprays provide a convenient liquid dosage form that can deliver a drug rapidly and may improve patient compliance, particularly in patients who have difficulty swallowing (Dysphagia) conventional tablets.

Methodology: A literature-based review was conducted to evaluate the principles, formulation approaches, advantages, limitations, and potential applications of sublingual spray drug delivery. Relevant scientific literature was reviewed with particular emphasis on drug absorption through the sublingual mucosa, selection of pharmaceutical excipients, spray formulation characteristics, dose uniformity, bioavailability, onset of action, and patient acceptability. The potential of sublingual sprays was compared conceptually with conventional oral and sublingual dosage forms.

Result: A literature indicates that sublingual sprays can provide rapid drug release and absorption because of the rich vascular supply of the sublingual region. Direct absorption into systemic circulation can reduce first-pass hepatic metabolism and potentially improve the bioavailability of suitable drugs. Sublingual sprays also offer advantages such as ease of administration, portability, flexible dosing, and rapid onset of action. However, formulation challenges including drug solubility, dose uniformity, spray pattern, formulation stability, mucosal irritation, limited drug loading, and variability in administration technique need to be carefully controlled.

Conclusion: Sublingual spray represents a promising and patient-friendly drug delivery platform for achieving rapid systemic drug absorption. Its ability to bypass significant gastrointestinal and hepatic first-pass effects makes it particularly attractive for drugs requiring a rapid onset of action. Although challenges related to formulation stability, dosing accuracy, and mucosal compatibility remain, advances in pharmaceutical formulation and spray technology may further expand its applications. Overall, sublingual spray has considerable potential as an innovative approach for improving the convenience, speed, and effectiveness of frug therapy.

Keywords: *Sublingual spray, Sublingual drug delivery, Rapid absorption, Dysphagia, First-pass metabolism, Patient compliance.*

P-03/F/028 POSTER · OFFLINE

Role of Polymers Used in Controlled Drug Delivery Systems & its Applications in the Field of Pharmacy

Parv Soni, Dr. Vijay Nigam, Mr. Bhan Singh Yadav
Daksh Institute of Pharmaceutical Sciences, Chhatarpur, (M.P.), Pin: 471001, India
Email: soniharshparv@gmail.com

Controlled drug delivery systems (CDDS) improve therapeutic efficacy by delivering drugs at predetermined rates. Polymers are critical components that regulate release kinetics, enhance stability, and enable targeted delivery. This review discusses natural and synthetic polymers, mechanisms of drug release, applications, recent advances, challenges, and future perspectives. Polymers are becoming very important in the drug delivery field. To control the drug release rate from the formulation, polymers are being used as the main tool. Polymers can be used as taste masking agents, to enhance stability of drug and to modify drug release characteristics. Biodegradable materials are used in medicine and other areas. In recent years there has been increase in use of biodegradable polymers. Biodegradable polymers are of two classes; synthetic and natural polymers. Natural polymers offer few advantages than synthetic polymers.

Controlled Drug Delivery Systems (CDDS) have revolutionized modern pharmaceutical technology by enhancing therapeutic efficacy, reducing dosing frequency, minimizing side effects, and improving patient compliance. Polymers play a pivotal role in the design and development of these advanced drug delivery systems. Both natural and synthetic polymers are extensively utilized for controlling drug release rates, protecting drugs from degradation, improving bioavailability, and targeting specific sites within the body. The present review discusses various classes of polymers, their mechanisms of drug release control, desirable characteristics, and applications in pharmaceutical formulations. Recent advancements and future prospects of polymer-based controlled drug delivery systems are also highlighted.

Keywords: *Polymers, drug delivery system, controlled drug delivery, biodegradable polymers, drug release mechanism.*

P-03/F/029 POSTER · OFFLINE

A Review on Mucoadhesive Drug Delivery System

Goldi Gupta, Dr. Vijay Nigam, Mr. Bhan Singh Yadav

Daksh Institute of Pharmaceutical Sciences, Chhatarpur, (M.P.), Pin: 471001, India

Mucoadhesive Drug Delivery System(MDDS) blazing these days as it has myriad advantages among these utmost is it prolong the residence time of dosage form with the underlying absorption surface to improve and enhance the bioavailability of the drugs. Faster onset of these dosage forms is a result of highly perfused mucosal membrane. When the biological substrate is attached to a mucosal layer then this phenomenon is known as mucoadhesion. Numerous polymers are responsible for forming complex with mucin protein and thus are used to improve drug delivery by enhancing the dosage form, contact time and residence time. Various natural and synthetic mucoadhesive polymers are used for designing of mucoadhesive drug delivery system such as tablets ,patches, gels, tapes, films, semisolids and powders. Most widely used polymers , carbapol, polyacrylic acid. Common sites where mucoadhesive polymers have the ability to deliver pharmacological active agents include oral cavity, eye conjunctiva, rectal lumen, vagina, nasal and entire gastrointestinal tract. Mucoadhesive system remains close contact with absorption tissue the mucus membrane releasing the drug at site of action leading to both local and systemic effects. Preferred drug candidates for the drug delivery system should have high permeability and solubility. Many antibiotic, antiulcer, antidiabetic, antifungal and NSAIDs are incorporated in mucoadhesive drug delivery system. Current review emphasis on current scenario and status of mucoadhesive drug delivery system.

Keywords: *Mucoadhesive, polymers, drug delivery, molecular*

P-03/F/030 POSTER · OFFLINE

Development and characterization of paclitaxel and embelin loaded solid lipid nanoparticles for breast cancer

Anik Mandal*, Veerpal Kaur, Amandeep Singh, Neeraj Mishra

Department of Pharmaceutics, I.S.F. College of Pharmacy, Moga, Punjab, 142001, India

Email: anikmandal454@gmail.com

Paclitaxel (PTX) is an established anticancer drug, but has limitations in its traditional formulation due to the delivery system. Embelin (EMB) is a naturally occurring anticancer compound that has been reported to potentiate the apoptotic effects of paclitaxel. The aim of the current study was to develop a PEGylated co-loaded solid lipid nanoparticle (SLN) formulation of PTX and EMB for parenteral delivery in the treatment of breast cancer. PTX-EMB loaded PEGylated SLN formulations were prepared by the hot homogenization method using the solid lipid glycerol monostearate and the surfactant Brij 35 along with the stabilizer DSPE-PEG2000. The optimized formulation exhibited a particle size of 316.3 ± 15.7 nm with a PDI of 0.075 ± 0.08 and showed high entrapment efficiencies of 92.83 ± 2.2% for PTX and 83.25 ± 2.4% for EMB. Homogeneous spherical nanoparticles were observed in transmission electron microscopy. In vitro release studies revealed that the release of PTX and EMB was sustained for more than 20 hours, with greater than 50% of the drug released at around 40 and 56 hours, respectively. The formulation effectively increased the uptake of MCF-7 cells and promoted apoptosis of the cells in comparison with the PTX formulation. Furthermore, the PTX-EMB loaded PEGylated SLNs exhibited an IC50 value of 6 µg/mL while that of PTX solution, PTX-EMB mixture solution, and PTX-loaded PEGylated SLNs were 12, 10, and 9.4 µg/mL, respectively. These results suggest that PTX-EMB formulation in PEGylated SLNs could be considered a promising platform for the delivery of breast cancer drugs.

Keywords: *Embelin, Paclitaxel, Solid lipid nanoparticles, PEGylation, Breast cancer, Cytotoxicity.*

P-03/F/031 POSTER · OFFLINE

Hydroxypropyl-β-cyclodextrin co-delivery hydrogel of crisaborole and curcumin for combinational antioxidant/anti-inflammatory therapy of vitiligo

Guneet Bhardwaj*, Dr. Vema Kiran
Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: gnb4576@gmail.com

Vitiligo results from oxidative stress and $CD8^+$ T-cell-mediated melanocyte destruction, and existing topical therapies remain constrained by poor skin permeation and side effects from prolonged immunosuppressant use. This study developed a hydroxypropyl-β-cyclodextrin (HP-β-CD) inclusion complex co-loading crisaborole (Cri), a PDE-4 inhibitor with pigment-repopulating activity, and curcumin (Cur), an Nrf2-activating antioxidant, then incorporated it into carbomer 940 hydrogel (Cri/Cur@CD-Gel) for transdermal delivery. Host-guest complexation, confirmed by spectroscopic and diffraction analyses, markedly improved the solubility and transdermal permeability of both hydrophobic drugs, while the hydrogel matrix enabled sustained release exceeding 80% over 24 hours. In TBHP-challenged PIG1 melanocytes, the combination restored cell viability, suppressed ROS accumulation, normalised mitochondrial membrane potential, and elevated cAMP, tyrosinase activity, and melanin production beyond either monotherapy, alongside reduced pro-inflammatory cytokine secretion. In monobenzone-induced vitiligo mice, Cri/Cur@CD-Gel produced significant repigmentation, lowered epidermal ROS and $CD8^+$ T-cell infiltration, and suppressed TNF-α, IL-1β, and IL-6, with efficacy matching or exceeding tacrolimus and no evidence of local or systemic toxicity. These findings support HP-β-CD-based co-encapsulation as a viable strategy for combinational antioxidant/anti-inflammatory vitiligo therapy.

Keywords: *Vitiligo; Hydroxypropyl-β-cyclodextrin; Crisaborole; Curcumin; Transdermal hydrogel.*

P-03/F/032 POSTER · OFFLINE

Development and characterization of enteric-coated pectin pellets containing mesalamine and Saccharomyces boulardii for specific inflamed colon*: In vitro* and *in vivo* evaluation

Prashant Arora*, Amandeep Singh, Uttam Kumar Mandal, Raj Kumar Narang
Department of Pharmaceutics, ISF College of Pharmacy, 142001, Moga, Punjab, India
Email: parora282828@gmail.com

Ulcerative colitis (UC) requires targeted colonic drug delivery. This study developed enteric-coated pectin pellets co-loading mesalamine and probiotic Saccharomyces boulardii for colon-specific delivery. Pellets were prepared by extrusion-spheronization using pectin and microcrystalline cellulose (MCC), then coated with cellulose acetate phthalate (CAP). Optimized uncoated pellets (MP10) contained 29% pectin, 70% MCC, 1% mesalamine, and 10^9 CFU S. boulardii, with 86.33% yield, 4.3% moisture, and 518 µm size. CAP coating (5% w/v) gave enteric-coated pellets (MP11). FTIR, DSC, and XRD confirmed drug-excipient compatibility. In vitro, coated pellets released ~4% mesalamine in simulated gastric fluid (pH 1.2, 2 h), ~13% in simulated intestinal fluid (pH 6.8, 5 h), and >55% at 10 h, with nearly complete release at 24 h in simulated colonic fluid (pH 7.4). With 2% rat cecal content, >80% release occurred within 12 h. Probiotic viability was maintained. In Wistar rats, coated pellets showed lower Cmax, delayed Tmax (5.91 vs 0.82 h), and longer MRT (16.23 vs 8.36 h) versus uncoated pellets, indicating reduced systemic exposure. In TNBS-induced colitis, coated pellets significantly improved body weight, stool consistency, histological scores, decreased MPO and LPO, and increased GSH compared to plain mesalamine or probiotic pellets. Stability over 6 months showed no significant changes. Thus, CAP-coated pectin pellets co-delivering mesalamine and S. boulardii represent a promising colon-targeted system for UC management.

Keywords: *Ulcerative colitis; Saccharomyces boulardii; Colon-targeted drug delivery; Enteric coating.*

P-03/F/033 POSTER · OFFLINE

Qbd-Guided Formulation Of A Soluplus®–Hpmc-As Based Ternary Amorphous Solid Dispersion Of Naproxen For Improved Dissolution And Physical Stability

Dhruv Dev
Shivalik College of Pharmacy, Nangal, Punjab, Pin Code- 140126
Email: ddagnihotri@gmail.com

Naproxen is a non-steroidal anti-inflammatory drug with limited aqueous solubility, which may restrict its dissolution and therapeutic performance. The present study is designed to develop and optimize a Soluplus®–HPMC-AS based ternary amorphous solid dispersion (ASD) of naproxen using a Quality by Design (QbD) approach to enhance dissolution and improve physical stability. Initially, preformulation studies will include determination of drug solubility, melting behavior, and drug–polymer compatibility using Fourier-transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC). The solubility of naproxen in Soluplus® and HPMC-AS will be evaluated to establish polymeric ratios. A risk assessment will be performed to identify critical material attributes and critical process parameters. Design of Experiments (DoE), preferably a Box–Behnken design, will be employed to investigate the effects of drug loading, total polymer concentration, and Soluplus® ratio on critical quality attributes, including drug content, dissolution, and physical stability. The ASDs will be characterized for saturation solubility, drug content, percentage drug release, dissolution efficiency, and release kinetics. Solid-state characterization will include FTIR, DSC, and powder X-ray diffraction (PXRD) to confirm molecular interactions and amorphous conversion. Supersaturation studies will be performed to evaluate drug concentration maintenance and precipitation inhibition in media. The optimized formulation will be subjected to accelerated stability testing to assess changes in drug content, dissolution, and physical state. Comparative dissolution studies will be conducted between pure naproxen, physical mixture, and optimized ASD. The optimized ternary ASD is expected to demonstrate enhanced dissolution, prolonged supersaturation, and improved physical stability, establishing an effective QbD-based strategy for formulation of naproxen.

Keywords: *Amorphous solid dispersion, naproxen, QbD.*

P-03/F/034 POSTER · OFFLINE

Translation of Pharmaceutical 3D Printing to Clinical Point-of-Care and Industrial Manufacturing

Abhinaw kumar
ISF College of Pharmacy, Moga, Punjab, India – 142001
Email: 2315698@isfcp.org

Pharmaceutical three-dimensional printing (3DP) is progressing from proof-of-concept research toward clinical point-of-care (PoC), community-pharmacy, and industrial manufacturing. This review critically evaluates the translational evidence, regulatory requirements, quality-assurance strategies, economic considerations, and barriers associated with pharmaceutical 3DP across these settings. Evidence from clinical studies indicates promising applications in personalized and paediatric dosage forms, dose titration, controlled release, palatability improvement, and bioequivalent formulations. Community-pharmacy implementation has also demonstrated potential for automated capsule preparation, reduced manual handling, and short-term cost savings. At the industrial level, the approval of SPRITAM® provides an established precedent for commercial 3D-printed medicines, while emerging platforms are expanding the potential for complex dosage-form architectures and rapid formulation development. However, clinical evidence remains limited, with many studies being single-centre, involving small cohorts, and using short-term or surrogate endpoints. Successful translation therefore requires validated equipment and processes, robust digital traceability, non-destructive analytical testing, cleaning and cross-contamination controls, trained personnel, and clearly defined regulatory and pharmacovigilance responsibilities. Economic advantages are context-dependent and appear most relevant to low-dose, small-batch, highly personalized products rather than high-volume conventional medicines. Overall, pharmaceutical 3DP has considerable potential to support safe, personalized, and flexible drug manufacturing, but broader adoption will depend on standardized clinical studies, multi-site quality and cost benchmarking, regulatory clarity, and stronger integration between industrial and clinical stakeholders.

Keywords: *Pharmaceutical 3D printing; Personalized medicine; Point-of-care manufacturing; Community pharmacy; Industrial manufacturing; Quality assurance; Regulatory framework.*

P-03/F/035 POSTER · OFFLINE

Beyond Binary Inclusion Complexes: Ternary Cyclodextrin Systems for Enhanced Drug Solubility and Dissolution

Kumar Satyam Raj, Dr. Shubham Singh
Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India -142001
Email: 2504007@isfcp.org

The fact that many new chemical entities fall under BCS Class II and IV, owing to their remarkably low solubility in water continues to pose a major problem in oral drug development. The inclusion complexation via cyclodextrin (CD) has been extensively used to enhance stability, solubility and bioavailability of poorly water soluble drugs by hosting hydrophobic guest molecules within the hydrophobic cavity of CD. Despite their use in drug formulations, binary complexes generally exhibit a limited degree of complexation efficiency, relatively high CD Drug ratios, and may not sufficiently enhance solubility of highly lipophilic or sterically bulky molecules. Systems involving a ternary cyclodextrin, formed with the additional inclusion of a water-soluble polymer, amino acid or organic acid, are more effective. These fancier agents may improve complexation through various means, such as fostering stronger drug-CD interactions, inhibiting CD self-aggregation, modifying pH in the in-situ microenvironment, and providing other additional stabilizing hydrogen bonds. The poster scrutinizes the comparative advantages of ternary vs binary CD complexation based on assessed phase-solubility behaviour, inclusion efficiency and dissolution profiles across the literature, with a view to classify ternaries as an efficient, resource-effective formulation strategy for solubility-limited drug candidates.

Keywords: *Cyclodextrin, Ternary complex, Inclusion complexation, Solubility enhancement, Dissolution, Drug delivery*

P-03/F/036 POSTER · OFFLINE

3D Printing of Personalized Medicine at the Point of Care

Khushvinder Singh*,Vema Kiran
Department of Pharmaceutics ISF College of Pharmacy, Moga-142001, Punjab, India
Email: singhkhushvinder991@gmail.com

Personalized medicine involve tailoring drug administration to meet the unique requirements of each individual, rather than applying a uniform dosage for all patients. In recent years, three-dimensional (3D) printing has emerged as a significant technology for creating bespoke pharmaceutical dosage forms. This method offers greater flexibility than traditional manufacturing techniques, allow for precise control over drug dosage, the design of dosage form, the quantity of drug incorporated, and the release mechanism. When 3D printing is implemented at the point of care, medications can be produced in closer proximity to patient. This enable adjustments to the dosage and design based on variables such as age, body weight, disease state, and specific treatment requirements. Various 3D printing techniques, including fused deposition modeling, semi-solid extrusion, stereolithography, and inkjet printing are under investigation for the production of tailored tablets, polypills, implants, and other drug-delivery systems. By altering the formulation, infill density, shape, and printing parameters, the characteristics of the dosage form can be customized for individual patients. Integrating 3D printing with digital health technologies could also facilitate the on-demand preparation of medications and simplify the personalization of doses. Nonetheless, numerous challenges must be addressed before it can become a routine practice in clinical settings. These challenges encompass drug stability, dose uniformity, reproducibility, material selection, equipment validation, quality control, and compliance with regulatory standards. In general, utilizing 3D printing, personalized medicine directly at the point of care offers a promising method for adaptable and patient-centered drug production, potentially aiding the advancement of personalized pharmaceutical treatments in the future.

Keywords: *3D printing, personalized medicine, point-of-care, drug delivery, pharmaceutical manufacturing.*

P-03/F/037 POSTER · OFFLINE

Alginate-Based Delivery Systems in Dentistry: Formulations, Release Mechanics, and Regenerative Applications

Rukshant Sharma, Vema Kiran
Department of Pharmaceutics, ISF College of Moga, Punjab, India.
Email: rukshantsharma0@gmail.com

Alginates are naturally derived hydrophilic, biodegradable, and non-toxic polysaccharides extracted predominantly from brown seaweeds and bacterial biosynthesis. While traditionally utilized in clinical dentistry as irreversible hydrocolloid impression materials and diagnostic molds, their biocompatibility, ease of gelation via divalent cations, and low production costs have driven extensive exploration into targeted drug delivery and tissue engineering. This chapter synthesizes current advancements in alginate-based formulations designed for localized oral therapeutics and periodontal regeneration. Key delivery platforms include solvent-cast poly-ε-caprolactone/alginate composite implant rings engineered to deliver metronidazole with diffusion-controlled kinetics (Ritger–Peppas model) to prevent peri-implant bacterial colonization. For localized periodontal pocket therapy, alginate-chitosan sspolyelectrolyte complex films loaded with clindamycin demonstrate concentration-dependent swelling, enhanced bioadhesiveness, and sustained drug release over extended periods via anomalous transport mechanisms. Furthermore, ionically cross-linked injectable calcium alginate hydrogels carrying bioactive molecules such as bovine serum albumin show favorable osteoinductive capability, increased mineralized nodule formation, and significant bone volume augmentation in mandibular defect models with reduced inflammation compared to standard synthetic matrices. Chlorhexidine-loaded microbeads prepared by internal gelation likewise demonstrate release characteristics comparable to accepted clinical regimens. Collectively, these findings underscore the versatility of pure and hybrid alginate matrices as effective, controlled local delivery platforms capable of addressing microbial infections and accelerating tissue regeneration in modern dental practice.

Keywords: *Alginates, Dental Drug Delivery, Periodontal Regeneration, Poly-ε-caprolactone, Polyelectrolyte Complex, Hydrogels, Controlled Release.*

P-03/F/038 POSTER · OFFLINE

Emerging innovation in Enzyme Immobilization Technology for Biomedical Application

Ayushi verma, Charanjeet Singh*
Department of Quality Assurance, ISF College of Pharmacy, Moga, Punjab, India, 142001
Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India, 142001
Research Scholar, I K Gujral Punjab Technical University, Jalandhar, India
Email: richazxoo7@gmail.com

Enzyme immobilization technology has emerged as a transformative approach in the field of biotechnology, particularly in biomedical applications. This technology involves the attachment of enzymes to solid supports, allowing for enhanced stability, reusability, and controlled activity. The recent advancements in enzyme immobilization techniques, including the use of novel materials and biocompatible carriers, have expanded the potential for enzymes in a variety of biomedical applications. The integration of immobilized enzymes into medical devices, biosensors, and therapeutic systems has shown significant promise in improving the efficiency and specificity of treatments, while reducing side effects. This presentation explores the latest innovations in enzyme immobilization methods, highlighting their role in overcoming traditional limitations and their profound impact on the future of biomedicine. Enzyme immobilization technology is set to transform various biomedical sectors, including biosensors for disease diagnosis, wound healing, bioreactors for tissue engineering, and targeted drug delivery. This advancement is expected to significantly enhance therapeutic approaches and pave the way for innovations in personalized medicine. This poster provides an overview of the fundamental principles of enzyme immobilization, the various methods employed for immobilization, and their applications in therapeutic and biomedical contexts.

Keywords: *Enzyme immobilization; Applications; Wound healing; Targeted delivery; Biosensors.*

P-03/F/039 POSTER · OFFLINE

Advancing Sustainability in Active Pharmaceutical Ingredient (API) Manufacturing Through Green Chemistry

Anantpreet Kaur*, Ms. Jasleen Kaur
ISF College of Pharmacy and Research, Moga, Punjab, India
Email: anantpreetkaur10@gmail.com

Introduction: Traditional active pharmaceutical ingredient (API) manufacturing is notoriously resource-intensive, often generating high volumes of hazardous chemical waste and relying on volatile organic solvents. Transitioning to sustainable engineering is critical for reducing the environmental impact of the pharmaceutical industry.

Aim & Objectives: This work aims to develop a scalable, eco-friendly framework for API production. Objectives include redesigning synthesis routes for higher atom economy, minimizing toxic solvent use, and optimizing energy efficiency.

Methods: We evaluated a model small-molecule therapeutic by replacing conventional batch processes with continuous flow manufacturing, utilizing bio-derived solvents, and applying biocatalytic steps. Real-time process analytical technology (PAT) was integrated to monitor reaction efficiency and control energy consumption.

Results: The redesigned framework achieved a 45% reduction in the E-factor (mass of waste per mass of product) and lowered thermal and electrical energy consumption by 30%. Chlorinated solvents were completely eliminated, significantly improving the overall safety profile.

Summary: By merging biocatalysis, continuous flow processing, and green solvents, this study demonstrates a successful redesign of a complex chemical synthesis route without sacrificing product yield or purity.

Conclusion: Sustainable pharmaceutical manufacturing is both feasible and economically viable. This methodology provides a robust, industry-ready roadmap toward greener, lower-impact drug production.

Keywords: *Green Chemistry; Active Pharmaceutical Ingredient (API); Sustainable Manufacturing; Continuous Flow; E-Factor.*

P-03/F/040 POSTER · OFFLINE

Gummy Dosage Forms for Travel-Associated Nausea: Pharmaceutical Strategies for Motion Sickness and Potential Applications in High-Altitude Travel

***Abhi Dey, Dr. Shubham Singh**
Department of Pharmaceutics, ISF College of Pharmacy, Moga 142001, Punjab, India
Email: abhidey983@gmail.com

Travel-associated nausea, especially from motion sickness and at high elevations, may negatively impact traveller's comfort and adherence to medication. It can be difficult to take the oral medications in a traditional pill or capsule format when traveling, as they can make you feel sick, make you choke down or be hard to swallow and may be difficult to take if you don't have access to water. Gummy dosage forms have become patient friendly oral dosage forms because of the following advantages: Portability, palatability, ease of administration and potential for taste masking and control of drug release. In this review, the pharmacological potential of gummies and other chewable dosage forms for the treatment of travel-associated nausea is discussed. Literature published regarding gummy formulation technologies, excipients, manufacturing methods, mechanical properties, drug release, taste masking, stability and patient acceptability was reviewed, especially in the context of applications for the prevention of motion sickness. Results from the meclizine-pyridoxine gummy formulation, the dimenhydrinate chewing gum system and the chewing gum based ginger system indicate that chewing gum systems are feasible as platforms for motion-sickness management. Pharmacological evidence to support the prevention and management of high altitude illness, particularly acetazolamide, was also reviewed to see where there are opportunities for traveller-oriented gummy delivery. The review notes that there is very little development of specific pharmaceutical gummies for high-altitude illness, and suggests that formulating on this platform could be a new opportunity. Future work should focus on uniformity of dose, rapid release of the drug, taste masking, stability and compatibility for changing travel conditions.

Keywords: *Gummy dosage forms; Motion sickness; High-altitude illness; Chewable drug delivery; Pharmaceutical formulation.*

P-03/F/041 POSTER · OFFLINE

Recent Advances in Spanlastic-Based Drug Delivery Systems: Formulation, Characterization and Therapeutic Applications

Akshit Thakur
ASBASJSMC of Pharmacy Bela Ropar
Email: thakurakshit125@gmail.com

Spanlastics are ultradeformable nanovesicular drug delivery systems composed of non-ionic surfactants and edge activators. Their flexible membrane enables deformation and efficient passage through biological barriers, thereby improving drug permeation and bioavailability. Recent advances have focused on optimizing formulation composition, preparation techniques, and physicochemical characteristics. Various methods such as thin-film hydration, ethanol injection, reverse-phase evaporation, and sonication have been employed for spanlastic preparation. These systems have shown promising potential for ocular, nasal, buccal, transdermal, topical, and brain-targeted drug delivery. Their ability to provide controlled release, enhanced permeability, and improved therapeutic efficacy makes them attractive alternatives to conventional delivery systems. Emerging approaches including ligand-targeted, stimuli-responsive, and personalized spanlastics may further expand their therapeutic applications. Overall, spanlastics represent a promising next-generation platform for efficient and targeted drug delivery.

P-03/F/043 POSTER · OFFLINE

Biodegradable Substance Used in Pharmaceutical Packaging

[*]Aryan Upadhiyay, Charanjeet Singh
Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315709@isfcp.org

As a sustainable substitute for traditional petrochemical-based plastics, this study explores the creation and improvement of biodegradable PLA–PHB (polylactic acid–polyhydroxybutyrate) blends for pharmaceutical packaging applications. Solvent casting was used to create a variety of formulations (F1–F7) with varying compositional ratios, and their mechanical, thermal, barrier, biological, and environmental performance were assessed. According to the study, PLA-rich blends had minimal migration characteristics, excellent tensile strength, and thermal stability, which made them appropriate for rigid packaging with a long shelf life. PHB-rich blends, on the other hand, showed improved biodegradability, encouraging eco-friendly disposal. The addition of amber-modified formulations enhanced their antibacterial and UV protection qualities, making them perfect for medicinal goods that are sensitive to light. Extensive evaluation tests, such as DSC, TGA, antibacterial activity, and stability investigations, verified that optimized blends like F2, F4, and F6 satisfy crucial pharmaceutical standards of durability, safety, and sterility. Overall, the study shows that PLA–PHB blends are promising, environmentally friendly materials that can take the place of traditional polymers in pharmaceutical packaging while maintaining perform

P-03/F/044 POSTER · OFFLINE

Development And Evaluation of Clove Oil-Based Elastic Liposomal Gel of Methotrexate for the Management Of Psoriasis

Amit Rana,* Dr. Balak Das Kurmi

Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab-India
Email: amitkumarrana20036@gmail.com, 2504002@isfcp.org

Aim: Methotrexate (MTX) is a gold-standard systemic therapy for moderate to severe psoriasis; however, its oral and parenteral use is limited by gastrointestinal toxicity, hepatotoxicity and poor patient compliance. This study aimed to develop and evaluate a clove oil-based elastic liposomal gel of methotrexate for enhanced topical delivery, to improve local therapeutic efficacy while minimizing systemic toxicity in the management of psoriasis.

Objectives: (i) To formulate MTX-loaded elastic liposomes using clove oil as a penetration enhancer and anti-inflammatory agent; (ii) To optimize the formulation using a Quality by Design (QbD) approach; (iii) To incorporate the optimized liposomes into a Carbopol gel and characterize the gel; (iv) To compare *in-vitro* drug release and *ex-vivo* skin permeation with a conventional gel; and (v) To assess *in-vivo* antipsoriatic efficacy in an imiquimod-induced psoriatic mouse model.

Methods: MTX-loaded elastic liposomes were prepared by the ethanol injection method using soya phosphatidylcholine, Tween 80 as an edge activator and clove oil as a penetration enhancer and anti-inflammatory agent. Formulation optimization was carried out using a Box-Behnken design under a QbD framework. The optimized vesicles were characterized for vesicle size, polydispersity index (PDI), entrapment efficiency and morphology (TEM). The liposomal suspension was incorporated into a Carbopol 934 gel, which was evaluated for pH, spreadability, viscosity and homogeneity. *In-vitro* drug release over 48 h and *ex-vivo* permeation through porcine ear skin were compared with a conventional gel. *In-vivo* efficacy was assessed in an imiquimod-induced psoriatic mouse model through skin thickness, erythema, scaling, pro-inflammatory cytokine levels (TNF-α, IL-17) and histopathology.

Results: The optimized formulation showed a vesicle size of 198.1 ± 4.5 nm, high entrapment efficiency (80.4 ± 2.1%) and a low PDI (0.218 ± 0.01), with TEM confirming uniform, spherical vesicles. The gel exhibited ideal pH (6.4 ± 0.1), excellent spreadability (18.3 ± 0.6 g·cm/sec), appropriate viscosity (4200 cP at 10 rpm) and superior homogeneity. The elastic liposomal gel showed sustained MTX release over 48 h (77.37 ± 2.65% cumulative release) compared with the conventional gel (59.4 ± 2.19%). *Ex-vivo* studies demonstrated enhanced drug permeation (74.8%) and dermal retention, attributed to the flexible vesicles and the permeation-enhancing properties of clove oil. *In-vivo*, MTX-liposomal gel-treated mice showed significant reductions in skin thickness, erythema and scaling, along with lower TNF-α and IL-17 levels. Histopathology confirmed reduced epidermal hyperplasia and immune cell infiltration.

Conclusion: The clove oil-based elastic liposomal gel of methotrexate is a promising non-invasive, site-specific delivery system for psoriasis, offering superior skin penetration, sustained release, enhanced anti-inflammatory activity and reduced systemic exposure, thereby addressing the limitations of conventional MTX therapy. Further clinical investigation and scale-up studies are warranted for its potential commercialization in topical psoriasis management.

Keywords: *Psoriasis, Methotrexate, Elastic liposomes, Clove oil, Topical gel, Box-Behnken design, Imiquimod-induced psoriasis.*

P-03/F/045 POSTER · OFFLINE

Cisplatin and Probiotic Biomass Loaded Pessaries for the Management of Cervical Cancer

Deepa Negi, Amandeep Singh, Navin Joshi and Neeraj Mishra

Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab 142001, India
Email: anuskaghosh089@gmail.com

Cervical cancer is one of the major cancers which kills the Indian women, and the conventional cisplatin chemotherapy is associated with toxicity in normal tissues. The aim of this study was to formulate a local vaginal delivery system consisting of cisplatin and *Lactobacillus rhamnosus* biomass that will be more effective and have fewer side effects. Pessaries were manufactured by melt mould technique with 108 of probiotics in 25:75 ratio of PEG 400: PEG 4000. Overall, the biomass demonstrated antioxidant activity in DPPH assay (IC50=60.77µg/mL) and had produced lactic acid and hydrogen peroxide. The obtained results for the pessaries were well formed, with melting time of 10.86 ± 0.64 min, friability of 0.25%, hardness of 2.2 kg/cm^2 (blank) and 2.5 kg/cm^2 (drug loaded) and content uniformity of 99.89 ± 0.74%. The Peppas model was the best fit for the release of the probiotic drug (R^2 = 0.9548) and probiotic pessaries containing drug released the drug at a higher rate. DSC revealed the change in physical state of cisplatin in the matrix. The formulation demonstrated greater cytotoxicity as compared to plain cisplatin against EAC cells (30.2% versus 47.4% viability at 200 µg). In Swiss albino mice, it resulted in the lowest tumour volume (2.25 ± 0.32) and histopathology appeared to indicate maintenance of tissue integrity. The strategy could be a potential option for cervical cancer treatment.

Keywords: *Cancer, probiotics, cisplatin, pessaries, local drug delivery, chemotherapy.*

O-03/N/001 ORAL · ONLINE

Cyclodextrins as Novel PDE4 Inhibitors: Evidence for an Exterior Binding Mechanism Dependent on the Cyclic Presentation of Hydroxyl Groups

Adrián Matencio*, Antonio Sánchez-Belmonte, Pablo Rodríguez-Barba, JosMAYé Manuel López Nicolás

Departamento de Bioquímica y Biología Molecular A, Unidad Docente de Biología, Facultad de Veterinaria, Regional Campus of International Excellence "Campus Mare Nostrum", Universidad de Murcia, Murcia, Spain

Department of Biochemistry and Molecular Biology A, Teaching Unit of Biology, Faculty of Veterinary Medicine, Regional Campus of International Excellence "Campus Mare Nostrum," University of Murcia, Murcia, Spain

Email: adrian.matencio@um.es

Phosphodiesterase 4 (PDE4) is a key regulator of intracellular cAMP signalling and a validated therapeutic target in inflammatory and neurological disorders. Cyclodextrins (CDs) are widely used as pharmaceutical excipients for drug solubilisation, yet their direct interaction with enzymatic targets remains largely unexplored. This study aimed to evaluate the inhibitory activity of α-, β- and γ-CD on PDE4 and to elucidate the underlying molecular mechanism. Inhibition constants were determined by Lineweaver-Burk analysis at multiple substrate concentrations. Four mechanistic controls were used to distinguish substrate encapsulation from direct enzyme binding: adamantanol, glucose, maltodextrin and methyl-β-CD. β-CD was also combined with roflumilast, and molecular docking with PLIP analysis identified the putative binding site. Adamantanol did not reverse CD-mediated inhibition, excluding cavity encapsulation. Neither glucose nor maltodextrin inhibited PDE4, whereas methyl-β-CD showed markedly reduced potency, indicating that both the macrocyclic scaffold and free hydroxyl groups are simultaneously required for inhibition. β-CD and roflumilast produced additive inhibition, consistent with binding at a site distinct from the catalytic pocket. Docking revealed a surface-exposed region on PDE4, with PLIP confirming hydrogen-bond interactions involving CD hydroxyls. Collectively, these results support a novel exterior binding mechanism whereby cyclodextrins inhibit PDE4 through hydroxyl-mediated contacts at an allosteric surface site, strictly dependent on the macrocyclic presentation of hydroxyl groups, with implications for the use of CDs as pharmacological modulators of PDE activity.

Keywords: *Cyclodextrins; PDE4 inhibition; Allosteric binding; Molecular docking; Hydroxyl groups; Roflumilast.*

O-03/N/002 ORAL · ONLINE

Formulation and Evaluation of a Polymeric Microneedle-Based Transdermal Drug Delivery System for Tizanidine Hydrochloride

Prasanth Yerramsetti

Department of Pharmaceutics, School of Pharmaceutical Sciences and Technologies, JNTUK, Kakinada, Andhra Pradesh, India.

Email: prasanth.pharmacy@jntuk.edu.in

Background: Tizanidine hydrochloride is a centrally acting α2-adrenergic agonist commonly prescribed for the management of spasticity. Its therapeutic use is limited by a short half-life and extensive first-pass metabolism, resulting in low oral bioavailability and the need for frequent dosing, which often leads to poor patient compliance. Transdermal delivery using microneedle technology offers a promising alternative to overcome these limitations. Polymeric microneedles, prepared from biocompatible and biodegradable materials, can enable controlled drug release, improved bioavailability, and enhanced patient adherence.

Methods: Polymeric microneedles containing tizanidine hydrochloride were fabricated using the solvent casting method with biocompatible polymers such as polyvinyl alcohol (PVA) and polyvinylpyrrolidone (PVP). The prepared microneedles were evaluated for morphological characteristics using scanning electron microscopy (SEM). Mechanical strength, insertion capability, and drug content uniformity were assessed to determine microneedle performance. In vitro drug release and skin permeation studies were carried out using Franz diffusion cells, and release kinetics were analyzed to elucidate the drug delivery mechanism. Stability studies were performed to evaluate the formulation's robustness under storage conditions.

Results: The optimised polymeric microneedle system demonstrated uniform morphology, adequate mechanical strength, and successful skin insertion capability. Compared to conventional topical formulations, the microneedle patches exhibited significantly higher transdermal flux and sustained drug release for up to 24 hours. Drug release kinetics indicated controlled and prolonged release behaviour. Stability assessments confirmed that the formulation maintained structural integrity and drug content during storage.

Conclusion: The developed polymeric microneedle-based transdermal system offers an effective and non-invasive approach for delivering tizanidine hydrochloride. By providing sustained drug release and enhanced transdermal permeation, the system has the potential to improve bioavailability, reduce dosing frequency, and increase patient compliance in the long-term management of spasticity.

Keywords: *Bioavailability, Patient compliance, Polymeric microneedles, Sustained release, Tizanidine Hydrochloride, Transdermal drug delivery.*

O-03/N/003 ORAL · ONLINE

Formulation Characterisation and Evaluation of Transferosomal Gel Loaded with Croton Bonplandianum Leaf Extract

Pabbiniddi Veera Lakshmi
Jawaharlal Nehru Technological University Kakinada
Email: veeram.pharmacy@gmail.com

Transferosomes represent a promising approach for the transdermal delivery of drugs due to their ultra-deformable nature, allowing them to penetrate deep into the stratum corneum by squeezing through its intercellular spaces. Croton bonplandianum, a medicinal plant known for its anti-inflammatory, antibacterial, antifungal, wound healing, anthelmintic, larvicidal, and cytotoxic properties, holds potential for treating wounds and skin disorders. Aqueous leaf extract of Croton bonplandianum was prepared using the grinding technique. Eight transferosome formulations (TF1–TF8) were developed using the modified vortexing sonication method. The formulations incorporated different edge activators (Span 80, Tween 80, and Span 60) and phospholipids (soy lecithin) to optimize vesicle formation and stability. The prepared transferosomes were characterized for percentage yield, drug loading and entrapment efficiency, particle size, zeta potential, FTIR and In vitro diffusion studies.

Keywords: *Croton bonplandianum, transferosomes, gel, herbal extract, edge activators, soy- lecithin, HPMC, Carbopol.*

O-03/N/004 ORAL · ONLINE

Development and Characterisation of Naringenin and Probiotic-Coloaded pH-Responsive Coated Mucoadhesive Pellets for the Management of Ulcerative Colitis

Diksha[1,2],*, Amandeep Singh[1]
[1]Department of Pharmaceutics, ISF College of Pharmacy, Moga- 142001, Punjab, India
[2]Department of Pharmaceutics, Dasmesh College of Pharmacy, Faridkot, Punjab, India
Email: dikshadd2001@gmail.com

Ulcerative Colitis (UC) is a chronic inflammatory bowel disease requiring effective colon-targeted therapies with improved safety and efficacy. In this study, naringenin and probiotic-loaded pellets were developed using extrusion–spheronization with Moringa oleifera gum and microcrystalline cellulose, followed by Eudragit S100 coating for pH-dependent colonic delivery. A central composite design was employed to optimize formulation variables. The optimized formulation exhibited a percentage yield of 86.62%, drug content of 88.82%, and friability of 0.42%, indicating excellent pellet quality and mechanical strength. In vitro release studies demonstrated minimal drug release under gastric conditions and enhanced release at colonic pH, confirming successful colon-specific targeting. Cell viability studies revealed high biocompatibility, while cellular assays showed significant reduction in oxidative stress and suppression of NF-κB activation. In TNBS-induced ulcerative colitis rats, the optimized formulation significantly attenuated disease severity by reducing body weight loss and restoring normal colon architecture. Treatment markedly decreased oxidative stress markers, including myeloperoxidase (MPO) and lipid peroxidation (LPO), while increasing glutathione (GSH) levels. Furthermore, significant reductions in pro-inflammatory cytokines (TNF-α, IL-6, and IL-1β) were observed. Histopathological and protein expression analyses confirmed enhanced mucosal healing and superior anti-inflammatory activity, demonstrating the potential of the developed formulation as an effective colon-targeted therapy for UC.

Keywords: *Naringenin, Colon-targeted delivery, pH-responsive, Mucoadhesive Pellets, Probiotic co-delivery.*

O-03/N/005 ORAL · ONLINE

Development and Evaluation of Cyclodextrin-Based Self-Microemulsifying Drug Delivery System of BCS Class- II Drug for Antidepressant Activity

Riya Lodha*, Kamal Singh Rathore, Komal Sharma, Meenakshi Bharkatiya

Department of Pharmaceutics, Bhupal Nobles` University, Udaipur, Rajasthan – 313001, India
Email: riyalodha0@gmail.com

Trazodone hydrochloride, a widely used antidepressant, exhibits poor aqueous solubility, leading to low bioavailability and variable therapeutic outcomes. To address these limitations, a Cyclodextrin associated self-microemulsifying drug delivery system (SMEDDS) was developed and evaluated to enhance its solubility and absorption. SMEDDS composed of oil, surfactant, and co-surfactant, forms fine oil-in-water microemulsion upon contact with gastrointestinal fluids, improving drug dissolution and bioavailability. Cyclodextrin incorporated as a solubility enhancement component to improve the apparent aqueous solubility of drug through complexation. The study involved screening various excipients to identify an optimal SMEDDS formulation using solubility studies and ternary phase diagrams. The selected formulation was characterized for globule size, polydispersity index (PDI), zeta potential, drug loading efficiency, and self-emulsification time. In vitro dissolution studies were conducted in comparison with pure Trazodone hydrochloride to assess solubility enhancement. The optimized formulation showed a mean globule size below 200 nm, a narrow PDI, and rapid self-emulsification, indicating efficient emulsification properties. In vitro dissolution studies revealed a significant improvement in drug release, drug absorption and improved bioavailability compared to the pure drug. The results indicate that SMEDDS is a promising strategy for improving the solubility and bioavailability of Trazodone hydrochloride, potentially leading to enhanced therapeutic efficacy in depression treatment. Further in vivo studies are required to confirm the pharmacokinetic advantages of the developed formulation.

Keywords: *Trazodone hydrochloride, SMEDDS, Bioavailability, Solubility enhancement, Depression, Self-emulsification, Antidepressant Drug, Cyclodextrin, Inclusion Complex,*

O-03/N/006 ORAL · ONLINE

Exploring Process Analytical Technology: Applications and Benefits in Pharma Operations: Comprehensive Review

Abhijeet Welankiwar*

P. R. Pote Patil College of Pharmacy, Amravati Maharashtra 444604
Email: abhijeetwelankiwar@prpotepatilpharma.ac.in

The integration of advanced analytical technologies, specifically Continuous Process Verification (CPV), Quality by Design (QbD), and Process Analytical Technology (PAT), within pharmaceutical manufacturing. Traditional Quality Control (QC)methods, which primarily rely on post-manufacturing checks, are limited in addressing real-time variability in the process. To overcome these limitations, CPV enables continuous monitoring and a better understanding of process variations. QbD fosters a systematic approach to correlate critical process parameters (CPPs) with critical quality attributes (CQAs), ensuring product quality is maintained throughout production. PAT plays a crucial role by providing real-time monitoring and adjustments, facilitating rapid issue resolution, and supporting Real-Time Release Testing (RTRT). The evolution of PAT, through technologies like Near-Infrared Spectroscopy (NIRS) and Raman Spectroscopy, allows non-destructive analysis and immediate feedback during manufacturing, enhancing process efficiency and product quality. The shift to continuous manufacturing (CM) offers significant advantages, such as improved efficiency and cost reduction. The document also delves into tablet dosage form manufacturing, describing key processes such as wet granulation, dry granulation, and compression. Tablet forms are highly suited for continuous manufacturing, ensuring consistent quality, real-time monitoring, and reduced production time, making them ideal for high-demand drug production. Additionally, PAT tools like the NIRS XDS Smart Probe Analyzer and Antaris 2 FT-NIR Analyzer ensure compliance and optimize manufacturing. This integration of technologies marks a significant advancement in pharmaceutical manufacturing, improving both drug quality and operational efficiency.

Keywords: *Analytical Technology, Continuous Process Verification, QbD, Proecess Analytical technology*

O-03/N/007 ORAL · ONLINE

Nanosuspension Gel Formulations: A Novel Strategy for the Treatment of Fungal Skin Infections

Vinayak Shukla*, Punam Gaba

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy Bela, Ropar, Punjab, India
Email: karthikeyshukla@gmail.com

Research Fungal skin infections are common superficial infections that can cause significant discomfort, irritation, itching, and inflammation. Conventional topical antifungal formulations may have limitations such as poor aqueous solubility, inadequate drug penetration, and insufficient residence time at the site of infection. Nanosuspension-based drug delivery systems offer a promising approach for enhancing the dissolution rate, surface area, and topical delivery of poorly water-soluble drugs. The present study aims to formulate and evaluate a nanosuspension-loaded gel for improved topical antifungal activity. The nanosuspension will be prepared using a suitable nanoparticle-size reduction technique, such as high-speed homogenization followed by ultrasonication, using an appropriate stabilizer system. The prepared nanosuspension will be incorporated into a suitable gelling agent to obtain a homogeneous nanosuspension gel. The formulation will be optimized by evaluating important formulation variables and physicochemical characteristics. The prepared nanosuspension will be evaluated for particle size, polydispersity index, zeta potential, drug content, entrapment efficiency, and physical stability. The final nanosuspension gel will be assessed for appearance, pH, viscosity, spreadability, drug content, in-vitro drug release, and ex-vivo permeation, where applicable. The optimized nanosuspension gel is expected to provide enhanced drug dissolution and improved contact with the skin, resulting in better antifungal activity compared with conventional drug formulations. The developed system may therefore represent a promising topical drug delivery approach for the effective management of superficial fungal infections.

Keywords: *Nano Suspension, Fungal Infection, topical delivery, solubility enhancement*

O-03/N/008 ORAL · ONLINE

Biomimetic Nanocarriers for Metastatic Cancer: Advancing Targeted Drug Delivery

Shivani Sharma[1]*, Nitin Sharma[2]

[1]Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, India
[2]Professor, Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, India
Email: Shivani.sharma21@s.amity.edu

Metastatic cancer remains a major cause of cancer-related mortality because disseminated tumor cells encounter complex vascular, stromal, immune and anatomical barriers in distant organs. Conventional chemotherapy, targeted therapy, and immunotherapy are often limited by systemic toxicity, inadequate tumor accumulation, poor tissue penetration, immune exclusion and acquired resistance. Biomimetic nanocarriers have emerged as versatile drug-delivery platforms that combine the engineering flexibility of synthetic nanoparticles with the biological functions of cell membranes, extracellular vesicles and protein-based interfaces. This review discusses the fundamental principles, major types, mechanisms, therapeutic applications, combination strategies and translational challenges of biomimetic nanocarriers in metastatic cancer. Cancer cell membrane coated nanoparticles can promote homotypic recognition of primary and metastatic tumors, whereas red blood cell, platelet, macrophage, neutrophil, and leukocyte membrane-based systems facilitate prolonged circulation, immune evasion, inflammatory targeting, circulating tumor cell interception and vascular interactions. Exosome-based and hybrid platforms further enhance biological-barrier penetration and support nucleic-acid delivery, imaging, and multimodal therapy. These systems can target multiple metastatic processes, including tumor dissemination, extracellular-matrix remodeling, angiogenesis, hypoxia, immune suppression, cancer stem-cell persistence and organ-specific colonization. Preclinical studies across breast, lung, colorectal, melanoma, prostate and brain cancers demonstrate their potential for chemo-gene, chemo-photothermal, chemo-immunotherapeutic, enzyme-drug and theranostic approaches. Despite promising findings, translation is challenged by membrane heterogeneity, manufacturing complexity, stability, biosafety, regulatory requirements, cost and limited clinical evidence. Future advances require standardized manufacturing, rigorous characterization, clinically relevant models, personalized designs and well-controlled clinical trials.

Keywords: *Biomimetic nanocarriers; metastatic cancer; targeted drug delivery; cell membrane-coated nanoparticles; extracellular vesicles; exosomes; tumor microenvironment; metastasis; nanomedicine; theragnostic.*

O-03/N/009 ORAL · ONLINE

Formulation and Evaluation of Sunscreen containing Zinc Oxide (ZnO) Nanotubes (Prepared by Chemical Etching Process)

Jagruti Dilip Walde*

Department of Pharmaceutics, Sonekar College of Pharmacy, Mahadula, koradi Nagpur, India
Email: jagruti1.w2014@gmail.com

Zinc oxide (ZnO) nanotubes have gained attention in the field of sunscreen due to their unique properties. In this article, we focus on the characterization of multi-walled zinc oxide (MWNTs) synthesized by Chemical Etching method. The morphology of MWNT is characterized by scanning electron microscopy (SEM). The SEM micrographs are used to analyze the morphologies of the nanostructures. The UV Visible spectrophotometer has been implemented in examine the in-vitro efficacy of sunscreen, which was discovered to be between of 6.97 to 7.24, which is good for skin pH of all formulations of cream were shown pH nearer to skin required, but pH formulation. The results show that zinc oxide nanotube-based sunscreen is a promising alternative to traditional sunscreens, potentially providing enhanced sun protection and improved cosmetic characteristics. Based on the formulation, sunscreens may offer improved aesthetics in contrast to the marketed sunscreen products, potentially providing enhanced sun protection and improved cosmetic characteristics. Therefore, it is preferable to combine various sunscreen agents with physical sunscreen in order to increase the level of protection.

Keywords: *Nanotubes, zinc oxide, Sunscreen, UV. Radiation.*

O-03/N/010 ORAL · ONLINE

Delivery of Biologics with the Help of Polysaccharides as a Novel Drug Targeting Strategy for Intestinal Inflammation

Swapnamoy Das*

Department of Pharmaceutics, Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, India
Email: swapnamoy.75@gmail.com

Introduction: Intestinal inflammation is associated with persistent immune activation, epithelial barrier disruption, dysbiosis and complex physiological barriers that limit the effectiveness of conventional therapies. Biological therapeutics offer targeted anti-inflammatory effects but are often restricted by gastrointestinal degradation, instability and limited site-specific delivery.

Aim and Objective: This review aims to evaluate the potential of polysaccharide-based delivery systems as novel platforms for the targeted oral delivery of biological therapeutics to inflamed intestinal tissues. It particularly focuses on how polysaccharides can improve biologic stability, gastrointestinal protection and localized release.

Methods: Relevant literature describing polysaccharide-mediated delivery of biological therapeutics for intestinal inflammation was reviewed and organized according to the type of biologic. Protein-based biologics, including monoclonal antibodies, cytokines, cytokine modulators and peptides, as well as nucleic acid-based biologics and microbial biologics, were considered. Different polysaccharide-based systems, including nanoparticles, hydrogels, microspheres and microgels, were evaluated with respect to their targeting and therapeutic functions.

Results: Evidence indicates that polysaccharides such as chitosan, alginate, pectin, hyaluronic acid, β-glucan and related materials can protect biologics from gastrointestinal degradation and facilitate intestinal delivery through mucoadhesion, pH responsiveness, microbial degradation, and inflammation-responsive mechanisms. These systems demonstrated improved biologic localization, stability, mucosal healing and reduction of inflammatory responses in experimental models.

Conclusion: Polysaccharide-based platforms represent a promising strategy for improving the oral and site-specific delivery of biological therapeutics in intestinal inflammation. However, challenges related to formulation optimization, biological variability, stability and clinical translation remain to be addressed.

Keywords: *Polysaccharides; Biological therapeutics; Intestinal inflammation; Colon targeting; Oral drug delivery*

O-03/N/011 ORAL · ONLINE

Fixed–Dose Combinations: Challenges and future perspectives

Pooja Rajak, Dhanashree Wankhede*, Amit Maliye

Department of Pharmaceutics, Sonekar College of Pharmacy, Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur 441111, Maharashtra, India.
Email: dhanashree.wankhede10@gmail.com

Fixed Dose Combinations (FDCs) are products that have two or more ingredients in them. Combination therapy can leverage the synergistic effects of multiple drugs to enhance efficacy. India has been at the forefront of using this method, especially in managing diabetes. However, the rapid growth of unnecessary combination drugs led to strict regulations by the Central Drugs Standard Control Organization. The paper explains the significant challenges in pharmaceutical engineering that occur when combining multiple active ingredients into one pill. It highlights important issues such as stability and incompatibility, including interactions between drugs in solid form, harmful reactions between drugs and other substances (like the Maillard reaction between amlodipine and lactose), physical changes due to eutectic formation, and moisture movement that can damage sensitive drugs. To address these problems, the review looks at the regulatory standards set by the World Health Organization and CDSCO, which require solid scientific evidence for how drugs work together in the body and their combined effects. Looking ahead, the paper suggests a move toward personalized medicine using digital health tools and innovative manufacturing methods. Technologies like 3D printing allow for better control over the design of medications to separate incompatible ingredients and tailor dosages. When combined with methods such as hot-melt extrusion for timed drug release, smart packaging, and virtual models called digital twins, FDCs are expected to become more accurate and driven by data. This review discusses the clinical importance, physical and chemical difficulties, and changing rules surrounding FDCs.

Keywords: *Fixed-Dose Combinations; Eutectic Formation; Maillard Reaction; CDSCO; 3D Printing; Chronotherapy*

O-03/N/012 ORAL · ONLINE

Bilayered Mucoadhesive Buccal Patches for Systemic Administration of Repaglinide

Nilesh Tikaramji Hingawe*

Department of Pharmaceutics, Sonekar College of Pharmacy, Koradi, Nagpur.
Email: nileshhingawe@gmail.com

Bilayered mucoadhesive buccal patches for systemic administration of repaglinide were developed comprising of mucoadhesive layer, made up of drug [Repaglinide- Hydroxy propyl β-cyclodextrin (HP β-CD) complex] with buccoadhesive polymers chitosan, hydroxypropyl methylcellulose (HPMC) K4M and HPMC E15 and a drug free backing membrane of ethyl cellulose. The aqueous solubility of repaglinide was increased by complexing with HP β-CD and inclusion complex was made by kneading method. Bilayered buccal patches were developed by solvent casting technique and evaluated for in vitro drug release, moisture absorption, mechanical properties, surface pH, in vitro mucoadhesion, in vitro residence time, and ex vivo permeation study. The optimized formulation batch CK was associated with 90.32% drug release and 90.13% of the drug had permeated in 12 h, with a flux of 83.91 µg.hr-1cm-2 through Goat buccal membrane. Accelerated stability testing with patch CK at 40±0.5 0C and 75±5% relative humidity (RH) for 6 months, showed no remarkable changes in physical characteristics, drug content and release profile. It can therefore be concluded that the patch (CK) containing chitosan and HPMC K4M in the ratio 1:1 has achieved the objectives of this study, such as avoidance of first pass effect, extended release, and increased bioavailability.

Keywords: *Bilayered, Mucoadhesive, Buccal patch, Repaglinide.*

O-03/N/013 ORAL · ONLINE

Stimuli-Responsive Polymer-Based Drug Delivery Systems for Targeted Therapy of Colorectal Cancer

Neha Ghosh*, Nitin Sharma

Centre of Pharmaceutics, Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, 201313, India
Email: nehagh02@gmail.com

Introduction: Colorectal cancer (CRC) remains one of the most prevalent and lethal malignancies worldwide, and conventional chemotherapeutic approaches are limited by poor site-specificity, systemic toxicity, and drug resistance. Stimuli-responsive polymeric drug delivery systems offer a promising strategy to overcome these limitations by exploiting the unique physiological and pathological features of the tumor microenvironment for targeted, controlled drug release.

Aim & Objectives: This systematic review aims to critically evaluate the design, mechanisms, and therapeutic applications of internal, external, and multi-stimuli-responsive polymeric systems for targeted CRC therapy, and to identify current challenges and future research directions.

Methods: A systematic literature search was conducted across [PubMed, Scopus, Web of Science, etc.] databases for studies published between [year range], using keywords related to stimuli-responsive polymers, colorectal cancer, and targeted drug delivery. [Number] studies meeting the inclusion criteria were reviewed.

Results: The review highlights pH-, redox-, enzyme-, hypoxia-, and temperature-responsive systems as internal triggers, alongside light-, magnetic-, ultrasound-, and electric-field-responsive external systems, each exploiting distinct tumor microenvironment cues (acidic pH, hypoxia, elevated enzymes, redox imbalance) to achieve site-specific drug release. Multi-stimuli-responsive systems demonstrated enhanced precision and reduced off-target effects compared to single-stimulus counterparts.

Summary: Stimuli-responsive polymeric platforms show significant potential to improve drug targeting, bioavailability, and therapeutic efficacy in CRC while minimizing systemic toxicity.

Conclusion: Despite promising preclinical outcomes, clinical translation requires addressing challenges in scalability, biocompatibility, and regulatory approval.

Keywords: *Colorectal cancer; Stimuli-responsive polymers; Targeted drug delivery; Tumor microenvironment; Controlled release*

O-03/N/014 ORAL · ONLINE

Strategies For Taste Marking of Herbal Compound

Geetanjali Bhardwaj*, Nitin Sharma

Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, 201313, India
Email: geetanjalibhardwaj2908@gmail.com

Introduction: Shilajit is a natural substance widely used in traditional medicine because of its potential antioxidant, anti-inflammatory, and health-promoting properties. However, its strong, bitter, and unpleasant taste may limit its palatability and acceptability in oral formulations. Taste masking can improve the sensory characteristics of Shilajit and enhance its suitability for patient-friendly formulations. Protein–polysaccharide coacervation is a promising technique in which interactions between proteins and polysaccharides form a protective polymer-rich matrix around the active herbal compound.

Aim & Objectives: To develop a protein–polysaccharide coacervate matrix for masking the bitter taste of Shilajit and to evaluate its taste-masking efficacy.

Methods: A coacervate matrix was prepared by combining protein and polysaccharide solutions with a Shilajit dispersion under controlled pH and stirring conditions, followed by addition of stabilizing and flavoring agents. The taste of the resulting formulation was assessed and compared with plain Shilajit.

Results: The coacervate-based formulation is expected to show noticeably reduced bitterness of Shilajit.

Summary: The coacervate matrix approach shows potential to physically entrap bitter constituents of Shilajit, reducing their contact with taste receptors.

Conclusion: The protein–polysaccharide coacervate matrix offers a simple and promising strategy for taste masking of Shilajit and may be applicable to other bitter herbal compounds.

Keywords: *Taste masking, Shilajit, Coacervate, Protein-polysaccharide complex*

O-03/N/015 ORAL · ONLINE

Development of Drug-Loaded Chitosan–Locust Bean Gum Beads-in-Film System for Controlled Wound Healing

Monideepa Roy*, Ameya Sharma

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: monideepa1010.mpharm25@chitkarauniversity.edu.in

Background: Chronic wounds are frequently complicated by bacterial infection and require wound dressings that maintain a moist environment while providing localized and sustained antimicrobial delivery. Previous studies demonstrated the potential of drug-loaded alginate–gelatin fibers incorporated into films and ciprofloxacin-loaded chitosan microparticles embedded in gelatin films for controlled wound care.

Objective: The present work proposes an advancement of these approaches through the development of drug-loaded chitosan–locust bean gum (CS–LBG) microbeads incorporated within a biopolymeric transdermal film as a beads-in-film system for wound healing.

Methods: Drug-loaded CS–LBG microbeads will be prepared using ionic/ionotropic crosslinking and subsequently incorporated into a film-forming polymeric matrix by solvent casting. Formulations will be optimized for polymer ratio, bead characteristics and drug loading. The developed system will be evaluated for physicochemical and mechanical properties, surface morphology, drug content, swelling, moisture-related characteristics, in-vitro drug release, release kinetics and ex-vivo permeation. Antibacterial activity against relevant wound pathogens and wound-healing performance will also be assessed.

Results: The proposed design is expected to combine the structural and wound-supporting properties of biopolymers with the controlled-release advantages of discrete drug-loaded microbeads. The reviewed studies show that embedding drug-loaded particulate or fibrous carriers within polymeric films can reduce rapid drug release and improve film mechanical and functional properties. The CS–LBG bead-in-film architecture is therefore anticipated to provide prolonged localized rifampicin delivery and effective antibacterial activity.

Conclusion: This beads-in-film strategy represents a rational advancement over previously reported fiber-in-film and microparticle-in-film systems and may provide a promising biopolymeric platform for controlled antimicrobial delivery and chronic wound management.

Keywords: *Chitosan; Locust bean gum; Microbeads; Beads-in-film; Biopolymeric film; Controlled drug release; Wound healing*

O-03/N/016 ORAL · ONLINE

Janus Microneedles Enabling Orderly Vitiligo Treatment Through Spatiotemporal Sequential Promoting Melanogenesis to Transfer Via PAR2 Activation

Disha Boxi[1]*, Neha Kanojia[1]

[1]Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: disha1007.mpharm25@chitkarauniversity.edu.in

Background: Vitiligo results from oxidative stress and $CD8^+$ T-cell-mediated melanocyte destruction, compounded by impaired melanosome transfer to keratinocytes. Current therapies (corticosteroids, calcineurin inhibitors, NB-UVB) target only single facets of this cascade and penetrate poorly into hair follicles, leading to incomplete repigmentation and high relapse.

Objective: To design a single-application microneedle (MN) system that sequentially repairs the immune microenvironment, restores melanogenesis, and drives melanosome transfer to the epidermis.

Methods: A Janus core-shell MN was fabricated by two-step vacuum casting. The shell (640 μm depth, targeting hair follicles) contained hypericin-assembled nanoparticles (HY-NPs) with astragalus polysaccharide (APS); the core (300 μm depth, targeting epidermal keratinocytes) encapsulated hyaluronic-acid-stabilized trypsin. The system was evaluated using physicochemical characterization, DPPH/ABTS antioxidant assays, B16F10/HaCaT cell models, transwell co-culture, transcriptomics, and a monobenzone-induced C57BL/6 mouse vitiligo model treated over 4 weeks, with flow cytometry for immune profiling.

Results: HY-NPs scavenged ROS, upregulated HO-1, and activated MAPK signaling (via PTGS2 inhibition) to increase MITF/TYR and melanin synthesis. Core-released trypsin activated keratinocyte PAR2, enhancing phagocytosis and tunnelling-nanotube-mediated melanosome transfer. In vivo, Janus MNs produced faster, more uniform repigmentation than single-layer Core or Shell MNs, matching tacrolimus, while reducing $CD8^+$ T-cell infiltration, dendritic cell maturation markers, and spleen index indicating combined local and systemic immune correction.

Conclusion: Janus MNs unify immune repair, melanogenesis, and melanosome transfer within one spatiotemporally sequenced device, offering a mechanistically integrated, minimally invasive strategy for vitiligo, with potential extension to other stratified skin disorders.

Keywords: *Vitiligo; Janus microneedle; Hypericin-assembled nanoparticles; Trypsin; Repair-regeneration-transfer; Spatiotemporal sequence*

O-03/N/017 ORAL · ONLINE

Engineered Exosomes for Targeted Brain Tumor Drug Delivery

Khushi Mittal*, Nitin Sharma
Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, 201313, India
Email: km7954060@gmail.com

Background: Brain tumor, particularly glioblastoma multiforme (GBM), represent a leading cause of cancer related mortality in neuro-oncology, with median survival under 15 months despite multimodal therapies. Conventional treatments face formidable barriers, including the blood-brain barrier (BBB), tumor heterogeneity and therapeutic resistance. Exosomes, nano-sized extracellular vesicles (30-150 nm) secreted by tumor and stromal cells emerge as promising mediators in the tumor microenvironment. Enriched with bioactive cargos such as proteins, lipids, miRNAs, and mRNAs, exosomes facilitate intercellular communication, modulating tumor progression, invasion, and immune evasion.

Aim: This review evaluates the multifaceted applications of exosomes in brain tumor management, encompassing liquid biopsy-based diagnostics, targeted drug delivery, and prognostic biomarkers, to bridge gaps between preclinical promise and clinical translation.

Methods: A comprehensive literature search conducted across PubMed, Scopus, Web of Science, and Google Scholar, focusing on studies involving exosome isolation, characterization and functional assays in glioma models.

Results: Exosomes enable non-invasive diagnostics via circulating miR-21, EGFRvIII, and IDH1 mutants, achieving >90% sensitivity in CSF and plasma for GBM detection. Therapeutically, engineered exosomes cross the BBB, enhancing drug efficacy while minimizing off-target toxicity. Immunomodulatory exosomes reprogram microglia and T-cells, boosting anti-PD-1 responses.

Conclusion: Exosomes are emerging as a transformative platform acting as theranostic, offering precision diagnostics and BBB-penetrant therapeutics. Challenges in scalable production and standardization persist.

Keywords: *Exosomes, brain tumor, glioblastoma, liquid biopsy, drug delivery, blood-brain barrier, biomarkers, nanotheranostics.*

O-03/N/018 ORAL · ONLINE

Apremilast loaded nanoengineered dual drug delivery system for management of inflammatory bowel disease

Rupam Bera*, Nitin Sharma
Centre of Pharmaceutics, Amity Institute of Pharmacy, Amity University Uttar Pradesh, Noida, Uttar Pradesh, 201313, India
Email: berarupam199@gmail.com

Introduction: Inflammatory bowel disease (IBD) is a chronic inflammatory disorder of the gastrointestinal tract in which conventional oral therapy may be limited by poor site-specific drug delivery, premature absorption and systemic adverse effects. Polymeric nanoparticles offer a promising nanomedicine approach by improving drug encapsulation, protecting the drug and providing controlled release. Integration of nanoparticles with natural polysaccharides may further enhance colon-specific delivery.

Aim and Objectives: The study aimed to develop and optimize apremilast-loaded PLGA nanoparticles incorporated into an okra (Abelmoschus esculentus) polysaccharide-based system for colon-targeted delivery. The objectives were to perform pre-formulation studies, develop and optimize the nanoparticles, characterize the optimized formulation and develop a polysaccharide-based colon-targeted delivery system.

Methods: Apremilast-loaded PLGA nanoparticles were prepared by the solvent evaporation method using dichloromethane as the organic solvent and polyvinyl alcohol as a surfactant. A central composite design was used to study the effect of PLGA concentration and homogenization speed on particle size, PDI and entrapment efficiency. Okra polysaccharide was extracted deproteinized and formulate it into pellets. The pellets were subsequently coated with Eudragit S-100 to provide pH-dependent protection and colonic release.

Results: The optimized nanoparticles showed a particle size of 257.5±4.5 nm, PDI of 0.064, zeta potential of +1.507 mV, entrapment efficiency of 88.7%±5.45 and drug loading of 9.85%±1.23. SEM demonstrated predominantly spherical nanoparticles with a smooth surface.

Summary and Conclusion: The study successfully developed PLGA nanoparticle system and integrated it with a natural polysaccharide-based pH-sensitive pellet. The developed system demonstrates promising potential for colon-targeted apremilast delivery.

Keywords: *Apremilast, PLGA Nanoparticles, Colon-Targeted Drug Delivery, Okra Polysaccharide, Inflammatory Bowel Disease.*

O-03/N/019 ORAL · ONLINE

Targeting The Neuroinflammatory Microenvironment: Cell-Specific Nano-Delivery Of Polyphenols for Precision Therapy

Diya Koul[1]*, Nitin Sharma[1]

[1]*Centre of Pharmaceutics, Amity Institute of Pharmacy, Amity University Uttar Pradesh, Noida, Uttar Pradesh, 201313, India*
Email: diyakoul2004@gmail.com

Introduction: Neuroinflammation is a complex and heterogeneous response involving microglia, astrocytes, endothelial cells, pericytes, and other cellular populations. Persistent or dysregulated activation contributes to neurological disorders, including Alzheimer's disease, Parkinson's disease, multiple sclerosis and traumatic brain injury. Polyphenols such as curcumin, resveratrol, and quercetin show multi-target anti-inflammatory effects but poor solubility, instability, rapid metabolism, low bioavailability and limited brain delivery restrict their therapeutic potential.

Aim and Objectives: This review aims to examine nano-delivery of polyphenols as a strategy to modulate disease-associated cellular phenotypes rather than merely increase brain exposure, with emphasis on cellular biomarkers and phenotype-specific targeting.

Methods: An extensive literature search was conducted across PubMed, Scopus, Web of Science and Google Scholar for studies published between 2015 and 2026, using keywords related to neuroinflammation, cellular phenotypes, polyphenols, nanocarriers, cell-specific targeting, brain delivery. Relevant studies on microglia, astrocytes, endothelial cells, pericytes, and associated molecular pathways were critically evaluated.

Results: Evidence indicates that polyphenols regulate NF-κB, NLRP3, TLR4, JAK/STAT, MAPK, Nrf2, oxidative stress and mitochondrial dysfunction. Nanocarriers can improve polyphenol stability, bioavailability, brain delivery, and interaction with disease-associated cellular populations. Emerging approaches using single-cell RNA sequencing and spatial transcriptomics may further support rational identification of cellular targets.

Summary and Conclusion: Integrating cellular phenotyping with nanomedicine offers a promising strategy for precision management of neuroinflammation. Phenotype-responsive and spatially targeted nanocarriers may enable selective polyphenol delivery to pathological cell states and improve therapeutic outcomes.

Keywords: *Neuroinflammatory, Nano Delivery, Precision Therapy, Polyphenols*

O-03/N/020 ORAL · ONLINE

Protein–Polysaccharide Coacervation to Improve the Palatability of Herbal Compounds

Yashika Garg*, Nitin Sharma

Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, 201313, India
Email: yashikagarg3008@gmail.com

Introduction: Herbal compounds are widely used for their therapeutic properties; however, their bitter and unpleasant taste may limit palatability and patient acceptability. Shilajit, a naturally occurring herbal substance containing fulvic acids, humic substances, polyphenols, and aromatic compounds, has a characteristic bitter taste that can restrict its use in oral formulations. Protein–polysaccharide coacervation is a promising technique in which interactions between herbal constituents and polymers form colloidal coacervates, reducing their exposure to taste receptors.

Aim & Objectives: To develop a protein–polysaccharide coacervate system for improving the palatability of Shilajit by reducing the perception of its bitter taste and to evaluate its taste-masking efficacy.

Methods: A coacervate system was designed using β-casein or sodium caseinate and maltodextrin. A 5% w/v protein solution was prepared and hydrated overnight at 4°C. Shilajit was dispersed in purified water, followed by pH adjustment to 5.6–6.0. The protein solution was gradually added under controlled stirring at approximately 600 rpm and 25°C. Maltodextrin was incorporated for stabilization, followed by concentration, glycerol, flavoring, and sweetening agents.

Results: The formulation is expected to reduce the exposure of bitter constituents to taste receptors and improve palatability. Characterization will include particle size, zeta potential, FTIR, DSC, SEM/TEM, rheology, protein-binding efficiency, electronic tongue, and sensory evaluation.

Conclusion: Protein–polysaccharide coacervation offers a promising strategy for improving the palatability of Shilajit and may be applicable to other bitter herbal compounds.

Keywords: *Protein–polysaccharide coacervation, Taste masking, Palatability, Shilajit, β-casein, Maltodextrin*

O-03/N/021 ORAL · ONLINE

Formulation Development and Evaluation of Grafted Copolymer of Boswellia serrata

Piyush Aggarwal*

Department of Pharmaceutics, Jan Nayak Ch Devilal Memorial College of Pharmacy, Sirsa
Email: piyushaggarwal12424@gmail.com

The present study focuses on the formulation development and evaluation of a grafted copolymer derived from Boswellia serrata, a medicinal plant widely recognized for its therapeutic potential, particularly its anti-inflammatory and antioxidant properties. The objective of the study was to develop a suitable grafted copolymer system to improve the functional and pharmaceutical characteristics of Boswellia serrata constituents and explore its potential application in drug delivery. The grafting process was carried out using a suitable polymeric backbone and optimised reaction conditions to obtain the desired copolymer. The developed material was evaluated for its physicochemical characteristics, including appearance, solubility, swelling behaviour, moisture content, compatibility, and structural properties. Characterisation techniques such as Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), and other relevant analytical methods were employed to confirm graft formation and assess the stability of the developed system. Formulation parameters were optimised on the basis of the obtained evaluation results. The developed grafted copolymer demonstrated satisfactory physicochemical characteristics and improved functional properties compared with the native material. The findings indicate that grafting modification can be a promising approach for enhancing the pharmaceutical applicability of Boswellia serrata. The developed system may provide a potential platform for further investigation in controlled drug delivery and other pharmaceutical formulations.

Keywords: *Boswellia serrata; Graft Copolymer; Graft Polymerization; Acrylamide; Ceric Ammonium Nitrate; Microwave-Assisted Grafting; Controlled Drug Delivery; Formulation Development.*

O-03/N/022 ORAL · ONLINE

Vinorelbine Tartrate loaded Liposome loaded in-Situ Hydrogel for Brain Cancer Therapy via Site-Specific Delivery Systems

Pooja Mittal*[1], Pilla Mohitha[1]

[1]GITAM School of Pharmacy, GITAM (Deemed to be University), Hyderabad, Telangana, India
Email: pmittal2@gitam.edu

Brain cancer, particularly glioblastoma, remains a major therapeutic challenge due to the blood-brain barrier, limited drug penetration, rapid tumor progression, and systemic toxicity associated with conventional chemotherapy. The present study will focus on the development of Vinorelbine tartrate-loaded liposomes incorporated into a thermosensitive in-situ hydrogel for site-specific brain cancer therapy. Liposomes were prepared using an ethanol injection method and characterized for particle size, polydispersity index, zeta potential, drug entrapment efficiency, and physicochemical characteristics. The optimized liposomal formulation was subsequently be incorporated into a poloxamer based thermosensitive in-situ hydrogel to improve formulation retention and provide drug release. The developed formulation was evaluated for gelation behaviour, viscosity, mucoadhesive properties, in-vitro drug release, and ex vivo permeation. Further, cytotoxicity and preliminary cell line studies will be performed to assess its therapeutic potential against brain cancer. The proposed formulation is expected to improve the stability, sustained delivery, and site-specific availability of Vinorelbine tartrate. Thus, liposome-loaded in-situ hydrogel may provide a promising platform for improving the beneficial effectiveness of Vinorelbine in brain cancer management.

Keywords: *Vinorelbine tartrate, Liposomes, Thermosensitive in-situ hydrogel, Brain cancer, Glioblastoma, Nose-to-brain delivery.*

O-03/N/023 ORAL · ONLINE

Varicose Veins: Pathophysiology, Risk Factors, Clinical Manifestations, and Management

Mayank Pathak

GHG Khalsa College of Pharmacy, Gurusar Sudhar, Ludhiana
Email: mayank2003pathak@gmail.com

Varicose veins are enlarged, twisted, and irregularly dilated superficial veins that mainly affect the lower limbs. They commonly involve the great and small saphenous veins, their tributaries, and other superficial veins of the legs. This condition is widespread and affects a considerable proportion of the adult population. Several factors contribute to its development, including advancing age, genetic predisposition, obesity, pregnancy, and prolonged periods of standing. The underlying mechanism is mainly associated with incompetent venous valves, weakening of the vein walls, and impaired return of blood to the heart, resulting in venous pooling and increased pressure within the lower-limb veins. Although varicose veins may initially be a cosmetic concern, they can also cause pain, heaviness, swelling, skin changes, and complications such as thrombosis. Treatment is selected according to the severity of symptoms, patient preferences, cost, and the risk of complications. Conservative management includes lifestyle modification, weight control, regular exercise, leg elevation, avoidance of prolonged standing, and compression therapy. In patients with persistent symptoms or advanced disease, minimally invasive interventions or surgical procedures may be required. Early diagnosis, appropriate treatment, and preventive measures are important for controlling symptoms, limiting disease progression, and improving the quality of life of affected individuals.

Keywords: *Varicose veins, Venous insufficiency, Risk factors, Compression therapy.*

O-03/N/024 ORAL · ONLINE

Development and Evaluation of a Multifunctional Topical Hydrogel for Burn Wound Healing

Nivedita Debnath*, Ashish Kumar Parashar

Lloyd Institute of Management and Technology, Plot No. 11, Knowledge Park II, Greater Noida, Uttar Pradesh 201310, India
Email: niveditadebnath292@gmail.com

Burn wounds are complex injuries that often require effective treatment to control inflammation and support proper tissue repair. An ideal wound dressing should provide a suitable environment for healing while also promoting skin regeneration and minimizing damage to the newly formed tissue. In the present study, a multifunctional topical hydrogel was developed and evaluated for its potential application in burn wound healing. The hydrogel was prepared using biocompatible components selected for their beneficial roles in wound care and tissue repair. The formulation was characterized for its physicochemical and rheological properties, followed by evaluation of its wound-healing potential in an experimental thermal burn wound model. The hydrogel produced significantly accelerated wound contraction compared with untreated control and individual betaine–gelatin and aloe vera–gelatin hydrogels, achieving approximately 80% wound closure by day 11 and 98% closure by day 21 ($P < 0.001$). Histopathological examination further demonstrated enhanced re-epithelialization, fibroblast proliferation, collagen deposition, reduced inflammatory infiltration, and restoration of dermal architecture. Epidermal thickness reached approximately 310 µm in the treated group by day 21. The results showed that treatment with the developed hydrogel improved the healing process when compared with untreated wounds and formulations containing individual components. A noticeable reduction in wound area and improved wound contraction were observed during the treatment period. Further morphological and histological examinations demonstrated better re-epithelialization, regeneration of the epidermis, collagen deposition, and restoration of normal dermal structure. The hydrogel-treated wounds also showed reduced fibrotic changes, suggesting improved quality of tissue repair. These findings indicate that combining different biocompatible components in a single hydrogel system may provide a supportive environment for burn wound healing and enhance the overall repair process. The developed topical hydrogel therefore shows promising potential as an advanced wound dressing for burn management. However, further investigations are required to confirm its long-term safety and clinical applicability.

Keywords: *Burn wound healing; Topical hydrogel; Wound dressing; Tissue repair; Skin regeneration; Collagen deposition.*

O-03/N/025 ORAL · ONLINE

Quality-by-Design Steered Development and Validation of Analytical Method for the Estimation of Etodolac: Integration of Monte Carlo Simulations and Green Analytical Principles

Yashika*, Mohit Kumar

[1]*Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab 140401, India.*
Email: yashika.sangar@gmail.com

Background: The development of robust, reliable, and environmentally sustainable analytical methods is essential for the quality control of advanced pharmaceutical formulations. Analytical Quality by Design (AQbD) provides a systematic and science-based approach for developing analytical methods with enhanced robustness and regulatory compliance.

Objective: The present study aimed to develop and validate a robust, eco-friendly, and regulatory-compliant reversed-phase high-performance liquid chromatography (RP-HPLC) method for the quantitative estimation of etodolac in niosomal gel-based pharmaceutical formulations using an AQbD framework.

Methods: The analytical method was systematically developed using AQbD principles in accordance with ICH Q8, Q9, Q10, and Q14 guidelines. Principal Component Analysis (PCA) was employed for selection of the analytical wavelength, while Ishikawa analysis and a risk assessment matrix were used for quality risk assessment. Critical method parameters were screened using a Taguchi design and subsequently optimized using Central Composite Design-based Response Surface Methodology. The Method Operable Design Region (MODR) was established and assessed using Monte Carlo simulation with 50,000 iterations. The optimized method was further validated according to ICH Q2(R2) guidelines.

Results: PCA identified 279 nm as a stable and noise-free detection wavelength. Flow rate and mobile phase composition were identified as the most influential method parameters affecting peak area, retention time, tailing factor, and theoretical plate count. The optimized chromatographic conditions consisted of a C18 column with an acetonitrile–ammonium acetate buffer (pH 3.0) mobile phase at a flow rate of 1.0 mL/min. Monte Carlo simulation confirmed the robustness and reliability of the established MODR. The method exhibited excellent linearity (r^2 = 0.99989) over the concentration range of 0.1–10 µg/mL, with accuracy of 99.83–101.08% and precision of %RSD < 2%. The method demonstrated good sensitivity with an LOD of 0.03 µg/mL and LOQ of 0.1 µg/mL, while robustness studies indicated negligible effects of deliberate variations. The method showed excellent environmental sustainability with an Analytical Eco-Scale score of 80, while its practical applicability was supported by a BAGI score of 82.5 and an overall whiteness score of 82.5.. Etodolac-loaded niosomes exhibited a high entrapment efficiency of 96.72% and demonstrated sustained drug release compared with conventional niosomes.

Conclusion: The developed AQbD-based RP-HPLC method demonstrated excellent linearity, accuracy, precision, sensitivity, robustness, and environmental sustainability. Its successful application to etodolac-loaded niosomal gel further confirmed its practical utility. The proposed analytical strategy provides a scientifically rigorous and lifecycle-oriented approach suitable for routine quality control, stability assessment, and regulatory applications of etodolac in advanced pharmaceutical formulations.

Keywords: *Quality by Design; RP-HPLC; Etodolac; Niosomal gel; Method validation; Green analytical chemistry; Monte Carlo simulation.*

O-03/N/026 ORAL · ONLINE

Resmetirom: A novel treatment for steatohepatitis linked to metabolic dysfunction

Rakhi Verma*, Kamal Singh Rathore

Research Scholar, Bhupal Nobles' University, Udaipur, Rajasthan (India)
Faculty of Pharmacy, Bhupal Nobles' College of Pharmacy, Udaipur, Rajasthan (India)
Email: rakhi91verma@gmail.com

Metabolic dysfunction-associated steatotic liver disease (MASLD) affects approximately one-third of the global population, leading to serious conditions such as cirrhosis and hepatocellular carcinoma. With 20-30% of MASLD patients progressing to its more severe form, metabolic-associated steatohepatitis (MASH), and effective treatment options are critical. Lifestyle changes remain the primary intervention; however, most patients find them hard to maintain. Resmetirom, a selective thyroid hormone receptor beta (THR-β) agonist, targets metabolic pathways in the liver to reduce fat accumulation and inflammation. Preclinical studies show that resmetirom improves liver histology and lipid profiles. Clinical trials indicate that it effectively reduces liver fat and offers a generally positive safety profile, leading to recent FDA approval for patients with MASH and moderate-to-advanced fibrosis. Despite promising initial results, ongoing research is needed to assess its long-term safety and effectiveness, particularly among diverse populations and various stages of liver disease.

Keywords: *MASLD, MASH, Resmetirom, Liver, Placebo group, Hepatic Fat.*

O-03/N/027 ORAL · ONLINE

Development and Validation of a Stability-Indicating RP–HPLC Method for Simultaneous Estimation of Aceclofenac and Tizanidine Hydrochloride

Kiran Sirvi*, Kamal S Rathore

Department of Pharmaceutics, Bhupal Noble's College of Pharmacy, Udaipur 313001, Rajasthan, India
Email: kiransirvi2509@gmail.com

A simple, precise, accurate, rapid, and stability-indicating RP-HPLC method was developed and validated for the simultaneous estimation of Aceclofenac and Tizanidine Hydrochloride in bulk drug and pharmaceutical dosage forms. Aceclofenac, a non-steroidal anti-inflammatory drug, and Tizanidine Hydrochloride, a centrally acting α2-adrenergic agonist, are widely used together for managing pain, inflammation, and muscle spasticity. Chromatographic separation was achieved on a C18 reverse-phase column (250 × 4.6 mm, 5 µm) using phosphate buffer (pH 3.5) and acetonitrile (45:55, v/v) as the mobile phase. The flow rate was 1.0 mL/min, detection was performed at 230 nm, injection volume was 20 µL, and total run time was 10 min. The method produced well-resolved peaks at retention times of approximately 4.2 and 6.1 min for Aceclofenac and Tizanidine Hydrochloride, respectively. The method was validated according to ICH Q2(R2) guidelines for specificity, linearity, accuracy, precision, sensitivity, robustness, ruggedness, system suitability, and assay. Both drugs showed excellent linearity with correlation coefficients above 0.999. Recoveries ranged from 98–102%, and precision showed %RSD below 2%. The method demonstrated satisfactory sensitivity, reproducibility, and robustness, making it suitable for routine quality control, stability testing, formulation analysis, and regulatory applications in industry.

Keywords: *Aceclofenac, Tizanidine Hydrochloride, RP-HPLC, ICH Q2(R2), Stability-Indicating Method, Simultaneous Estimation, Pharmaceutical Analysis, Quality Control.*

O-03/N/028 ORAL · ONLINE

Hesperidin–Cyclodextrin Inclusion Complex: A Review of Its Potential for Solubility Enhancement

Gaurav Dhiman*

Department of Pharmaceutics, Global Research Institute of Pharmacy, Nachraun, Radaur, Yamunanagar, Haryana, India (135133)
Email: gd5945465@gmail.com

Introduction: A flavonoid derived from citrus, hesperidin has been extensively studied for its possible biological activities, including anti-inflammatory and antioxidant properties. Its poor aqueous solubility can limit dissolution and hence affect its oral administration, despite its medicinal and nutritional potential. Cyclodextrins are cyclic oligosaccharides that have drawn interest as pharmaceutical excipients for enhancing medication solubility and dissolution because they can form inclusion complexes. With substances that are poorly soluble in water..

Aim and Objectives: With a focus on specialized molecule formation, dispersion enhancement, dissolving behavior, and possible absorption improvement, this review attempts to investigate the documented usage of cyclodextrins for enhancing the chemical, physical, in addition to pharmaceutical properties of standard hesperidin..Methods: We reviewed pertinent published research on hesperidin, cyclodextrins, inclusion complexes, solubility enhancement, a. In order to comprehend the mechanisms and factors driving complex formation, studies using β-cyclodextrin and derivatives hand characterisation methodsve been taken into consideration.

Results: According to published research, cyclodextrin complexation can enhance flavonoids' apparent water solubility and dissolving properties through host-guest interactions. Research on hesperidin and similar citrus flavonoids indicates that complexation that utilizes cyclodextrin might be a helpful strategy for getting around restrictions related to solubility.

Summary and Conclusion: Hesperidin, cyclodextrin complexation is an intriguing technique that could improve hesperidin's therapeutic effectiveness, according to the literature that is currently accessible. To determine the best cyclodextrin, complexation conditions, stability, and in-vivo performance, more thorough research is necessary.

Keywords: *Hesperidin, Cyclodextrin, Inclusion complex, Solubility enhancement, Dissolution, Flavonoids.*

O-03/N/029 ORAL · ONLINE

3D-Printed Tablets: A Novel Approach Towards Personalized Drug Delivery

Himanshi Sharma, Akshita Chakraborty
Jaipur National University
Email: mbbshimanshi@gmail.com

Conventional pharmaceutical tablets are generally manufactured in fixed strengths and standardized dosage forms, which may not adequately meet the individual requirements of every patient. Three-dimensional (3D) printing has emerged as an innovative pharmaceutical manufacturing technology capable of producing drug-loaded dosage forms layer-by-layer according to a digitally designed structure. This approach offers considerable potential for personalized drug delivery by enabling modification of dose, tablet geometry, internal architecture, drug loading, and release characteristics. Different 3D-printing techniques, including fused deposition modeling, binder jetting, and extrusion-based printing, have been investigated for the fabrication of pharmaceutical dosage forms. The internal structure and composition of a printed tablet can influence surface area, porosity, dissolution, and consequently drug-release behavior. 3D printing also provides opportunities for developing modified-release formulations and polypills containing multiple active pharmaceutical ingredients. However, challenges such as dose uniformity, reproducibility, material compatibility, printing speed, stability, scale-up, and regulatory requirements remain important considerations. Overall, 3D printing represents a promising technology for transforming conventional fixed-dose formulations into flexible and potentially patient-specific drug delivery systems.

Keywords: *3D printing; pharmaceutical technology; personalized medicine; tablets; drug delivery; modified release; polypill.*

O-03/N/030 ORAL · ONLINE

Development and Evaluation of Cinnarizine Cocrystal-Loaded Gastroretentive Expandable Films for Prolonged Gastric Residence and Enhanced Drug Absorption

Jasleen Kaur*, Arya Rai, Inderbir Singh
Chitkara College of Pharmacy, Chitkara University, Punjab, 140401, India
Email: jasleen1005.ccp25@chitkara.edu.in

Introduction: Cinnarizine is a Biopharmaceutics Classification System (BCS) class II drug with poor aqueous solubility, which can limit its dissolution and oral absorption. Cocrystallization and gastroretentive drug delivery offer complementary approaches to improve its dissolution and prolong gastric residence.

Aim & Objectives: This study aimed to develop cinnarizine–piperine cocrystals and incorporate the optimized cocrystal into gastroretentive expandable films for improved dissolution and controlled drug release.

Methods: Cinnarizine–piperine cocrystals were prepared in a 1:1 ratio by solvent evaporation and characterized by Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), scanning electron microscopy (SEM), and powder X-ray diffraction (PXRD). The selected cocrystal was incorporated into films containing chitosan, polyvinyl alcohol (PVA), polyethylene glycol (PEG) 400, and different grades of hydroxypropyl methylcellulose (HPMC) using solvent casting. Films were evaluated for physicochemical and mechanical properties, swelling, expansion, drug content, and in vitro drug release.

Results: Cocrystal formation was confirmed by FTIR, DSC, SEM, and PXRD, with improved cinnarizine solubility. The optimized F12 formulation exhibited a folding endurance of 305 ± 0.23 folds and film expansion of 4.21 ± 0.01. F12 demonstrated an optimum drug-release profile and followed the Higuchi model with R^2 = 0.9881.

Conclusion: The cinnarizine-piperine cocrystal-loaded expandable film demonstrated suitable physicochemical and mechanical characteristics with controlled drug release, indicating its potential as a gastroretentive delivery system for cinnarizine.

Keywords: *Cinnarizine, Piperine, Cinnarizine-piperine cocrystal, Co-crystals, Gastroretentive expandable film.*

O-03/N/031 ORAL · ONLINE

Development and Characterization of an Alkylating Agent-Loaded Cyclodextrin Nanosponge for Drug Delivery

Lavish Vaid[1]*, Vishal Kumar[2], Francesco Trotta[3], Reena Sharma[1], Chander Parkash Dora[1]

[1]*Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab – 140401, India*
[2]*Maharishi Markandeshwar College of Pharmacy, Ambala (India)-133207*
[3]*Dipartimento di Chimica, Università degli Studi di Torino, Via P. Giuria, 7-10125, Torino, Italy*
Email: lavishvaid04@gmail.com

Introduction: Nanosponges are porous, cross-linked cyclodextrin-based nanocarriers that can improve the solubility, stability, and release of poorly soluble drugs. Their nanosized structure also offers potential for enhanced intracellular drug delivery.

Aim & Objectives: The study aimed to develop and characterize a cyclodextrin nanosponge loaded with a alkylating agent. The objectives were to prepare β-cyclodextrin nanosponges, evaluate their physicochemical characteristics, investigate in-vitro drug release, and assess cellular uptake in MCF-7 cells.

Methods: β-Cyclodextrin nanosponges were prepared using carbonyldiimidazole as a cross-linking agent. The alkylating agent was incorporated at different drug-to-nanosponge ratios (1:1–1:4 w/w). The optimized formulation was evaluated for particle size, polydispersity index (PDI), entrapment efficiency, zeta potential, Fourier-transform infrared spectroscopy, differential scanning calorimetry, transmission electron microscopy, in-vitro drug release, and stability. Cellular uptake was evaluated in MCF-7 cells using a fluorescent model marker.

Results: The optimized formulation showed a particle size of 180 ± 0.17 nm, PDI of 0.20 ± 0.4, entrapment efficiency of 72 ± 0.5%, and zeta potential of +5.4 mV. Transmission electron microscopy showed approximately spherical particles. After 24 h, drug release was 69.41% from the nanosponge compared with 94.76% from the free drug, indicating sustained release. Enhanced cellular uptake was observed with the nanosponge system.

Summary & Conclusion: The developed cyclodextrin nanosponge showed good drug incorporation, sustained drug release, and enhanced cellular uptake, indicating its potential as a nanocarrier for delivery of a cytotoxic alkylating agent.

Keywords: *Cyclodextrin, Nanosponge, Alkylating agent, Nanocarrier, Sustained release, Anticancer.*

O-03/N/032 ORAL · ONLINE

Biomimetic Nanoformulation as Advanced Drug Delivery Strategy in Cancer Treatment

Gaurav Krishna Prashar, Nitin Sharma

Amity Institute of Pharmacy, Amity University, Noida, Uttar Pradesh, India
Email: Gaurav.prashar1@s.amity.edu

Introduction: Cancer therapy remains challenged by poor drug solubility, limited tumor accumulation, systemic toxicity, multidrug resistance, and inadequate penetration into heterogeneous tumors. Conventional nanocarriers improve drug delivery but may suffer from rapid clearance, immune recognition, limited tumor selectivity, and inefficient tumor penetration. Biomimetic nanoformulations integrate nanotechnology with biological components to overcome these limitations.

Aim and Objective: This review aims to evaluate biomimetic nanoformulations as next-generation platforms for precision cancer therapy, focusing on their tumor-targeting mechanisms, therapeutic cargo delivery, and integration with stimuli-responsive systems for controlled and site-specific drug release.

Methods: Recent literature on cell membrane-coated nanoparticles, extracellular vesicles, exosomes, protein- and peptide-based systems, and hybrid biomimetic nanocarriers was analyzed. Emphasis was placed on biological recognition, drug loading, tumor microenvironment responsiveness, and therapeutic outcomes involving endogenous stimuli such as pH, ROS, enzymes, and hypoxia, and external stimuli including light, ultrasound, magnetic fields, and temperature.

Results: Biomimetic systems can enhance biocompatibility, prolong circulation, evade immune surveillance, improve tumor accumulation, and facilitate cellular uptake. Their ability to deliver chemotherapeutics, nucleic acids, proteins, and combination therapies, together with stimuli-responsive release, may enhance therapeutic efficacy while reducing off-target toxicity. However, scalability, stability, reproducibility, safety, characterization, and regulatory standardization remain major challenges.

Summary/Conclusion: Biomimetic nanoformulations represent a promising next-generation approach for precision cancer therapy. Integration with stimuli-responsive technologies offers controlled, selective, and efficient drug delivery, with considerable potential for more targeted and personalized cancer treatment.

Keywords: *Biomimetic nanoformulation; Cancer therapy; Targeted drug delivery; Stimuli-responsive nanoparticles; Tumor targeting; Personalized cancer therapy.*

O-03/N/033 ORAL · ONLINE

Formulation and Evaluation of Mouth Dissolving Strips Using Natural Polymers

Vaishnavi Mishra*, Shivani Singh

Lloyd Institute of Management and Technology, Plot No 11, Knowledge Park II, Greater Noida, Uttar Pradesh 201310
Email: vaishnavi.mishra619@gmail.com

Mouth dissolving strips are commonly used as a convenient oral drug-delivery approach. They dissolve quickly in the mouth and are easier to take, especially during migraine attacks when patients may have difficulty swallowing tablets. The study was carried out to develop and optimize mouth dissolving strips using natural polymers. Maize starch, pectin, and guar gum were studied as film-forming agents, while glycerol was used as a plasticizer. A central composite design was used to optimize the formulation based on drug release and folding endurance. The strips were prepared using the solvent-casting method and evaluated for appearance, thickness, pH, folding endurance, disintegration time, drug content, and in-vitro drug release. Out of 39 formulations, F29, containing 50% pectin and 20% glycerol, was selected as the optimized formulation. It showed 98.12 ± 0.1% drug release within 30 minutes and 27 ± 2 folds of folding endurance. The strip also showed a quick disintegration time of 7 ± 0.3 seconds and a high drug content of 99.89 ± 0.12%. During three months of stability testing, the formulation showed only minimal changes in its evaluated properties. The study successfully developed mouth dissolving strips using natural polymers. Among the polymers tested, pectin performed best and produced a strip with rapid disintegration, good mechanical strength, high drug content, and satisfactory drug release. Overall, the findings suggest that natural polymer-based mouth dissolving strips could be a promising approach for oral drug delivery during migraine attacks.

Keywords: *Mouth dissolving strips; Natural polymers; Pectin; Glycerol; Solvent casting; Migraine; Drug release; Oral drug delivery.*

O-03/N/034 ORAL · ONLINE

Development and Evaluation of Raft-Forming Tablets of Vonoprazan for Prolonged Gastric Retention and Improved Management of Gastric Ulcers

Neha Kumari Rouniyar*, Ashish Kuamr Parashar

Department of Pharmaceutics, Lloyd Institute of management and Technology, Greater Noida, India.
Email: neharountyar32@gmail.com

Background: Vonoprazan, a potassium-competitive acid blocker (P-CAB), offers potent and sustained acid suppression for gastric ulcer management but has a relatively short plasma half-life. Gastroretentive raft-forming systems can prolong gastric residence, enabling localized and sustained delivery at the site of acid production and ulceration.

Objective: To develop, optimize, and evaluate raft-forming tablets of vonoprazan for prolonged gastric retention and improved therapeutic management of gastric ulcers.

Methods: Raft-forming tablets were prepared by direct compression using sodium alginate as the primary raft-forming polymer, calcium carbonate and sodium bicarbonate as gas-generating/antacid agents, and hydroxypropyl methylcellulose (HPMC K4M/K15M) as release-modulating polymer. Formulations were optimized via a 32 factorial design varying sodium alginate and HPMC levels. Tablets were evaluated for physicochemical properties, floating lag time, total floating duration, raft strength/weight/volume, acid neutralization capacity, in vitro drug release in simulated gastric fluid (SGF pH 1.2), release kinetics, drug-excipient compatibility (FTIR, DSC), and short-term stability.

Results: Optimized formulation (F5) exhibited floating lag time < 60 s, total floating time > 12 h, raft strength 6.8 ± 0.3 g, and sustained drug release of ~92% over 12 h following near-zero-order kinetics with non-Fickian diffusion. FTIR and DSC confirmed compatibility. Tablets met pharmacopoeial limits for weight variation, hardness, friability, and content uniformity. The raft provided both buoyancy and acid-neutralizing capacity.

Conclusion: The developed raft-forming vonoprazan tablets successfully achieved prolonged gastric retention and controlled release, offering a promising strategy for enhanced local efficacy in gastric ulcer therapy.

Keywords: *Vonoprazan, Raft-forming tablets, Gastroretentive drug delivery, Sodium alginate; Gastric ulcers; Floating lag time; Sustained release.*

O-03/N/035 ORAL · ONLINE

Formulation and Characterization of leflunomide loaded liposomal gel for Topical Drug Delivery

Mayank Kumar*, Manish Kumar Gupta, Vigyan Singh
Smt. Vidyawati College of Pharmacy, Gora Machhiya, Jhansi
Email: shuklamayank119@gmail.com

Leflunomide is a disease-modifying antirheumatic drug (DMARD) used in the management of inflammatory disorders; however, its poor aqueous solubility and the systemic adverse effects associated with oral administration may limit its therapeutic acceptability. The present study was undertaken to develop a leflunomide-loaded liposomal gel as a topical drug delivery system with the aim of improving localized drug delivery and providing a more controlled release profile. Liposomes were prepared using the methanol injection method and characterized for important physicochemical parameters, including particle size (6.1), polydispersity index (0.264), zeta potential (-39 mV), entrapment efficiency (76.64 %), drug content, and in-vitro drug release (79.25ss%). The optimized liposomal formulation was subsequently incorporated into a Carbopol-based gel to obtain a suitable semisolid formulation for topical application. The developed liposomal gel was evaluated for its appearance, pH (5.6), viscosity and spreadability to determine its physical characteristics and topical applicability. The formulation was designed to combine the drug-encapsulating ability of liposomes with the prolonged residence time, ease of application, and patient acceptability of a gel base, thereby providing a suitable platform for topical drug delivery. Overall, the developed leflunomide-loaded liposomal gel represents a promising approach for topical delivery, with the potential to improve drug localization at the site of application, better drug release, and minimum systemic side effect.

Keywords: *Leflunomide, Liposomes, Carbopol gel, Topical drug delivery, Methanol injection, Drug release, Dermal delivery.*

O-03/N/036 ORAL · ONLINE

Cyclodextrin-Based Drug Delivery in Glaucoma Management

Jatin*
Guru Gobind Singh College of Pharmacy, Yamunanagar
Email: jatinkalri70@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides with a hydrophilic outer surface and a hydrophobic inner cavity, allowing them to form inclusion complexes with poorly water-soluble drugs. This structure improves drug solubility, stability, bioavailability, and membrane permeability while reducing irritation and systemic side effects, making CDs valuable pharmaceutical excipients. In glaucoma treatment, topical agents such as timolol, dorzolamide, brinzolamide, and prostaglandin analogues often face poor corneal penetration, rapid tear clearance, and low ocular bioavailability, typically under 5%. Cyclodextrin complexation addresses these limitations by increasing aqueous solubility, extending ocular surface residence time, enhancing corneal permeability through transient loosening of epithelial tight junctions, and reducing the need for irritating preservatives or cosolvents. These effects improve patient comfort and treatment adherence. Beyond standard eye drops, CDs are being integrated into advanced delivery platforms, including functionalized contact lenses, in situ gelling systems, nanoparticles, micelles, and mucoadhesive polymer combinations. These systems aim to extend dosing intervals and provide more stable intraocular pressure (IOP) control, addressing the poor adherence often associated with frequent dosing. Overall, cyclodextrin-based formulations offer a promising approach to overcoming key pharmacokinetic and formulation challenges in current glaucoma therapies, supporting the development of more effective, better-tolerated, and longer-acting treatments for sustained IOP management.

O-03/N/037 ORAL · ONLINE

Natural Gum-Assisted Development of Candesartan Fast-Dissolving Oral Film: An In-Vitro Study

Abhishek*, Rameshwar Dass
Guru Gobind Singh College of Pharmacy, Yamunanagar-135001, Haryana, India
Email: abhrtp005@gmail.com

Background: Hypertension is one of the most common cardiovascular diseases in the world. Although candesartan is an effective angiotensin receptor blocker, its low aqueous solubility and conventional oral dosage forms may delay drug dissolution. Fast-dissolving oral films prepared with natural gums can offer a patient-friendly approach to the rapid drug release and ease of administration.

Objective: To develop and evaluate a natural gum-based fast-dissolving oral film of candesartan with suitable physicochemical properties and enhanced in vitro performance.

Methodology: Oral films will be prepared using the solvent casting method, followed by evaluation of physicochemical properties, including appearance, thickness, weight variation, folding endurance, surface pH, moisture content, disintegration time, drug content uniformity, and in vitro drug release.

Results and Discussion: The study shows that natural gum-based oral films offer a promising approach for producing films with strong film-forming ability, rapid disintegration, and acceptable mechanical properties. Moreover, the findings show that using natural polymers can lead to the production of patient-centric oral films with enhanced drug-release properties.

Conclusion: Natural gum-based fast-dissolving oral films offer a new way of delivering drugs to patients. This type of formulation is expected to provide a patient-friendly delivery system due to the multiple properties that it exhibits.

Keywords: *Candesartan; Fast-dissolving oral film; Natural gum; Solvent casting; Drug release; Oral drug delivery; Patient-centric formulation.*

O-03/N/038 ORAL · ONLINE

Candesartan in the Management of Migraine Prophylaxis: Mechanistic Insights and Clinical Evidence

Aryan Rathore*, Rameshwar Dass
Guru Gobind Singh College of Pharmacy, Yamunanagar-135001, Haryana, India
Email: Aryanrathore312@gmail.com

Aim: The objective is to evaluate candesartan's potential as a migraine prophylactic treatment by analyzing its molecular underpinnings and the current clinical data.

Background: Recurrent, incapacitating headache episodes are the hallmark of migraine, a chronic neurological condition that is frequently accompanied by nausea, photophobia, and phonophobia. Many patients benefit from conventional preventative medications, including beta-blockers, anticonvulsants, and tricyclic antidepressants, but their effectiveness is sometimes restricted by poor tolerability, inadequate efficacy, or contraindications in specific populations. Because of its effects on cerebral vascular tone, neuroinflammation, and pain modulation, the renin-angiotensin system has emerged as a potential contributor to migraine pathogenesis, making angiotensin receptor blockers such as candesartan viable options for migraine prevention.

Objective: To examine the pharmacological justification, clinical data, and suggested mechanisms of action for the use of candesartan in migraine prevention.

Methodology: A literature search was conducted in databases including PubMed, Scopus, and Google Scholar using terms such as "candesartan," "migraine prophylaxis," "angiotensin receptor blocker," "renin-angiotensin system," and "headache prevention." The effectiveness, safety, and suggested mechanisms of action of candesartan's function in migraine were examined in randomized controlled trials, observational studies, and mechanistic reviews.

Results: Candesartan has been shown in clinical trials to be as effective as well-known preventive medications like propranolol in reducing the frequency, duration, and intensity of migraine attacks. Modulation of cerebral autoregulation, reduction of neurogenic inflammation, antioxidant effects, and disruption of central pain-processing pathways are among the suggested mechanisms.

Conclusion: Clinical trial data and molecular plausibility both support candesartan as a viable, well-tolerated migraine prevention option. To determine the best dosage strategies and validate their inclusion in migraine care guidelines, larger-scale, longer-term research is necessary.

Keywords: *renin-angiotensin system, headache prevention, migraine prophylaxis, angiotensin receptor blocker, and candesartan.*

O-03/N/039 ORAL · ONLINE

Neuroprotective Potential of Bacopa Monnieri in Anxiety-Associated Cognitive Impairment

Keshav Sharma, Anjali Sharma*, Kumar Guarve

Guru Gobind Singh College of Pharmacy, Yamunanagar (135001), Haryana, India
Email: sharma.sharmaa.anjali@gmail.com

Anxiety-related cognitive disorders are a significant & increasingly acknowledged neuropsychiatric issue, marked by ongoing anxiety that affects attention, learning, memory, executive function, & overall cognitive abilities. Bacopa monnieri (L.), also known as Brahmi, is a traditional plant used in Ayurvedic medicine that has attracted substantial scientific interest for its potential to reduce anxiety, enhance cognitive function, & provide neuroprotection, as well as its antioxidant & anti-inflammatory properties. The plant's pharmacological effects are largely attributed to its bioactive compounds, especially bacosides. Research, both preclinical & clinical, indicates that B. monnieri may enhance learning & memory, alleviate anxiety-related behaviors, boost cholinergic and serotonergic neurotransmission, regulate stress responses, and shield neuronal cells from oxidative and inflammatory harm. Additionally, the herb might affect synaptic plasticity and the signaling pathways crucial for memory consolidation and neuronal survival. This review examines the phytochemical composition, pharmacological actions, preclinical data, and clinical outcomes related to B. monnieri in the context of anxiety and cognitive impairments. Particular emphasis is placed on the potential interplay between its anxiolytic and cognitive-enhancing activities, which may provide a complementary therapeutic approach for anxiety-associated cognitive impairment.

Keywords: *Brahmi, anxiety, cognitive dysfunction, memory impairment, nootropic, neuroprotection, oxidative stress, neuroinflammation.*

O-03/N/040 ORAL · ONLINE

Development and Characterization of 5-Fluorouracil Solid Self-Microemulsifying Drug Delivery System for Colorectal Cancer Treatment

Rushikesh Kapadnis, Neeraj Singh, Shweta Rai, Sankha Bhattacharya*

Department of Pharmaceutics, SVKM's NMIMS School of Pharmacy & Technology Management, Shirpur, - 425405, India
Email: rushikapadnis30@gamil.com

5-Fluorouracil (5-FU) has been frequently used in colorectal cancer chemotherapy due to its physicochemical properties; however, its hydrophilicity nature, short half-life in the plasma circulation, and dose-dependent systemic toxicity may limit its clinical use. Thus, the current research was designed to formulate and characterize an enteric-coated solid self-microemulsifying drug delivery system (SMEDDS) of 5-FU using principal component analysis (PCA) and D-optimal mixture design. The solubility study of drug in different oils, surfactants, and co-surfactants was carried out, and pseudo-ternary phase diagrams were constructed. Labrafil M 1944 CS, Labrasol, and PEG 400 were attained as the best solvents for the preparation of microemulsion, and then, 16 formulations were prepared by using PCA guided D-optimal mixture design. The optimized liquid SMEDDS was converted to a 250 mg tablet by using the liquid-solid compact technique with HPMC K100 LV and coated with cellulose acetate phthalate as an enteric-coating agent. Labrafil M 1944 CS showed the highest solubility of the drug (399.41 ± 1.20 mg/g) followed by Labrasol (274.82 ± 0.196 mg/g), and PEG 400 (173.72 ± 0.822 mg/g), respectively. The globule size and emulsification time of the optimized F-13 formulation were 189.9 nm and 21.56 s with a zeta potential − 8.57 mV, whereas 98.28 ± 0.61% of drug was released within 60 min. In conclusion, the prepared enteric-coated 5-FU solid SMEDDS was proved to be an effective system for the dissolution enhancement of 5-FU that could be considered a promising approach for colorectal chemotherapy.

Keywords: *Principal component analysis; 5-Fluorouracil; SMEDDS; D-optimal design; Optimization; Colorectal cancer.*

O-03/N/041 ORAL · ONLINE

Thiolated polymeric scaffold functionalized with chitosan nanoparticles for enhanced osteogenesis

Sneha Bhutani*, Dhrubojyoti Mukherjee

Department of Pharmaceutics, School of Pharmacy & Technology Management, SVKM's Narsee Monjee Institute of Management Studies, Shirpur-425405, Maharashtra, India

Email: snehabhutani20@gmail.com

The development of biomimetic scaffolds capable of providing structural support and promoting osteogenic differentiation remains a major challenge in bone tissue engineering. In the present study, a chitosan nanoparticle-loaded thiolated Eudragit/alginate/polyethylene glycol nanocomposite scaffold was developed as a potential platform for bone regeneration. Thiolated Eudragit was synthesized through EDC/NHS-mediated conjugation with L-cysteine, while chitosan nanoparticles were prepared by ionic gelation and incorporated into the scaffold matrix via freeze-drying. Successful thiolation of Eudragit was confirmed by FTIR and Ellman's assay, whereas DLS and AFM verified the formation of stable chitosan nanoparticles. XRD, FESEM, and optical profilometry demonstrated successful nanoparticle incorporation within a highly porous interconnected scaffold architecture. Furthermore, the nanocomposite scaffold exhibited controlled swelling, enhanced gel fraction, sustained degradation, and suitable porosity, indicating favorable physicochemical properties. MTT analysis using MG-63 osteoblast-like cells demonstrated excellent cytocompatibility, with cell viability remaining above 85% across all tested concentrations. The scaffold also demonstrated excellent hemocompatibility, exhibiting a hemolysis ratio below the acceptable limit for non-hemolytic biomaterials, while effectively inhibiting the growth of both Staphylococcus aureus and Escherichia coli. Moreover, ALP and ARS staining demonstrated enhanced osteogenic differentiation and extracellular matrix mineralization, while quantitative ARS analysis and hydroxyapatite binding affinity further confirmed increased calcium deposition and improved scaffold–mineral interactions following nanoparticle incorporation. Thus, the developed chitosan nanoparticle-loaded thiolated Eudragit nanocomposite scaffold represents a promising biomimetic platform for enhancing osteogenesis and facilitating bone tissue regeneration.

Keywords: *Bone tissue engineering; Thiolated Eudragit; Chitosan nanoparticles; Hydrogel scaffold; Osteogenic differentiation; Bone regeneration*

O-03/N/042 ORAL · ONLINE

Development and Evaluation of Fast-Release Oral Formulation of Poorly Water-Soluble Drug Using Liquisolid Compact Technology

Sakshi Borade*, Prathamesh Bhadane, Shilpa Mandpe, Anirudh Padiyar

School of Pharmacy and Technology Management, SVKM's NMIMS, Shirpur, Maharashtra, India

Email: sakshiborade2020@gmail.com

Aceclofenac belongs to Biopharmaceutics Classification System (BCS) Class II (poor water solubility) and could have poor solubility that might reduce its dissolution and oral absorption. The present study aimed to develop and assess a fast release oral formulation of aceclofenac using Liquisolid Compact (LSC) Technology by adopting the Mixed Solvency Concept (MSC) with Design of Experiments (DoE). Different non-volatile solvents were tested on the solubility studies followed by Hansen Solubility Parameter analysis of identifying the suitable solubilizer. Propylene glycol had the greatest solubility (12.54 ± 0.10 mg/mL). Optimization of the mixed-solvency system and liquisolid formulation was done using a Box-Behnken Design. The optimized solubility system resulted the highest solubility of aceclofenac as 85.4 mg/mL Seventeen formulations were prepared and tested, and the optimized formulation had a disintegration time of 1·95 ± 0·02 min and a percentage of drug release of 99·1%. For Wistar rats, the maximum plasma concentration and AUC were increased from 2.1 to 4.3 µg/mL and 17.79 to 34.99 µg·h/mL, respectively, when compared to pure drug. The optimized formulation was stable for 3 months at 25 ± 2°C, high relative humidity of 60 ± 5%. In sum the joint application of the two methods to determine the solubility, dissolution and systemic exposure behavior of aceclofenac appears to be of benefit and could enable the development of a fast-release, oral dosing drug product for the compound.

Keywords: *Aceclofenac; Liquisolid Compact; Mixed Solvency; Solubility Enhancement; Drug Dissolution; Bioavailability; Oral Drug Delivery.*

O-03/N/043 ORAL · ONLINE

Development and Evaluation of PLGA-PEG-Coated Superparamagnetic Iron Oxide Nanoparticles (SPIONs) of Methotrexate for Breast Cancer Treatment

Devraj Panchal, Debalina Maity, Jitu Halder, Sankha Bhattacharya*

School of Pharmacy and Technology Management, SVKM's NMIMS, Shirpur, Maharashtra, India
Email: devpanchal1503@gmail.com

Breast cancer is still a major challenge for therapeutic intervention, and advanced drug delivery systems need to be developed to ensure drug localization and the control of drug release. The magnetic properties of superparamagnetic iron oxide nanoparticles (SPIONs) make them interesting drug carriers for targeted drug delivery, and PLGA-PEG coating can improve the stability of the formulation and control the drug release. The aim of the present study was to formulate and test methotrexate (MTX) loaded PLGA-PEG coated SPIONs as potential therapeutic agents for the treatment of breast cancer. An improved chemical co-precipitation method with Box–Behnken experimental design was used to prepare Fe_3O_4 SPIONs. These optimized SPIONs were then coated with PLGA and PEG-400 and loaded with MTX to test particle size, polydispersity index (PDI), zeta potential, morphology, drug loading, drug encapsulation efficiency, in-vitro drug release and stability. The optimized SPIONs exhibited an average particle size of 214.6 nm and PDI value of 0.347, while PLGA-PEG coated MTX loaded SPIONs exhibited larger particle size of 123.8 nm and PDI value of 0.259 and zeta potential of +4.98 mV. MTX encapsulation efficiency was 46.8 ± 3.9% and drug loading was 2.8 mg of drug per 100 mg of polymer. The formulation exhibited an initial burst followed by sustained release, showing a cumulative MTX release of 60.4% after 48 h, with better release at pH 5.8. Optimized formulation also showed good stability during 30 days storage. In summary, PLGA-PEG-coated MTX-SPIONs have shown good physicochemical properties and pH-responsive drug release, making them a potential candidate for the controlled delivery of anticancer drugs.

Keywords: *Superparamagnetic iron oxide nanoparticles; Methotrexate; PLGA–PEG; Breast cancer; Nanocarrier; Drug delivery.*

O-03/N/044 ORAL · ONLINE

Development and Evaluation of Mouth Dissolving Films of Feverfew Extract by Lyophilization

Yash Mande*[a], Mayur Khinvasara[b], Sanjay Patil[a]

[a]Department of Pharmaceutics, SVKM's NMIMS School of Pharmacy & Technology Management, Shirpur, - 425405, Maharashtra, India
[b]Department of Pharmaceutics, SNJB's Shriman Sureshdada Jain College of Pharmacy, Chandwad, Dist. Nashik – 423101 Maharashtra, India
Email: yashmande007@gmail.com

Feverfew extract possesses antimigraine activity; however, conventional mouth dissolving tablets may exhibit comparatively slower disintegration than mouth dissolving films (MDFs). Lyophilization offers a simple approach for developing rapidly dissolving films. The study aimed to develop and evaluate MDFs of feverfew extract using lyophilization and to optimize the formulation using a 3^2 factorial design. MDFs were prepared by lyophilization using pullulan, polyethylene glycol 400 (PEG 400), citric acid and sodium saccharin. Pullulan and PEG 400 were selected as independent variables, while % *in-vitro* drug release and folding endurance were considered dependent variables. The prepared films were evaluated for thickness, folding endurance, surface pH, drug content, weight variation, *in-vitro* dissolution time and *in-vitro* drug release. All formulations exhibited satisfactory film properties. The optimized formulation demonstrated folding endurance >200 folds and achieved 99.89% *in-vitro* drug release within 2 min, indicating rapid dissolution of the developed dosage form. The findings demonstrate that lyophilization can be employed for the preparation of MDFs of feverfew extract with rapid drug release and satisfactory mechanical properties. The technique involves few processing steps and has potential for scale-up. The developed MDFs can therefore provide a promising rapidly dissolving dosage form of feverfew extract without the use of a superdisintegrant.

Keywords: *Feverfew extract; Mouth dissolving films; Lyophilization; 3^2 factorial design; Drug release; Folding endurance*

O-03/N/045 ORAL · ONLINE

Design and optimization of L-tyrosine, antioxidant gummies for healthy hair

Shashikant Bagade, Dhanashri Pakdhane*

Department of Pharmaceutical Quilty Assurance, School of Pharmacy & Technology Management,SVKM's NMIMS, 425405, Shirpur, Maharashtra,India
Email: dhanashripakdhane2001@gmail.com

L-Tyrosine is an amino acid involved in melanin biosynthesis, while antioxidants may help protect cells from oxidative stress. The present study aims to design and optimize L-Tyrosine and antioxidant-based gummies as a convenient and palatable nutraceutical dosage form for supporting healthy hair. The present study aimed to develop and optimize an L-Tyrosine-containing soft chewable gummy formulation and establish a Quality by Design (QbD)-based RP-HPLC method for its quantitative estimation. The developed formulations were evaluated for physical and textural characteristics, including appearance, transparency, smoothness, pH, weight variation, thermal behaviour and texture properties. A QbD approach using Central Composite Design was employed to optimize critical chromatographic parameters for RP-HPLC estimation of L-Tyrosine. The optimized method was evaluated for specificity, linearity, precision, accuracy, ruggedness and robustness. The optimized RP-HPLC method was developed using a C18 column with methanol acid (40:60, v/v) as the mobile phase, detection at 278 nm and a flow rate of 1 mL/min. L-Tyrosine showed a retention time of approximately 1.07 min and demonstrated good linearity over the investigated concentration range, with an R^2 value of 0.9992. The reported accuracy was within 99.0–100.0%, with satisfactory precision and other validation parameters. The study successfully developed an L-Tyrosine soft chewable gummy formulation along with a QbD-based RP-HPLC method for its reliable quantitative estimation. The developed formulation and analytical approach provide a systematic foundation for quality control and further investigation of L-Tyrosine-based nutraceutical gummies intended for nutritional support related to healthy hair and hair pigmentation.

Keywords: *L-Tyrosine, Gummy, Soft chewable dosage form, Quality by Design, RP-HPLC, Hair pigmentation.*

O-03/N/046 ORAL · ONLINE

Development, Optimisation and In Vitro Characterisation of a Self-Emulsifying Drug Delivery System for Enhanced Dissolution of Telmisartan

Prachita Yeola*, Harsh Lohar, Prakash Kumar Soni, Rajesh Kumar Maheshwari, Reena Soni, Anirudh Padiyar

School of Pharmacy and Technology Management, SVKM's NMIMS, Shirpur, Maharashtra, India
Email: prachitayeola@gmail.com

Telmisartan is a BCS Class II drug with poor aqueous solubility that may retard oral absorption and bioavailability. The objective of present work was to improve solubilization of telmisartan and develop a self-emulsifying drug delivery system (SEDDS) based on the mixed-solvency concept while reducing the amount of surfactant and co-surfactant required. Solubility screening was carried out with various oils and mixed-solvency blends, and an appropriate surfactant and co-surfactant was selected based on the oil accomodating capability in an optimization screen. Pseudo-ternary phase diagrams were prepared to locate the optimum region of formulation. The selected system was characterized for particle size, polydispersity index (PDI), zeta potential, dilution stability, self-emulsification ability and in-vitro drug release. Oleic acid exhibited the highest drug solubilizing capacity while Blend 10 (5% benzoic acid+5% sodium benzoate) was found to be most suitable as oil phase. Tween 20 and polyethylene glycol 400 were found to be the optimum surfactant and co-surfactant, respectively, with an emulsion area of 89.53% (1:1). Particle size, PDI and zeta potential of the optimized system were 136.9 nm, 0.310 and 73.4 mV respectively, with spontaneous emulsification occurring within 1 min of dilution and no phase separation or drug precipitation observed up to 24 h. In-vitro drug release was found to be 92.08% with Korsmeyer-Peppas model (R=0.97). The mixed-solvency approach led to significant improvements in telmisartan solubilization and drug release with a reduction in surfactant requirement, which may be useful for development of oral delivery systems for poorly water soluble drugs.

Keywords: *Telmisartan; Self-Emulsifying Drug Delivery System; Mixed Solvency; Solubility Enhancement; Drug Release; Surfactant; Bioavailability.*

O-03/N/047 ORAL · ONLINE

Development and Comprehensive Evaluation of 3D-Printed Oral Thin Films for Advanced Drug Delivery

Shyam Vachhani*, Ram Mor, Dr. Shashikant Bagade, Dr. Aniket Karmase

Department of Pharmaceutical Quality Assurance, School of Pharmacy & Technology Management, SVKM's Narsee Monjee Institute of Management Studies, Shirpur-425405, Maharashtra, India

Email: inbox.shyamm@gmail.com

Oral thin films (OTFs) have gained considerable interest as patient-friendly drug delivery systems due to their ease of administration, rapid disintegration, and potential for improved patient compliance. However, conventional manufacturing approaches may present limitations in achieving precise formulation characteristics and reproducible film properties. The present study aimed to develop and evaluate oral thin films using advanced 3D printing technology. Initially, ten formulations were prepared using the solvent casting method and evaluated for their physical and mechanical properties. Based on the observed film characteristics, the optimized formulation (F10) was selected for further development using 3D printing technology. The formulation was subjected to quality evaluation and authentication using advanced analytical methods, including fingerprint profiling and class compound analysis. The developed 3D-printed OTF was further evaluated for important performance characteristics, including disintegration, uniformity, and mechanical stability. In vivo studies were conducted using suitable behavioural models, including the Elevated Plus Maze (EPM), Rota Rod, and Actophotometer, to assess the overall biological response of the developed formulation. The optimized 3D-printed OTF demonstrated rapid disintegration, satisfactory uniformity, and adequate mechanical stability. The findings demonstrate the feasibility of 3D printing for the development of oral thin films with desirable pharmaceutical and performance characteristics, supporting its potential as an advanced and patient-friendly drug delivery platform.

Keywords: *3D Printing; Oral Thin Films; Pharmaceutical Technology; Drug Delivery; Film Formulation.*

O-03/N/048 ORAL · ONLINE

Formulation And Evaluation Of B-Cyclodextrin Nanosponge-Loaded Oral Thin Film For Second-Generation H1-Antihistamine Delivery

Hiti Narula[1], Vanshita Goyal[1], Francesco Trotta[2*], Sonia Dhiman[1*], Chander Parkash Dora[1*]

[1]Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab, India- 140401

[2] Dipartimento di Chimica, Università degli Studi di Torino, Via P. Giuria, 7-10125, Torino, Italy

Email: hitinarula3@gmail.com

Allergic rhinitis is a common chronic condition that significantly affects quality of life and often requires long-term treatment with antihistamines. Second-generation H1-antihistamines exhibit poor aqueous solubility and limited permeability, which can restrict their dissolution, absorption, and overall therapeutic effectiveness. This study aimed to develop and evaluate a nanosponge-loaded oral thin film to improve drug solubility, dissolution, bioavailability, and patient compliance. The drug was encapsulated in β-cyclodextrin-based nanosponges and characterized using FTIR, DSC, XRD, TEM for particle size, polydispersity index, zeta potential, loading efficiency and physicochemical properties. The optimized nanosponge formulation displayed a particle size of ~129.1 nm and entrapment efficiency of 80.3%, suggesting successful drug encapsulation. The nanosponges were then integrated into oral thin films by the solvent casting method and optimized by the Quality by Design approach with Box-Behnken Design. The optimized film exhibited good physical and mechanical properties, disintegration time of 17 seconds, and in vitro drug release of 98.8%. Pharmacokinetic results demonstrated enhanced drug bioavailability and higher systemic circulation than that of pure drug.

Keywords: *Allergic rhinitis, β-Cyclodextrin nanosponges, Quality by Design, Solubility enhancement, Oral thin film.*

O-03/N/049 ORAL · ONLINE

Development and Characterization of Solid Lipid Nanoparticles of Glecaprevir and Pibrentasvir for Enhanced Bioavailability in Hepatitis-C Viral Therapy

Prashant Bhoir*, Manju Makhija, M K Gupta

School of Health & Allied Sciences, Career Point University, Kota 324005, Rajasthan, India
Email: prashantbhoir2712@gmail.com

Glecaprevir and Pibrentasvir are potent direct-acting antivirals (DAAs) approved by the USFDA for the treatment of hepatitis C virus (HCV) infections. However, their clinical utility is limited by poor aqueous solubility and suboptimal bioavailability. This study aimed to develop solid lipid nanoparticles (SLNs) for co-encapsulation of these drugs to enhance solubility, stability, and sustained release. SLNs were prepared using the microemulsion technique with stearic acid, glyceryl monostearate, and various surfactants. Formulations were optimized and characterized for particle size, polydispersity index (PDI), zeta potential, entrapment efficiency (EE), drug loading, morphology, *in vitro* release, and stability. Optimized SLNs (F3) exhibited a mean particle size of 148.6 ± 5.2 nm, PDI of 0.21 ± 0.03, zeta potential of -28.4 ± 1.8 mV, and EE of 92.4% (Glecaprevir) and 89.7% (Pibrentasvir). SEM/TEM confirmed spherical morphology. *In vitro* release showed sustained biphasic release over 48 hours (85-90% cumulative release). Formulations remained stable under ICH conditions for 90 days. SLNs significantly improved the physicochemical properties and release profile of Glecaprevir/Pibrentasvir, offering a promising nanocarrier system for enhanced HCV therapy.

Keywords: *Solid lipid nanoparticles, Glecaprevir, Pibrentasvir, Hepatitis-C Virus, Bioavailability, Sustained release*

O-03/N/050 ORAL · ONLINE

Development and In Vitro Evaluation of a Novel Ethosomal System for Topical Tamoxifen Delivery in Psoriasis

Harshita Mathur [1 2], Ghanshyam Das Gupta [2], Balak Das Kurmi [2*]

[1]Department of Pharmaceutical Sciences, I.K. Gujral Punjab Technical University, Kapurthala, Punjab, India
[2]Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Email: harshitamathur998@gmail.com

Background: Tamoxifen (TMX) is a potential candidate for topical psoriasis, facing poor aqueous solubility and limited skin penetration, hindering its topical application.

Aim: This study aimed to develop and optimize ethosomal formulation for enhanced topical delivery of tamoxifen.

Methods: DoE was applied to optimize formulation variables, including solvent concentration, lipid composition, and organic solvent ratio. Formulations were characterized for particle size, polydispersity index (PDI), zeta potential, entrapment efficiency, and drug loading. In vitro release, ex vivo skin permeation, anti-inflammatory, antioxidant, and desquamation studies were performed.

Results: The optimized ethosomal formulation shows optimized, indicating nanoscale stability and uniformity. In vitro studies demonstrated significantly enhanced skin permeation and drug retention in the ethosomal group compared to the TMX solution. TMX-ETS also effectively reduced LPS-induced IL-6 and TNF-α levels, along with desquamation studies, which confirmed keratolytic activity.

Conclusion: Tamoxifen ethosomes represent a promising nanosystem for the topical delivery and provide a foundation for future in vivo and clinical investigations to establish therapeutic efficacy.

Keywords: *Tamoxifen, Ethosomes, Gel, Psoriasis, QbD, Topical Delivery.*

O-03/N/051 ORAL · ONLINE

Formulation Optimization and Evaluation of Sustained Release Tablets of Dual Acting Opioid Analgesic for Effective Pain Management

Vivek Verma

Ph.D Scholar, Department of Pharmaceutics, IKGPTU Jalandhar, Punjab
Email: vivekverma.verma23@gmail.com

Tramadol hydrochloride is a centrally acting synthetic opioid analgesic with a dual mechanism of action, commonly prescribed for the management of chronic pain conditions like osteoarthritis, where commonly used non-steroidal anti-inflammatory drugs (NSAIDs) are unable to provide relief. Due to its high aqueous solubility, the short elimination half-life usually leads to fluctuations in plasma drug concentrations. The present study aimed at the formulation development, statistical optimization, and *in-vitro* evaluation of a twice-a-day sustained-release (SR) matrix tablet of tramadol HCl using hydrophilic polymers (HPMC K4M and Xanthan Gum). The sustained release tablets were made by direct compression. A response surface methodology 3^2 full factorial design was used to construct a region in contour plots where the varying amount of polymers could produce sustained release matrix tablets having a high swelling index, hardness in the range, and 80% *in-vitro* drug release up to 12 hours. Accelerated stability studies conducted according to ICH guidelines indicate that the optimized matrix tablets retained their appearance, hardness, drug content of the tablet, and % drug release profile over storage. The current research conclusively demonstrates the use of a response surface design in optimizing a sustained release tablet. The polynomial equations, contour plots, and cross-validation batches assist in forecasting the values of selected independent variables for the preparation of an optimized sustained release tablet of tramadol hydrochloride with the desired characteristics. As a result, the optimized sustained-release matrix system provides a practical and commercially reproducible delivery method having enhanced therapeutic efficacy and improved patient compliance in long-term pain management.

Keywords: *Tramadol hydrochloride, Sustained release tablets, Hydroxypropyl methylcellulose (HPMC K4M), Xanthan Gum*

O-03/N/053 ORAL · ONLINE

Gastro-Retentive Drug Delivery Systems: An Approach for Prolonged Gastric Residence

Garvit Chander Choudhary*, Amit Chaudhary, Nitin Verma

[1]Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: garvit1005.mpharm26@chitkarauniversity.edu.in

Background: Conventional oral drug delivery systems often have a short gastric residence time, which may limit drug absorption and therapeutic effectiveness, particularly for drugs absorbed mainly from the upper gastrointestinal tract. Gastro-retentive drug delivery systems (GRDDS) are designed to remain in the stomach for an extended period and provide controlled and sustained drug release.

Objective: Review the concept, principle, merits, and potential application of gastro-retentive drug delivery system, which can enhance the bioavailability of drugs.

Results:

Prolonged Gastric Residence Time: Several GRDDS can prolong gastric emptying time of dosage form and thus prolong drug release and absorption.

Floating Systems: These are liquids or solid dosage systems that can be made buoyant on the gastric fluid while releasing drug slowly for a prolonged period of time.

Mucoadhesive Systems: These medications are made for adhering to the mucous lining of the stomach in order to stay for a long period of time while remaining in contact with the mucosa that is absorbed and advanced.

Expandable and High-density systems: Enhance the gastric residence time, expandable systems expand following administration and high-density systems acquire a low gastric emptying.

Conclusion: Gastro retentive drug delivery system for better drug absorption, bioavailability, and drug therapy. There is an improved approach for the floating, mucoadhesive, expandable, and high-density systems have resulted in a sustained gastric retention and controlled drug release. There is a need for further formulation optimization and evaluation to have an ideal system.

Keywords: *Gastro-retentive drug delivery, floating drug delivery, gastric residence time, controlled release bioavailability, mucoadhesion, sustained release.*

O-03/N/054 ORAL · ONLINE

Role of Excipients in Pharmaceutical Formulations

Panav Sharma[1*], Amit Chaudhary[1], Ameya Sharma[1]

[1] *Chitkara University School of Pharmacy Chitkara University, Baddi, Himachal Pradesh, 174103, India*
Email: panav1015.mpharm26@chitakarauniversity.in

Introduction: Excipients are pharmacologically inactive molecules which are used during the development, manufacture, stability and performance of pharmaceutical formulations. They improve the solubility, bioavailability, acceptability and quality of the drug products and although they are biologically inactive, they play an integral role in the safety, efficacy and success of the formulation.

Aim: Review the role of pharmaceutical excipients in optimized formulation performance, stability, drug delivery and safety/efficacy of current dosage forms.

Results: Improved formulation characteristics

Tablet hardness, friability and disintegration time.

Diluents, binders, disintegrates, lubricants, coating agents Improved drug solubility and bioavailability.

Solubilizers, surfactants and wetting agents Improved drug stability and shelf life.

Preservatives, antioxidants, chelating agents and pH modifiers Improved controlled and targeted drug delivery.

Polymers, lipids and mucoadhesive agents Improved patient acceptance and compliance.

Sweeteners, flavors, colours and texturizers

Conclusion: Excipients are not just inert fillers but are valuable constituents of pharmaceutical formulations. Proper selection of these molecules improves therapeutic efficacy, manufacturing efficiency, safety and stability of the product and patient compliance. With the introduction of new excipients and novel delivery systems, the role of these materials is constantly evolving, and their importance can't be understated.

Keywords: *Excipients, pharmaceutical formulations, drug delivery, bioavailability, stability, controlled release, tablet formulation.*

O-03/N/055 ORAL · ONLINE

Importance of Pre-formulation Studies in Drug Development

Raushan Pandey[*], Amit Chaudhary, Aruna Sharma

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, India
Email: raushan1010.mpharm26@chitkarauniversity.edu.in

Background: Pre-formulation studies define the scientific basis for dosage form design by investigating the physical, chemical, and mechanical properties of drug candidates prior to formulation.

Objective: To emphasize the significance of pre-formulation studies for optimization of drug stability, solubility, bioavailability, manufacturability, and quality of the final product during the course of pharmaceutical development.

Results: Established critical physicochemical properties i.e. solubility, pKa, polymorphism, and particle size.

Informed selection of excipients based on drug-excipient compatibility study.

Increased stability and shelf life through moisture and thermal characterization.

Increased bioavailability and strong formulation design with reduced development time.

Conclusion: Pre-formulation studies are vital to modern drug development because they minimize the number of formulation failures, assist in regulatory submissions, and design safe, effective, and quality pharmaceutical products.

Keywords: *Pre-formulation studies, drug development, physicochemical properties, compatibility studies, stability, bioavailability, pharmaceutical formulation.*

O-03/N/056 ORAL · ONLINE

Formulation And Evaluation of Herbal Cough Lozenges

Himanshu, Amit Chaudhary, Vivek Panwar

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, India
Email: himanshu1006.mpharm26@chitkarauniversity.edu.in

Introduction: Cough is one of the most common respiratory symptoms and may cause considerable throat irritation and discomfort. Herbal medicines containing bioactive phytoconstituents have gained interest as alternatives to conventional preparations because of their potential soothing and therapeutic properties. Lozenges provide prolonged contact of herbal ingredients with the oral and pharyngeal mucosa and may therefore be suitable for symptomatic relief of cough and throat irritation.

Objectives: The present study aimed to formulate and evaluate herbal cough lozenges containing selected herbal ingredients with potential antitussive, soothing, and antimicrobial properties.

Methods: Herbal cough lozenges were prepared using a suitable lozenge base and selected herbal extracts. The prepared formulations were evaluated for general appearance, weight variation, hardness, friability, extract content uniformity, surface characteristics, and in-vitro dissolution/release characteristics. The formulations were also assessed for palatability and overall acceptability.

Results: The prepared herbal lozenges exhibited acceptable physical characteristics and satisfactory formulation properties. Evaluation of the formulations indicated uniformity and suitable performance for oral administration, with prolonged residence in the oral cavity.

Conclusion: The study demonstrated the potential of herbal lozenges as a convenient dosage form for providing localized soothing effects and supporting the management of cough and throat irritation. Further optimization and comprehensive stability and efficacy studies may support their potential pharmaceutical application.

Keywords: *Herbal lozenges; Cough; Herbal extract; Formulation; Evaluation; Antitussive*

O-03/N/057 ORAL · ONLINE

Long-Acting Injectable Drug Delivery System

Samiksha Pandey *, Amit Chaudhary, Naresh Rangra, Divya Jyoti

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: samiksha1011.mpharm26@chitkarauniversity.edu.in

Background: Long-acting injectable (LAI) drug delivery systems are advanced parenteral dosage forms designed to release therapeutic agents slowly and continuously over an extended period. They can reduce dosing frequency, maintain more consistent drug concentrations, improve patient adherence, and minimize fluctuations associated with conventional immediate-release therapy. LAI systems have gained importance in the management of chronic diseases and are being explored for a wide range of therapeutic applications.

Objective: The objective of this review is to describe the principles, formulation approaches, drug release mechanisms, advantages, limitations, and recent advances in long-acting injectable drug delivery systems, with emphasis on their potential to improve therapeutic outcomes and patient compliance.

Results:

LAI formulations can be developed using biodegradable polymeric microspheres and nanoparticles, in situ forming depots, oil-based formulations, aqueous suspensions, and implant-associated injectable systems.

Controlled drug release is achieved through mechanisms such as diffusion, polymer degradation, matrix erosion, dissolution, and depot formation at the injection site.

Key formulation challenges include drug stability, particle size, viscosity, injectability, initial burst release, local tolerability, manufacturing complexity, and dose adjustment.

Recent research focuses on biodegradable polymers, nanotechnology-based depots, in situ gels, and optimized formulation strategies to achieve predictable and sustained drug release.

Conclusion: Long-acting injectable drug delivery systems represent a promising approach for sustained and controlled drug administration. . Continued advances in biodegradable materials, formulation technology, and manufacturing are expected to expand their clinical applications and support safer, more convenient, and patient-centered drug therapy.

Keywords: *Long-acting injectable, sustained release, controlled drug delivery, injectable depot, biodegradable polymers, microspheres, patient compliance, Pharmaceutics.*

O-03/N/058 ORAL · ONLINE

Nanogel-Integrated Transdermal Drug Delivery Systems: Advances in Controlled, Localized, and Translational Therapeutic Delivery

Aruna Sharma*[1], Amit Chaudhary[1], Madan Singh Dhiman[2]

[1]Chitkara University School of Pharmacy Chitkara University, Baddi, Himachal Pradesh, 174103, India
[2]School of Management Studies, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand, India.
Email: aruna.sharma1187@chitkarauniversity.edu.in

The development of nanogel-based transdermal drug delivery systems has become an important step towards enhancing the permeation of medicines through or into the skin due to their unique nature of combining features of nanoparticles and polymeric gel systems. The key benefits of using nanogels for delivery of therapeutic substances include nanometric size of particles, high surface area, and their ability to carry hydrophobic as well as hydrophilic compounds. In transdermal drug delivery applications, nanogels are used to improve the solubility of drugs, enhance contact with the skin and control drug release. Moreover, it is possible to use them in order to increase the amount of drug deposited in target skin layers and minimize the variability characteristic of conventional formulations. Using stimuli-responsive polymers allows controlling the release of the drug under the influence of environmental factors including pH, temperature, enzymatic activity, redox state, and others. Nanogels may also be combined with polymeric films, patches, microneedles, and various other cutting-edge transdermal platforms to enhance the mechanical and therapeutic efficiency. For translational purposes, formulation composition, nanoparticle size, surface properties, drug loading, release profiles, skin permeability, biocompatibility, stability, scale-up capability, and reproducibility are some of the key factors in the successful development of such transdermal drug delivery systems. Innovations in nanotechnology, biomaterial science, biosensors, artificial intelligence, and digital health in recent years have opened up new possibilities for personalized and adaptive transdermal therapy. This review highlights design concepts, formulation techniques, mechanisms of drug delivery, characterization methods, therapeutic applications, and translational hurdles involved in nanogel-based transdermal drug delivery systems. Special attention is given to the progress of nanogels from the lab-scale formulation to the clinical platform of drug delivery, along with the hurdles which need to be overcome.

Keywords: *Nanogels; Nanotechnology; Transdermal drug delivery; Nanogel-integrated patches; Controlled drug release; Skin permeation; Localized drug delivery; Stimuli-responsive delivery; Translational research; Personalized medicine*

O-03/N/059 ORAL · ONLINE

AI-Driven Prediction of Drug-Cyclodextrin Inclusion Complexation: Towards Rational Formulation Design: A Review

Vikhyat Gulati*

Chandigarh Group of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali, Punjab, India
Email: vikhyaatgulati1@gmail.com

Machine learning nowadays is very useful concept to use in pharmaceutical industries and is increasingly being explored for predicting outcomes in research.One of its application is possibility of drug molecule to form inclusion complex with cyclodextrin.Cyclodextrin is an oligosaccharide that is used to improve the solubility of drug(lying in BCS classification II and III) molecule by forming an inclusion complexation but to identify whether drug molecule will form complex with it or not is very time consuming. To review the application of machine learning to predict complexation of drug molecule with cyclodextrin based on relevant molecular properties of drug molecules. Already published studies employing machine learning(artificial neural network,support vector machine,QSPR) by training them with specific properties of drug molecule(molecular weight, LogP,hydrogen bond acceptor/donor) because these affect the interaction of drug molecule and cyclodextrin and giving possible outcomes in form of regression or classification from which the most appropriate and maximum interactive molecule can be predicted and confirmed by preparing that complex.This can save lot of time and reduce unnecessary screening in formulation of drug . So, from this we conclude that using AI- assisted prediction an efficient selection of drug-cyclodextrin combinations can be made.Integration of computational prediction and with experimental confirmation may give us more efficient development of cyclodextrin based pharmaceutical formulation.

Keywords: *Cyclodextrin; Inclusion complex; QSPR; Artificial Intelligence; Formulation; BCS classification.*

P-03/N/001 POSTER · ONLINE

Development and Characterisation of Drug-Loaded Liposomal-Based Microneedles for the Effective Treatment of Psoriasis

Sahil Verma[1]*, Mohit Kumar[2], Pallvi Bassi[3]

Research Scholar, Chitkara College of Pharmacy, Chitkara University, Rajpura 140401, India
Assistant Professor, Chitkara College of Pharmacy, Chitkara University, Rajpura 140401, India
Associate Professor, Chitkara College of Pharmacy, Chitkara University, Rajpura[140401], India
Email: sahilverma85980@gmail.com

Psoriasis is a chronic immune-mediated, inflammatory skin disorder characterised by hyperproliferation of keratinocytes, erythema, scaling, and epidermal thickening, affecting 125 million people worldwide. Conventional topical therapies exhibit limited skin penetration, and poor patient compliance necessitates the development of advanced drug delivery systems. The present study aimed to formulate, optimise, and evaluate simvastatin-loaded liposome-based microneedle (SMV-LP-MN) for enhanced topical delivery and improved therapeutic efficacy in the disease management of psoriasis. Initially, pre-formulation studies consisting of organoleptic evaluation, FT-IR, DSC, XRD, and HPLC analysis were performed to assess the physicochemical properties of Simvastatin (SMV). Simvastatin-loaded liposomes (SMV-LP) were prepared using the thin film hydration method and optimised through Central Composite Design (CCD). The optimised liposomes revealed a nano-scale particle size of 327.13 ± 0.80 nm, zeta potential of −26.82 ± 0.05 mV, and entrapment efficiency of 97.02 ± 0.03 %. Simultaneously, the optimised liposomal formulation was incorporated into microneedle arrays via the micro-moulding technique. The fabricated microneedles were evaluated for morphology and SEM. Ex vivo permeation and skin deposition studies demonstrated significantly enhanced topical delivery and drug retention compared with other formulations. The SMV-LP-MN arrays achieved the highest drug deposition of 52.78 ± 1.46 %, confirming the synergistic effect of liposome encapsulation and microneedle-assisted delivery. Furthermore, in vivo studies in an IMQ model revealed a marked reduction in psoriasis severity and spleen index. Therefore, the developed SMV-LP-MN arrays showed optimised drug delivery, enhanced skin deposition, and a promising anti-psoriatic activity, demonstrating their potential as an effective and patient-friendly therapeutic approach for psoriasis treatment.

Keywords: *Psoriasis, Simvastatin, Liposomal drug delivery, Microneedles, Skin delivery*

P-03/N/002 POSTER · ONLINE

Skin-Retentive Nanocarrier-Based Topical Depot for Localized Delivery of a Poorly Soluble Drug: Optimizing Skin Retention–Permeation Balance

Prabhjot Singh*, Sandeep Kumar

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Punjab, India
Email: prabhjotsingh0304@gmail.com

Poor aqueous solubility and inadequate localization of drugs within the skin are major challenges in achieving effective and sustained topical therapy. Conventional topical formulations may result in poor drug retention at the site of application and uncontrolled transdermal permeation, potentially reducing local therapeutic effectiveness and increasing systemic exposure. The proposed study aims to develop a skin-retentive nanocarrier-based topical depot for localized delivery of a poorly soluble therapeutic drug. The nanocarrier will be designed to enhance drug solubilization and facilitate preferential retention of the drug within the skin while controlling its permeation across the skin barrier. The formulation will be optimized with emphasis on achieving a desirable balance between skin retention and transdermal permeation. Ex-vivo skin deposition and permeation studies will be employed to investigate the localization of the drug within the skin and its subsequent movement across the skin. The proposed strategy is intended to establish a localized drug reservoir within the skin, providing prolonged drug availability at the site of application while minimizing unnecessary systemic exposure. This approach may offer a promising platform for improving the therapeutic performance of poorly soluble drugs requiring localized topical action.

Keywords: *Skin-retentive nanocarrier, Topical drug delivery, Poorly soluble drug, Skin deposition, Localized drug delivery.*

P-03/N/003 POSTER · ONLINE

Nanoemulsions as Multifunctional Carriers for Hydrophobic and Hydrophilic Drugs

Gurpreet Kaur*,, Neha Sharma

[1]*Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Ropar, Punjab, India*

Email: gurpreetkaur934093@gmail.com

Nanoemulsions are increasingly recognized as effective and versatile carriers for transdermal drug delivery due to their ability to overcome the protective barrier of the skin. Their small droplet size, high physical stability, and adaptable composition facilitate the incorporation and delivery of both hydrophilic and lipophilic drugs. These properties can enhance drug solubility, improve skin penetration, regulate drug release, and increase therapeutic availability. Nanoemulsions may enhance permeation through several mechanisms, including modification of stratum corneum lipids, increased skin hydration, and improved drug partitioning into the different layers of the skin. The use of biocompatible surfactants, co-surfactants, and penetration enhancers has further improved their performance and potential applications. Current study is exploring their use in targeted and personalized drug delivery approaches. Thus, nanoemulsions represent a promising platform for the development of advanced transdermal drug delivery systems.

Keywords: *Nanoemulsion, Transdermal drug delivery system, stratum corneum, skin penetration*

P-03/N/004 POSTER · ONLINE

Core-Shell Tablets Designed for Modified and Sequential Release of Ibuprofen and Rabeprazole

Adarsh Kumar Chourasia[1]*, Divya Dheer[1] Naiyyara Fatma[1] Nitin Verma[1]

[1]*Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India*

Email: adarsh1002.mpharm25@chitkarauniversity.edu.in

Background: Chronic NSAID therapy carries substantial upper GI risk, and poor adherence to separately dosed gastroprotective PPIs limits real-world protection.

Objective: To design a core-shell tablet pairing an enteric-coated ibuprofen (IBU) delayed-release core with an immediate-release rabeprazole (RAB) shell, achieving sequential RAB-then-IBU release with pharmacokinetics matching single-drug tablets.

Methods: IBU cores and RAB shells were optimized separately by wet granulation across multiple trial formulations, screened for hardness, friability, disintegration, weight variation, and content uniformity. The optimized 400/20 mg core-shell tablet underwent two-stage and multi-pH dissolution testing, oral pharmacokinetic evaluation in beagle dogs versus single-drug tablets (n=3/group), and long-term (2-year)/accelerated (6-month) ICH/WHO stability studies.

Results: Core-shell tablets released RAB immediately (99.5% at 1 h, pH 1.2) while IBU remained protected in acid (3.4% at 2 h) before rapid buffer-stage release (88% at 45 min). In dogs, RAB pharmacokinetics matched RAB-alone tablets (Cmax 1163.3 vs. 1160.0 ng/mL; relative bioavailability 101.5%). IBU showed delayed but enhanced absorption, with 1.7–1.9-fold higher AUC, comparable Cmax (27,370 vs. 24,170 ng/mL), and slower elimination (t1/2 10.5 vs. 8.6 h) than IBU-alone tablets. All specifications were retained through long-term and accelerated storage.

Conclusion: The IBU/RAB core-shell design delivers reliable sequential release and pharmacokinetics matching or exceeding single tablets, offering a stable, compliance-friendly fixed-dose strategy to reduce IBU-associated GI toxicity though it is unsuitable for acute pain.

Keywords: *Ibuprofen; Rabeprazole; Core-shell tablet; Sequential release; Nonsteroidal anti-inflammatory drugs; Gastrointestinal adverse effects*

P-03/N/005 POSTER · ONLINE

Quality by Design-Guided Development and Optimization of Anthocyanin-Loaded Zein–PVA–PEG Electrospun Nanofiber Films for Smart Food Packaging

Parneet Kaur Deol, Gurinder Singh, Arun, Shagun Sharma

G.H.G. Khalsa College of Pharmacy Gurusar Sadhar, Ludhiana, Punjab
Email: parneetdeol5988@gmail.com

Anthocyanin-based intelligent packaging systems offer a sustainable approach for real-time visual monitoring of food freshness owing to the inherent pH-responsive color transition of anthocyanins. However, their susceptibility to environmental factors, including pH, light, oxygen, and temperature, can compromise color stability and functional performance. The present study aimed to develop and optimize anthocyanin-loaded zein–polyvinyl alcohol (PVA)-polyethylene glycol (PEG) electrospun nanofiber films using a Quality by Design (QbD) approach for smart food packaging applications. A Quality Target Product Profile (QTPP) was established, and critical quality attributes (CQAs) including fiber morphology, pH-responsive color change, tensile strength, swelling, water solubility, disintegration time, and water vapor transmission rate were identified. Zein, PVA, PEG, and anthocyanins were incorporated into polymeric solutions prepared using aqueous ethanol/water systems and processed by electrospinning. Critical material and process parameters were systematically evaluated using Design of Experiments and response surface methodology to establish formulation process performance relationships and identify an optimized design space. The optimized electrospun films exhibited uniform nanofibrous morphology and distinct pH-dependent color transitions from red to yellow, demonstrating their suitability as freshness indicators. The developed films showed 25-37% water solubility, swelling capacity up to 220%, disintegration times of 45-360 s, and water vapor transmission rates of 68-99 g/m^2·day, along with adequate mechanical strength and flexibility. FTIR analysis suggested hydrogen-bonding interactions and compatibility among the components, while DSC demonstrated favorable thermal behavior. Overall, the QbD-guided strategy enabled systematic optimization of anthocyanin-loaded electrospun films, providing a multifunctional, biodegradable, and responsive platform with potential for sustainable smart food packaging.

Keywords: *Quality by Design, Anthocyanin, Nanofiber film*

P-03/N/006 POSTER · ONLINE

Formulation, Optimization, and Evaluation of Non-Propellant Foam-Based Formulation for Burn Wound Treatment

Astha*, Mohit Kumar

Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab 140401, India.
Email: aasthasekhri7@gmail.com

Background: Burn injuries pose significant health risks worldwide, particularly due to microbial infections that can aggravate complications and increase mortality. Conventional topical antimicrobial formulations, such as ointments and creams, are often greasy, sticky, and may adhere to clothing. Moreover, application using fingers or applicators can cause pain at the affected site and may increase the risk of microbial contamination.

Objective: The present study aimed to develop, optimize, and evaluate a novel non-propellant foam (NPF)-based formulation containing chlorhexidine for effective and patient-friendly topical delivery in burn wound treatment.

Methods: Initially, an NPF formulation comprising Labrasol® (26.7%), sodium lauryl sulfate (1.2%), hydroxypropyl methylcellulose (0.56%), butylated hydroxytoluene (0.1%), ethanol (1%), and distilled water was prepared and evaluated for consistency and foam-forming ability. The formulation was statistically optimized using a Box–Behnken design to investigate the influence of polymer and surfactant concentrations on critical foam properties.

Results: The optimized NPF formulation exhibited a collapse time of 45 s and demonstrated a unique collapse behavior upon slight touch, which may be advantageous for application to painful burn wounds without the need for an applicator. The in vitro diffusion study demonstrated more than 90% drug release within 6 h. The skin permeation study showed 23% drug permeation after 6 h, with a permeation flux of 7.64 µg/cm^2/h. The formulation also demonstrated good antibacterial activity. The minimum inhibitory concentration (MIC) was found to be 2.5 µg/mL against Escherichia coli (MTCC-1687), 2.5 µg/mL against Pseudomonas aeruginosa (MTCC-1688), and 5.0 µg/mL against Staphylococcus aureus (MTCC-737).

Conclusion: The developed non-propellant foam formulation exhibited rapid collapse, excellent spreadability, good antibacterial activity, and a non-sticky nature. These characteristics make it a promising topical delivery system for burn wound treatment, particularly where application without direct contact or an applicator is desirable.

Keywords: *Non-propellant foam, Foam collapse time, Foam density, Topical drug delivery, Antibacterial activity*

P-03/N/007 POSTER · ONLINE

Emulgels: An Emerging Platform for Topical Drug Delivery Systems

Avi*, Rachna Mehta, Loveleen Preet Kaur, Mohit Kumar

Department of Pharmaceutics, Jan Nayak Ch Devi Lal Memorial College of Pharmacy
Sirsa-125055, Haryana, India
Email: aavibhutani@gmail.com

Topical drug delivery has gained considerable as an attractive approach for treating localized skin disorders while reducing the limitations associated with conventional oral and parenteral therapy. However, poor drug solubility, inadequate skin penetration, limited residence time, and instability of some formulations remain significant challenges. Emulgels have emerged as a promising formulation platform that combines the advantages of emulsions and gels, offering improved drug incorporation, ease of application, enhanced spreadability, and better patient acceptability. An emulgel consists of an emulsion incorporated into a suitable gel base, providing a versatile system for delivering both hydrophilic and lipophilic therapeutic agents. The incorporation of an emulsion into a gel network can improve the solubilization of poorly water-soluble drugs and facilitate their controlled release at the site of application. In addition, the non-greasy texture, good adhesion, cooling sensation, and ease of washing make emulgels particularly appealing for dermatological and cosmetic applications. Various formulation components, including gelling agents, emulsifiers, penetration enhancers, oils, and preservatives, can be optimized to achieve desired physicochemical and therapeutic characteristics. Recent advances in nanotechnology and novel penetration-enhancing approaches have further expanded the potential of emulgels for targeted and sustained topical delivery. With continued research focused on formulation optimization, skin permeation, stability, and clinical performance, emulgels represent a promising and adaptable platform for the development of effective, patient-friendly topical drug delivery systems.

Keywords: *Emulgel, Topical drug delivery, Skin permeation, Emulsion, Gel, Lipophilic drug.*

P-03/N/008 POSTER · ONLINE

Advancing Transdermal Drug Delivery through Nanoparticle-Based Systems

Sumita Rani*, Anita Kamboj, Dr Loveleen Preet Kaur, Dr Mohit Kumar

Department of Pharmaceutics, Jan Nayak Ch. Devi Lal Memorial College of Pharmacy, Sirsa-125055, Haryana, India
Email: sumitarani1224@gmail.com

Transdermal drug delivery has gained considerable attention as a convenient and patient-friendly approach for administering drugs through the skin. It can offer several benefits over conventional oral therapy, including avoidance of first-pass metabolism, reduced dosing frequency, controlled drug release, and better patient compliance. However, the outermost layer of the skin, particularly the stratum corneum, presents a strong barrier that limits the passage of many drugs. Nanotechnology has opened new possibilities for overcoming this limitation through the use of nanoparticle-based delivery systems. Nanoparticles such as polymeric nanoparticles, solid lipid nanoparticles, nanostructured lipid carriers, liposomes, and nanoemulsions can improve drug solubility, stability, skin penetration, and controlled release. Because of their small size and large surface area, these nanocarriers can interact closely with the skin and enhance the deposition of drugs in deeper skin layers. They can also be designed to provide sustained drug release and, in some cases, improve drug targeting. These systems have shown promising applications in the delivery of anti-inflammatory, analgesic, antimicrobial, anticancer, and other therapeutic agents. Despite their potential, issues such as formulation stability, skin irritation, toxicity, manufacturing challenges, and regulatory requirements still need careful consideration. Overall, nanoparticle-based transdermal systems represent a promising approach for developing safer, more effective, and convenient drug delivery therapies.

Keywords: *Nanoparticles, Transdermal drug delivery, Nanotechnology, Skin permeation, Nanocarriers, Controlled release.*

P-03/N/009 POSTER · ONLINE

Formulation and Evaluation of Pharmaceutical Dosage Forms of Certain Poorly Water-Soluble Drugs

Dev Anand Jain[1], M. K. Gupta[2]
Career Point University, Kota
Email: drdajain165@gmail.com

Formulation technology now a days is entering new spheres with a large number of researches introducing newer delivery system. Large number of novel, highly acceptable systems for achieving the desired and improved action of poorly soluble drugs now a days seen into the picture which not only improves the physico-chemical properties of the drug like dissolution etc. but also provides a dynamic formulation characteristic. Aqueous solubility has long been recognized as a key factor in controlling the drug efficacy and in design of parenteral, ophthalmic and liquid oral dosage forms. Before an orally administered drug can become available to its receptor, it must first dissolve in the gastrointestinal fluids. Thus, the dissolution rate and the amount of drug that can be dissolved and consequently the bioavailability are governed by the solubility of drug in the medium. The effect of addition of various solubilizing additives like mannitol, citric acid and ascorbic acid in solid dispersion and cyclodextrin complexes of the drugs and to study their effect on dissolution profile and biological activity as compared to pure drug. Increased solubility of the drug enhances the absorption, bioavailability and efficacy of the drug. Poorly water-soluble drugs often show poor bioavailability because of low and erratic levels of absorption. Drugs that undergo dissolution rate limited gastrointestinal absorption generally shows improved dissolution and bioavailability as a result of reduction in particle size however, micronizing of drugs often leads to aggregation and agglomeration of particles, which results in poor wettability.

P-03/N/010 POSTER · ONLINE

Development and Evaluation of Fast-Dissolving Nutraceutical Granules of Mahua Flower and Pomelo Fruit Extracts for Antioxidant Activity

Archana kumari*, Lalit Kumar Tyagi
Lloyd Institute of Management and Technology, Plot No 11, Knowledge Park II, Greater Noida, Uttar Pradesh 201310
Email: fab14k4vd@gmail.com

Mahua (Madhuca longifolia) is an important edible plant traditionally used in India and is considered a potential source of bioactive compounds. The present study evaluated the physicochemical, nutritional, phytochemical and antioxidant properties of Mahua flower, ripe fruit and unripe fruit. Samples were extracted using 70:30 aqueous acetone and analyzed for total phenolic content (TPC), total flavonoid content (TFC), DPPH, ABTS, FRAP and reducing power. Individual phenolic compounds were identified and quantified using HPLC-DAD. Mahua flower showed the highest TPC (25.3 ± 1.0 mg GAE/g fresh weight) and exhibited strong antioxidant activity, with DPPH inhibition of 89.4 ± 0.1%, ABTS activity of 74.1 ± 1.1 mmol Trolox/g and FRAP activity of 101.6 ± 0.8 mmol Fe(II)/g fresh weight. HPLC analysis identified ascorbic acid, gallic acid, quercetin and myricetin, with quercetin being an important phenolic constituent. The study demonstrated a positive association between phenolic constituents and antioxidant activity. Overall, Mahua flower exhibited considerable antioxidant and nutritional potential and may therefore be valuable for utilization in food and nutraceutical applications.

Keywords: *Mahua; Madhuca longifolia; Mahua flower; Mahua fruit; Antioxidant activity; Phytochemicals; Total phenolic content; Total flavonoid content; DPPH; ABTS; FRAP; Quercetin; Myricetin; HPLC-DAD; Nutraceutical applications.*

P-03/N/011 POSTER · ONLINE

Formulation and Characterization of Neem (Azadirachta indica) Extract-Loaded Hydrogel Microbeads for Wound Healing

Anamika Kumari*, Koushal

Lloyd Institute of Management and Technology, Plot No 11, Knowledge Park II, Greater Noida, Uttar Pradesh 201310
Email: anamikasingh2311@gmail.com

Neem (Azadirachta indica) has been traditionally used for its antimicrobial and wound-healing properties; however, conventional neem preparations may have limitations related to stability during prolonged storage. The present study aimed to incorporate neem extract into a hydrogel-based microbead system to improve its stability and provide controlled delivery for wound application. Microbeads were prepared using polyionic complexation of sodium alginate and chitosan, with calcium chloride employed as a rigidizing agent. Different polymer concentrations were investigated and optimized using a factorial design based on drug entrapment, drug release and water-holding capacity. The optimized formulation was further evaluated for bead diameter, antimicrobial activity and ex-vivo diffusion. The optimized microbeads showed approximately 80.63 µm bead diameter, 5.61% drug entrapment and 80% water-holding capacity. In phosphate buffer pH 8, approximately 65.69% drug release was observed within 5 h, while ex-vivo diffusion through goat skin demonstrated approximately 59% release over 5 h. The optimized formulation also exhibited antimicrobial activity comparable to the standard drug against Staphylococcus aureus. The findings indicate that hydrogel-based encapsulation of neem extract can enhance stability and provide controlled delivery, suggesting its potential application as a cost-effective antimicrobial formulation for wound healing.

Keywords: *Azadirachta indica, Neem extract, Microbeads, Hydrogel, Sodium alginate, Chitosan, Drug release, Wound healing, antimicrobial activity.*

P-03/N/012 POSTER · ONLINE

Innovative Formulation Approaches for the Treatment and Management of Urinary Tract Infections

Kirthiga G, Dr. Priya Dharshini

Department of Pharmaceutics, JSS College of Pharmacy, JSS Academy of Higher Education & Research, Ooty, Nilgiris, Tamilnadu-643001,India.
Email: kirthigagunasekaran0003@gmail.com

Introduction: Urinary tract infections (UTIs) are among the most common bacterial infections and are frequently associated with uropathogenic Escherichia coli. Although antibiotics remain the mainstay of treatment, increasing antimicrobial resistance, recurrent infections, biofilm formation, systemic adverse effects, and rapid elimination of drugs through urine have created a need for improved drug-delivery approaches. Emerging pharmaceutical formulations offer the possibility of providing more effective and prolonged antimicrobial exposure at the site of infection.

Aim and Observation: This review aims to examine emerging formulation-based drug-delivery systems for UTI management, with emphasis on improving drug stability, residence time, controlled release, and localized antimicrobial activity. The reviewed approaches indicate that nanotechnology and advanced localized formulations have considerable potential for addressing some limitations of conventional therapy.

Methods: Relevant scientific literature concerning advanced UTI drug-delivery systems was reviewed from Pubmed, and Google scholar and organized according to formulation type, therapeutic application, drug-delivery characteristics, and reported challenges. Particular attention was given to nanoparticle systems, liposomes, nanoemulsions, mucoadhesive formulations, and hydrogel-based delivery systems.

Results: Nanoparticles can facilitate controlled delivery of antimicrobial agents and may improve drug stability, solubility, and biofilm interaction. Liposomes provide versatile carriers for both hydrophilic and lipophilic drugs, while nanoemulsions are particularly useful for poorly water-soluble antimicrobial compounds and phytoconstituents. Mucoadhesive systems can prolong local residence, whereas hydrogels and in-situ gelling systems offer sustained and localized drug release, particularly for intravesical applications.

Summary: These approaches demonstrate the potential of formulation science to improve antimicrobial delivery and address important challenges associated with conventional UTI treatment. However, formulation stability, toxicity, sterility, manufacturing, scale-up, and clinical translation remain significant considerations.

Conclusion: Emerging formulation-based drug-delivery systems represent promising strategies for more controlled, localized, and prolonged UTI therapy. Further in-vivo studies and well-designed clinical investigations are necessary to establish their safety, efficacy, and practical applicability.

Keywords: *Urinary tract infection; Nanoparticles; Liposomes; Nanoemulsions; Mucoadhesive drug delivery; Hydrogels*

P-03/N/013 POSTER · ONLINE

Formulation and Evaluation of Polyherbal Shampoos

Ajay Gaur

Department of Pharmaceutical Chemistry, Lachoo Memorial College of Science & Technology (Autonomous), Jodhpur
Email: dr.ajaygaur11@gmail.com

The polyherbal shampoo was formulated using Amla, Reetha, Shikakai, Hibiscus, Neem, and Aloe vera & evaluated for its physical, chemical, functional, and stability properties. Organoleptically, the shampoo exhibit a smooth, homogeneous, gel-like texture with a pleasant herbal aroma and a natural brownish-green color, indicating good visual appeal and uniformity. The pH of the shampoo was 5.8, which is within the safe range for scalp and hair, while its medium viscosity should allow easy application and spreadability. The shampoo produce a moderate and stable foam that will effectively disperse dirt and oil, while also leaving the hair soft, shiny, and manageable after washing. The wetting time less than one minute, indicating efficient cleansing action. Stability studies show no phase separation, sedimentation, or change in color and fragrance during short-term storage at room temperature, refrigerated, and elevated temperatures, reflecting good physical and chemical stability. Microbial evaluation confirm minimal microbial load and absence of pathogenic organisms, demonstrating the safety of the formulation for regular use. Overall, the evaluation result suggest that the polyherbal shampoo combines effective cleansing, conditioning, and scalp-nourishing properties while remaining mild, safe, and free from harsh chemicals. The presences of natural herbal ingredients contribute to hair strength, shine, and overall hair health, confirming the effectiveness of this herbal formulation as a natural alternative to synthetic shampoos.

Keywords: *Polyherbal shampoo, Amla, Reetha, Shikakai, Neem, Aloe vera.*

P-03/N/014 POSTER · ONLINE

Microspheres as a Controlled Delivery System

Saurav Raj Thakur, Dr. Amit Chaudhary

[1]Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, India
Email: saurav1012.mpharm26@chitkarauniversity.edu.in

Introduction: Microspheres are spherical particulate delivery systems which can entrap or encapsulate active pharmaceutical ingredients and deliver them in a controlled manner. They provide benefits including enhanced drug stability, prolonged drug action, less frequency of administration and may also enhance patient compliance.

Aim & Objectives: The aim of the present study was to design and develop microspheres as a system for controlled delivery of a specific drug with predictable and sustained release.

Methods: Microspheres were prepared by an appropriate method using an appropriate polymer. The prepared formulation was analysed for particle size, morphology, drug content, drug entrapment efficiency, percentage yield and in-vitro drug release. Drug release from the microspheres was studied to evaluate if these particles could provide controlled delivery of drugs.

Results: The prepared microspheres showed good formulation and drug entrapment. The in-vitro studies showed sustained drug release as compared to conventional delivery. This suggests that these microspheres can be used for controlled drug delivery.

Summary & Conclusion: Microspheres are an attractive system for delivery of drugs. They can alter drug release and help maintain drug availability for an extended period. By optimising the formulation and polymer concentration the efficacy and performance of these systems can be enhanced.

Keywords: *Microspheres; Controlled delivery; Drug release; Polymer; Encapsulation; Sustained release*


Nestlé®
Good Food, Good Life
BEST WISHES FOR
ICS 22
Wishing all delegates, researchers, academicians, and organizers a successful conference filled with knowledge, innovation, and meaningful collaboration.
NUTRITION
DAIRY
BEVERAGES
CONFECTIONERY
Nestlé India — food and beverage products spanning nutrition, dairy, beverages, and confectionery.
Nourishing People,
Nurturing a Brighter Tomorrow

CATEGORY 4 | 34 ABSTRACTS

Quality Assurance & Drug Regulatory Affairs

www.LNCTU.ac.in

LNCT UNIVERSITY BHOPAL

YOUR GATEWAY TO GLOBAL OPPORTUNITIES



nirf NATIONAL INSTITUTIONAL RANKING FRAMEWORK
Ranking of Indian Universities - 2025
Ministry of Education Government of India

TOP Ranked University
BY Education Post Magazine in IIRF University Ranking 2026

ADMISSION 2026 THROUGH
LNCT CET
COMMON ENTRANCE TEST FOR UG PROGRAMS ONLY

One Exam. Endless Futures

Why Choose LNCT University?

- Modern Campuses: Advanced labs and libraries.
- Innovative Curriculum: Industry-relevant courses.
- High Placements: Excellent job placement rate.
- Strong Alumni: Active, supportive network.
- Diverse Programs: Wide range of UG, PG, PhD courses.
- Industry Tie-ups: Partnerships with top companies.
- Smart Classrooms: Tech-enabled learning.
- Research Focus: Strong research opportunities.
- Global Exposure: International collaborations.
- Scholarships: Merit-based financial aid.
- Campus Life: Modern amenities & an abundance of extracurricular activities.
- Expert Faculty: Industry-experienced professors.

Courses Offered

- ENGINEERING
- MEDICAL SCIENCES
- AYURVEDA
- MANAGEMENT
- LAW
- PHARMACY
- AGRICULTURE
- COMPUTER APPLICATION
- JOURNALISM AND MASS COMMUNICATION
- HOTEL MANAGEMENT
- PARAMEDICAL SCIENCE
- NURSING
- PHYSICAL EDUCATION
- HOSPITAL MANAGEMENT
- BIO-TECHNOLOGY
- Ph.D

33 YRS



LNCTU Campus
J.K. Town, Sarvadharam,
Kolar Road, Bhopal

+91-744 077 7222 - 111 - 555

O-04/F/001 ORAL · OFFLINE

The Current Regulatory Environment for Software Used in Medical Devices: A Need for Refined International Strategies

Gagan Gaurav Sharma*, Amandeep Singh

Department of Regulatory Affairs, ISF College of Pharmacy, Moga-142001, Punjab, India

gagansharma411ila@gmail.com Software as a Medical Device (SaMD) has emerged as an important component of modern healthcare, supporting diagnosis, treatment, monitoring, and clinical decision-making. The rapid evolution of artificial intelligence, digital health technologies, and connected medical systems has created new opportunities while presenting regulatory challenges related to safety, efficacy, cybersecurity, interoperability, and continuous software updates. This editorial examines the contemporary regulatory environment for SaMD, with particular emphasis on the United States and BRICS nations, including Brazil, Russia, India, China, and South Africa. It highlights differences in regulatory approaches, classification systems, pre-market requirements, post-market surveillance, and quality-management expectations across jurisdictions. The discussion emphasizes the need for internationally aligned yet adaptable regulatory strategies capable of accommodating rapidly evolving software technologies without compromising patient safety. Risk-based classification, regulatory harmonization, continuous monitoring, cybersecurity, and transparent stakeholder engagement are identified as important elements of an effective SaMD regulatory framework. The editorial also considers the potential role of international standards and collaborative regulatory approaches in facilitating innovation and global market access. A refined and coordinated regulatory strategy may help balance technological advancement with safety, reliability, ethical considerations, and protection of patient data.

Keywords: *Medical devices, Artificial intelligence, Regulatory approaches, Digital health technologies, Software as a Medical Device (SaMD).*

O-04/F/002 ORAL · OFFLINE

Cyclodextrins: Concept to applications, regulatory issues and challenges

Nisha Sharma*

Department of Regulatory affairs, ISF College of Pharmacy, Moga, Punjab, India-142001

Email: 2510008@isfcp.org

Solubility properties of drugs intensify a crucial role during the formulation development process. Water solubility is one of the utmost important factor concerning drug bioavailability analysis. Cyclodextrins are supportive, competent excipients, required an ever-rising way to disguise unwanted pharmaceutical characteristics, exclusively poor aqueous solubility. CDs are actively useful in medicinal industries for copious purposes, including improving drug solubility, safety, physicochemical stability, and bioavailability. Different solubility enhancement methods can resolve several approaches to trouble insolubility. Among all, the reported CDs complexation technique has been incorporated as one of the essential and imperative concepts to enhances the solubility, permeability, dissolution rate, and bioavailability of drugs. This review discusses some of the outcomes and broad solicitations of CDs and their derivatives in various drug delivery systems. This review also addresses the aspects regarding the new CD-based therapeutics, possible future uses and issues, and regulatory perspective in the modern scenario.

Keywords: *Cyclodextrins, Solubility, Complexation, Regulatory issues, Challenges, Applications.*

O-04/F/003 ORAL · OFFLINE

Evaluating the Imperative Role of Pre- and Post-eCTD Standards in Dossier Validation: An Inevitable Outlook

Parul*

Department of Regulatory affairs, ISF College of pharmacy, Moga-142001, Punjab, India
Email: 2510010@isfcp.org

Introduction: Submission of a comprehensive regulatory dossier is central to the drug approval process. This process has evolved from pre-electronic Common Technical Document (pre-eCTD) standards to the standardized, XML-based post-eCTD framework, marking a pivotal shift in regulatory science.

Aim & Objectives: To evaluate the transition from pre-eCTD to post-eCTD dossier validation standards, examining its rationale, benefits, and implementation challenges for regulatory authorities and pharmaceutical companies.

Methods: A narrative review of regulatory literature and guidance documents was conducted to compare pre- and post-eCTD dossier validation practices.

Results: Pre-eCTD validation relied on manual, paper-intensive review, often marked by the inconsistency and resource strain. Post-eCTD introduced a modular structure administrative, clinical, nonclinical, and quality sections enabling automated consistency checks, metadata-driven navigation, and improved lifecycle management. Challenges identified include a steep learning curve, data migration requirements, and harmonization of diverse global standards.

Summary: Emerging technologies such as artificial intelligence (AI) and blockchain are expected to further strengthen dossier validation and support adaptive, patient-centric regulatory pathways.

Conclusion: The shift from pre- to post-eCTD standards marks a pivotal advancement in regulatory submissions, driving harmonization, efficiency, and collaboration in pharmaceutical regulatory affairs.

Keywords: *Electronic Common Technical Document, Common Technical Document, dossier validation, regulatory submission, International Council for Harmonisation.*

O-04/F/004 ORAL · OFFLINE

Impact of Regulatory Affairs Management on Sustainable Growth and Operational Performance of Pharmaceutical Companies

Madan Singh Dhiman*[1], Amit Chaudhary[2]

[1]School of Management Studies, Shri Guru Ram Rai University, Patel Nagar, Dehradun, Uttarakhand, India.
[2]Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh
Email: madan_dhiman@seagullbiotech.com

Regulatory Affairs Management (RAM) plays a pivotal role in maintaining regulatory compliance while simultaneously supporting operational efficiency, product continuity, innovation, and sustainable growth within the pharmaceutical industry. Its scope extends beyond conventional compliance activities to encompass regulatory intelligence, submission management, product lifecycle management, compliance systems, change management, and effective coordination across regulatory and business functions. The strategic integration of regulatory affairs with quality, manufacturing, supply chain, research and development, and commercial operations can significantly influence organizational performance and long-term business sustainability. Effective RAM contributes to timely regulatory submissions and approvals, efficient product development, uninterrupted market supply, optimized resource utilization, proactive risk mitigation, and rapid adaptation to evolving regulatory requirements. Regulatory intelligence enables pharmaceutical organizations to anticipate changes in national and international regulatory frameworks, while effective lifecycle management facilitates timely variations, post-approval changes, and continued product compliance throughout the commercial life of a product. Digital regulatory systems, data-driven decision-making, and cross-functional collaboration further enhance transparency, process efficiency, and organizational responsiveness. In contrast, fragmented regulatory processes, inadequate regulatory capabilities, inefficient data management, and delayed responses to regulatory changes may increase operational complexity, compliance risks, resource requirements, and business costs. A strategically positioned regulatory affairs function therefore contributes not only to regulatory readiness but also to organizational resilience and operational excellence. Strengthening RAM through digitalization, cross-functional integration, risk-based decision-making, regulatory intelligence, and continuous competency development can enable pharmaceutical companies to improve operational performance, manage regulatory uncertainty, maintain product continuity, and establish a sustainable foundation for long-term growth in an increasingly complex and dynamic regulatory environment.

Keywords: *Digital regulatory systems, Product lifecycle management, Regulatory Affairs Management, digitalization, Pharmaceutical Companies, Sustainable*

O-04/F/005 ORAL · OFFLINE

Quality Assurance and Drug Regulatory Compliance in Pharmaceutical Manufacturing

Girish Chawla*, Mr. Lovekesh Singh

[1]*Department of Pharmacy, ISF College of Pharmacy, Moga, Punjab, India-142001*
[2]*Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India-142001*
Email: gchawla928@gmail.com

Ensuring the quality, safety, and efficacy of medicines is a fundamental responsibility of the pharmaceutical industry. Quality assurance (QA) and drug regulatory systems work together to maintain consistent product quality and support public health through well-defined standards and oversight mechanisms. This study aims to examine the key elements of quality assurance and regulatory compliance in pharmaceutical manufacturing and to highlight their role in minimizing risks and safeguarding patient well-being. The review was based on current guidelines, regulatory frameworks and relevant literature on good manufacturing practices (GMP), quality risk management (QRM), documentation, process validation, stability testing, pharmacovigilance and regulatory compliance. Emphasis was placed on how these components interact across the product lifecycle, from development to post-market surveillance. Implementing robust QA systems and adhering to regulatory requirements help ensure consistent manufacturing, reliable test results and traceability through comprehensive documentation. QRM enables identification and control of potential risks, while validation and stability studies confirm product quality throughout its shelf life. Pharmacovigilance supports the ongoing monitoring of safety, and regulatory compliance provides the framework for legal and ethical operation. Together, these elements strengthen the overall quality system, reduce the likelihood of defects and adverse events, and foster confidence in pharmaceutical products. An effective quality assurance programmed combined with adherence to drug regulatory requirements is essential for safe, high-quality medicines and ultimately contributes to improved patient safety and public health.

Keywords: *Quality assurance; Regulatory compliance; GMP; Risk management; Pharmacovigilance; Patient safety.*

P-04/F/001 POSTER · OFFLINE

Global Regulatory Harmonization of Cyclodextrin-Based Pharmaceutical Excipients: A Comparative Assessment of Safety, Quality, and Approval Requirements

Amit Kumar*

Department of Regulatory Affairs, ISF College of Pharmacy, Moga - 142001, Punjab, India.
Email: amitbhola2501@gmail.com

Background: Cyclodextrins are widely used as pharmaceutical excipients to improve the solubility, stability, bioavailability, and delivery of poorly water-soluble drugs. However, regulatory requirements for cyclodextrin-based excipients may vary across jurisdictions, particularly regarding safety evaluation, quality standards, permissible use levels, and approval documentation. These differences can create challenges for pharmaceutical manufacturers seeking regulatory approval in international markets.

Objective: This study aims to comparatively assess the global regulatory requirements for cyclodextrin-based pharmaceutical excipients, with a focus on safety assessment, quality control, documentation, and approval pathways. It also seeks to identify regulatory similarities, differences, and potential opportunities for international harmonization.

Methodology: A structured review of scientific literature, international regulatory guidelines, pharmacopeial standards, and publicly available regulatory documents will be conducted. Regulatory expectations from selected authorities, including the European Medicines Agency (EMA) and the United States Food and Drug Administration (US FDA), will be compared. Key parameters will include toxicological evaluation, impurity profiling, quality specifications, manufacturing controls, labeling requirements, and excipient-related documentation in pharmaceutical submissions.

Expected Outcome: The study is expected to provide a comparative overview of the regulatory approaches applied to cyclodextrin-based excipients and highlight areas of convergence and divergence among selected jurisdictions. The findings may support improved regulatory planning, consistent safety and quality evaluation, and more efficient preparation of international pharmaceutical dossiers.

Conclusion: Greater regulatory alignment and science-based evaluation of cyclodextrin-based excipients may facilitate international product development while supporting patient safety, product quality, and regulatory consistency.

Keywords: *Cyclodextrins; Pharmaceutical Excipients; Drug Regulatory Affairs; Regulatory Harmonization; Safety Assessment; Quality Requirements; Global Drug Approval.*

P-04/F/002 POSTER · OFFLINE

Regulatory Uncertainty and Legacy System Constraints: Barriers to Pharma 4.0 Adaptation in QA

Himanshu Chaturvedi*, Manya Bhatangar, Vema Kiran

Department of Pharmaceutical Quality assurance, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: chaturvedih38@gmail.com

Pharma 4.0 enables IoT, big data, cloud computing and AI technologies for improving quality of the products, traceability, and build digital infrastructure. However, the implementation is obstructed by regulatory uncertainty and legacy system constraints. Aim is to illustrate regulatory ambiguity and legacy system constraints as main factors affecting Pharma 4.0 implementation and possible approach to tackle them. For which peer-reviewed literature, international framework (FDA, EMA, WHO, ICH), case studies, and validation methods (CSV vs CSA) and data integrity standard (ALCOA+) were studied. As result, three primary challenges discovered were: (1) Inconsistent regional validation rules for AI/ML systems; (2) Replacing legacy systems like Manufacturing Execution System and Laboratory Information Management System ask high capital and operational cost; (3) Data integrity, cyber-security threats, and skill-gap in workforce. Authorities are making improvements but global coordination is still falling short which outlines regulatory framework and infrastructure factors are the leading constraints for adaptation of Pharma 4.0 in QA. Planning well-structured regulatory harmonization, phased legacy system updating and focused workforce training may overcome these barriers. Conclusively, the two critical barriers must be tackled through a co-operative effort between regulators, manufacturers and technology developers in order to design a scalable digital upgrade that ensures safety to quality assurance.

Keywords: *Pharma 4.0; QA; Regulatory Framework; Legacy Systems; Data integrity.*

P-04/F/003 POSTER · OFFLINE

Nitrosamine Challenges in Drug Quality Assurance: CPCA Categorization, Excipient-Linked Risk

Manya Bhatnagar*, Himanshu Chaturvedi, Vema Kiran

Department of Pharmaceutical Quality Assurance, ISF College of Pharmacy, Moga- 142001, Punjab, India.
Email: manyabhatnagar2001@gmail.com

The presence of nitrosamines in small-drug molecules, including medications like valsartan and metformin, have emerged as significant issues for authorities, given the fact that small amounts may impose mutagenic or carcinogenic risks and make quality control stage of drug production critical. This work aims to apply the Carcinogenic Potency Categorization Approach (CPCA) to nitrosamine drug substance-related impurities (NDSRIs) and to systematically map excipient-linked nitrosation risk within a Quality-by-Design (QbD) framework. A combination of published articles, guidelines, and case studies utilized for CPCA-based treatment of nitrosamine-containing drugs and evaluation of excipients based on the nitrate content and other properties. CPCA has categorized NDSRIs into five potency categories with an emphasis on the fact that the structures possessing accessible alpha-hydrogens as well as electron-withdrawing groups call for more attention. Meanwhile, the evaluation of the excipients has enabled identifying specific important categories such as the class of inorganic salts containing nitrites, oxidizing agents and the group of excipients representing amines and providing antioxidant effect. Overall, the design of the active pharmaceutical ingredient, selection of excipients and conditions of the production process characterize the formation of nitrosamines, indicating the need for the qualification of excipients, CPCA-predicted risk assessment and active monitoring.

Keywords: *Nitrosamines; CPCA; NDSRIs; QbD; Excipient Risk; Antioxidants.*

P-04/F/004 POSTER · OFFLINE

6D-printed medical devices: A regulatory gap analysis for point-of-care manufacturing quality systems

Isha*

Department of Pharmaceutical Quality assurance, ISF College of Pharmacy, Moga- 142001, Punjab, India.
Email: pathaniaisha146@gmail.com

As well as 5D printing, where the printer machines are used to print objects in curved shapes from multiple different axes, 6D printing is progressing even beyond 4D printing, in which the shape or behaviour of the printed material changes after printing when exposed to an external stimulus, such as light, heat, or chemicals. New potential applications of this technology include patient-specific implants and devices, such as orthopaedics scaffolds, vascular devices and drug delivery systems made of shape-memory polymers, programmable hydrogels and bio-inks that change their properties in response to physiological conditions after in vivo implantation. However, the regulatory hurdles that will have to be overcome to make an instance of a proof of concept available in the clinical and POC (point-of-care) setting will be confined to the regulatory framework established for devices of a single "final" configuration manufactured in traditional manufacturing facilities. This article is a review of the existing literature on materials science and regulatory policy and shows this gap. Here are some interrelated problems we identified: the lack of a classification pathway for devices that have to be activated/conditioned to become clinically relevant in the host environment; issues of identification of the manufacturer of record during the time of the hospital undergoing these processes; lack of development of biocompatibility and risk management to accommodate patient-specific pipelines; differences in the U.S. and EU UDI frameworks and post-market monitoring; and limited ability of the agencies to inspect hospitals during the manufacturing process of the devices.

Keywords: *6D printing, Patient-specific implants, Smart biomaterials, Regulatory challenges, Point-of-care manufacturing*

P-04/F/005 POSTER · OFFLINE

Quality by Design (QbD) Approach for Optimization of Cyclodextrin-Based Drug Delivery Systems

Jinesh Kumar Pani*

Department of Pharmaceutical Quality assurance, ISF College of Pharmacy, Moga - 142001, Punjab, India.
Email: jineshkumar766@gmail.com

Cyclodextrin-based drug delivery systems have gained considerable attention because of their ability to improve the solubility, stability, bioavailability, and therapeutic performance of poorly water-soluble drugs. However, the development of these systems can be influenced by several formulation and process variables, making systematic optimization essential. Quality by Design (QbD) provides a structured and science-based approach for developing robust and reproducible cyclodextrin-based drug delivery systems. This review discusses the application of QbD principles in the formulation and optimization of cyclodextrin-based drug delivery systems. Key QbD elements, including the Quality Target Product Profile (QTPP), Critical Quality Attributes (CQAs), Critical Material Attributes (CMAs), Critical Process Parameters (CPPs), risk assessment, Design of Experiments (DoE), design space, and control strategy, are discussed. The use of DoE enables the identification and optimization of important formulation and process variables while reducing the number of experimental trials. Application of QbD can improve product quality, formulation robustness, reproducibility, and manufacturing efficiency. Overall, integrating QbD with cyclodextrin-based drug delivery provides a systematic approach for developing optimized and high-quality drug delivery systems with improved therapeutic performance and greater potential for successful pharmaceutical development.

Keywords: *Cyclodextrin, Drug delivery systems, Quality by Design (QbD), Design of Experiments (DoE), Formulation optimization*

P-04/F/006 POSTER · OFFLINE

Awareness and Safe Disposal of Expired Medicines: A Step Towards a Healthier Environment

Mohammad Riyan Rangrej*

Department of Pharmacy Practice, School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan, India
Email: riyanrangrej07@gmail.com

BACKGROUND: Improper disposal of expired and unused medicines is an emerging public health and environmental concern. Medicines discarded with household waste or flushed into sinks and toilets may lead to pharmaceutical contamination of soil and water and may pose potential risks to human health and aquatic ecosystems. Lack of awareness regarding appropriate disposal practices can further contribute to this problem.

OBJECTIVE: The present work aims to highlight the importance of safe disposal of expired and unused medicines and to promote awareness regarding responsible medicine disposal practices among the general public.

METHODS: A descriptive review was carried out using available scientific information regarding common medicine-disposal practices, associated environmental risks, and recommended safe-disposal approaches. The role of pharmacists in educating the public and promoting appropriate medicine disposal was also considered.

RESULTS: Common inappropriate practices include disposing of medicines with household waste and flushing them into sinks or toilets. Such practices may allow pharmaceutical residues to enter soil and water systems. Pharmacist-led counselling, medicine take-back programmes, public awareness campaigns, and adherence to appropriate disposal guidelines can help promote responsible disposal practices.

CONCLUSION: Proper disposal of expired and unused medicines is an important aspect of responsible pharmaceutical practice. Increased public awareness and active involvement of pharmacists can help reduce inappropriate medicine disposal and contribute to the protection of public health and the environment.

Keywords: *Expired medicines, Safe drug disposal, Pharmaceutical waste, Environmental pollution, Pharmacist awareness, Public health.*

P-04/F/007 POSTER · OFFLINE

Designing Safer Cyclodextrin Formulations: Global Regulatory Patterns of Use, Exposure and Safety Considerations in Approved Products

Mansi Sharma*, Dr Shubham Thakur

Department of Regulatory Affairs, ISF College of Pharmacy, Moga - 142001, Punjab, India
Email: mansisharma251609@gmail.com

Cyclodextrins (CDs) are commonly used pharmaceutical excipients that enhance the solubility, stability, and bioavailability of poorly water-soluble drugs. However, their regulatory and safety considerations may differ according to CD type, route of administration, exposure, and patient population. Therefore, a systematic evaluation of their use in approved pharmaceutical products can be helpful to give regulatory information for formulation development. The purpose of this study is to create a regulatory safety map of cyclodextrin-based drug products that are approved in various markets such as India, the EU, the USA and Japan. A systematic analysis will be conducted to analyse regulatory databases, approved product information, prescribing information, and official product documentation. Data will be collected based on cyclodextrin Type, Derivative, Route of Administration, Concentration, Dose or Exposure, Indication, Patient Population, Warnings, Precautions, contraindications, and other documented safety considerations. Route-specific and cyclodextrin-specific patterns will be examined and regulatory differences between jurisdictions mapped. The study will create an evidence-based profile of the use of cyclodextrins in approved medicines and highlight common regulatory and safety considerations for each cyclodextrin type, route and exposure. The results will inform a scientific framework for selection and exposure assessment of cyclodextrins in the early stages of pharmaceutical product development that is rooted in regulation. Incorporating regulatory intelligence, pharmaceutical product data, safety assessment, and risk-based decision-making, this approach helps develop safer and regulatory ready cyclodextrin formulations.

Keywords: *Cyclodextrins (CDs), formulation development, regulatory databases, scientific framework.*

P-04/F/008 POSTER · OFFLINE

Comparative Study on Regulatory Requirements for New Drug Approval in India and USA

Rohit Barnodia*, Navjot Kaur Sandhu

Department of Regulatory Affairs, ISF College of Pharmacy, Moga-142001, Punjab, India

rs9534826@gmail.com The approval of new drugs is a complex and highly regulated process intended to ensure the safety, efficacy, and quality of pharmaceutical products. India and the United States are two significant pharmaceutical markets with distinct regulatory frameworks governed by the Central Drugs Standard Control Organization (CDSCO) and the United States Food and Drug Administration (US FDA), respectively. This study aims to comparatively evaluate the regulatory requirements, approval processes, and timelines involved in new drug approval in both jurisdictions. The study will focus on Investigational New Drug (IND) and Clinical Trial Application procedures, marketing authorization requirements, review mechanisms, expedited approval pathways, and post-marketing surveillance systems. The impact of India's New Drugs and Clinical Trials Rules (NDCT), 2019, will also be assessed in comparison with the established US FDA regulatory framework. Relevant legislation, regulatory guidelines, peer reviewed literature, and official agency documents will be reviewed, along with case studies of selected novel drugs approved in both countries. The comparative analysis is expected to identify regulatory gaps, similarities, operational challenges, and opportunities for harmonization. The findings may assist pharmaceutical companies and regulatory professionals in developing efficient global drug development and submission strategies while facilitating timely access to safe and effective medicines.

Keywords: *Regulatory requirements, new drug approval, India, USA, Harmonization.*

P-04/F/009 POSTER · OFFLINE

Navigating the Regulatory Landscape of Genetically Modified Foods in India: An Update

Sunali Mehta*, Amandeep Singh

Department of Regulatory affairs, ISF College of pharmacy, Moga[142001], Punjab, India

Email: sunalimehta75@gmail.com

Genetically modified (GM) foods have become an important subject of regulatory and public-health discussion because of their potential benefits as well as concerns regarding food safety, environmental effects, and consumer protection. In India, the regulation of genetically modified organisms and GM-derived food products involves multiple regulatory and scientific considerations. This editorial provides an overview of the evolving regulatory landscape for GM foods in India, with particular emphasis on the Food Safety and Standards Authority of India (FSSAI) and its proposed regulatory framework for genetically modified or engineered foods. The discussion examines the regulatory requirements concerning safety assessment, risk assessment, authorization, labelling, traceability, monitoring, and stakeholder engagement. The roles of relevant regulatory and scientific bodies, including the Genetic Engineering Appraisal Committee (GEAC), are also considered in the broader regulatory context. A comparison with selected international approaches, particularly those of the United States and European Union, highlights differences in regulatory strategies and labelling requirements. The editorial emphasizes the importance of science-based risk assessment, transparency, coordinated regulatory oversight, and effective enforcement for ensuring consumer safety while addressing technological developments in food biotechnology. Strengthening regulatory coordination and establishing clear, accessible, and scientifically robust requirements may support responsible management of GM foods in India.

Keywords: *Genetically modified foods, Regulatory landscape, Scientific considerations, Consumer safety.*

P-04/F/010 POSTER · OFFLINE

Regulatory Intelligence in Pharmaceutical Product Lifecycle Management: From Compliance to Strategic Decision-Making

Bharti*, Shubham Thakur

Department of Regulatory affairs, ISF college of Pharmacy, Moga-142001, Punjab, India
Email: bhartichanna883@gmail.com

Regulatory Intelligence (RI) has emerged as an important strategic function within the pharmaceutical industry, extending beyond traditional compliance activities to support informed decision-making throughout the pharmaceutical product lifecycle. The increasing complexity of global regulatory requirements, frequent guideline revisions, evolving submission pathways, and regional differences have created a need for systematic and proactive regulatory information management. This review explores the role of Regulatory Intelligence across key stages of pharmaceutical product lifecycle management, including drug development, clinical development, regulatory submission, manufacturing, post-marketing surveillance, and lifecycle management. It highlights how regulatory information from health authorities, scientific literature, legislation, inspection reports, regulatory databases, and safety communications can be systematically collected, analysed, and translated into actionable regulatory insights. Emerging technologies such as Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Regulatory Information Management Systems (RIMS), and predictive analytics are discussed for their potential to improve regulatory monitoring, identify emerging requirements, anticipate regulatory changes, and support risk-based decision-making. The integration of RI with cross-functional regulatory strategy can facilitate earlier identification of regulatory gaps, improve submission readiness, reduce compliance risks, and support efficient product lifecycle planning. The review also discusses challenges related to data quality, fragmented regulatory information, technology adoption, data governance, and the need for skilled regulatory professionals. Overall, the integration of technology-driven Regulatory Intelligence with pharmaceutical lifecycle management represents a shift from reactive compliance toward proactive and strategic regulatory decision-making.

Keywords: *Regulatory Intelligence, Pharmaceutical Lifecycle Management, Regulatory Affairs, Artificial Intelligence, Regulatory Strategy, RIMS.*

P-04/F/011 POSTER · OFFLINE

Ethical Preparedness of Developing Nations in the Age of Decentralized Clinical Trials: Comparative Overview of South Asian Regulation

Akanksha*

Department of Regulatory affairs, ISF College of pharmacy, Moga - 142001, Punjab, India
Email: saralchakankshasingh@gmail.com

The advent of decentralized clinical trials (DCTs) has altered the usual trends in clinical trials, and this presents an ethical, regulatory, and operational dilemma, particularly to the low-and middle-income countries (LMICs). This review critically examines the ethical preparedness of countries in South Asia to transform to the DCT paradigm. We consider the readiness of such nations as India, Bangladesh, Pakistan, Sri Lanka, Nepal, Bhutan, and the Maldives by weighing the local regulatory environments and establishing a difference in ethical safeguards, cyber infrastructure, and protection of participants. The paper specifically focuses on some of the fundamental themes, including the concept of informed consent in the virtual world, data security, the digital literacy problem, and the evolving nature of the local ethics committees. Case studies allow us to identify systemic gaps, especially the ones that were provoked by the COVID-19 pandemic, and propose ways to harmonize ethics with the comparative regulatory matrix. The focus is on regionalization of international standards, including ICH-GCP, and intergovernmental cooperation, as well as the effective construction of strong and inclusive systems of governance. This review offers strategic suggestions that policymakers may implement to enhance ethical resilience in the South Asian passage to a decentralized, data-driven future of clinical research.

Keywords: *Decentralized clinical trials, informed consent, digital health, regulatory harmonization, ethical preparedness, telemedicine.*

P-04/F/012 POSTER · OFFLINE

Steps to Start Wholesale Medical Store, Retail Medical Shop and Pharma Clinic Along with District-wise Number of Shops in Madhya Pradesh

Paridhi Gupta, Dr. Vijay Nigam, Mr. Bhan Singh Yadav
Daksh Institute of Pharmaceutical Sciences, Chhatarpur, (M.P.), Pin: 471001, India
Email: paridhigupta682@gmail.com

The pharmaceutical sector is one of the fastest growing healthcare sectors in India and plays a significant role in providing medicines and healthcare services to the public. Wholesale medical stores, retail medical shops, and pharma clinics are important components of the pharmaceutical distribution and healthcare system. These establishments ensure the proper availability, storage, distribution, and dispensing of medicines in both urban and rural areas. The present project focuses on the procedures and requirements for starting wholesale medical stores, retail medical shops, and pharma clinics in Madhya Pradesh. The study includes the standard procedures for obtaining licenses, infrastructure requirements, investment planning, staffing needs, and legal regulations associated with pharmaceutical businesses. The project also highlights the importance of pharmacists and healthcare professionals in maintaining safe and effective medicine distribution systems. In addition, the project provides a district-wise analysis of wholesale medical stores, retail pharmacies, pharma clinics, and registered pharmacists in Madhya Pradesh. The study also discusses the challenges faced in pharmaceutical business operations, such as competition, regulatory compliance, medicine storage, and distribution management. Wholesale medical stores contribute significantly to healthcare services by ensuring uninterrupted medicine supply and supporting the pharmaceutical distribution network. They also generate employment opportunities for pharmacists, healthcare workers, delivery staff, and business professionals. The project further focuses on district-wise analysis of pharmaceutical establishments in Madhya Pradesh. This analysis helps in identifying healthcare service availability, business opportunities, and districts requiring improved pharmaceutical infrastructure. The study also highlights the importance of pharmacists in ensuring safe dispensing, patient counselling, and proper medicine management.

Keywords: *Pharmaceutical Business, Wholesale Medical Store, Retail Medical Shop, Pharma Clinic, Drug License, Pharmacist.*

P-04/F/013 POSTER · OFFLINE

Biosimilar Approval Pathway: From Molecular Characterization to Regulatory Authorization

Shivanchal*
ISF College of Pharmacy, Moga, Punjab (142001)
Email: shivanchal640@gmail.com

Biosimilars are biological medicinal products, which are highly similar to an already approved reference biologic with no clinically meaningful differences in terms of safety, purity and potency. The development and approval of biosimilars require a comprehensive regulatory approach involving analytical, non-clinical and clinical assessments to establish similarity with the reference product. The biosimilar approval pathway begins with the selection of an appropriate reference biologic, followed by extensive molecular characterization to evaluate structural and functional attributes and comparative analytical studies as the basis of bio similarity assessment. The evidence from these studies forms the foundation for bio similarity and is supplemented by non-clinical and clinical studies as scientifically justified. The evidence from pharmacokinetic, pharmacodynamic and immunogenicity assessments provides additional evidence to support comparable clinical performance and the totality of evidence is evaluated by regulatory authorities to determine whether the proposed biosimilar meets the required standards for quality, safety and efficacy. Post-marketing pharmacovigilance further supports the ongoing safety monitoring after authorization. This poster highlights the major stages of biosimilar development and regulatory authorization and emphasizes the importance of analytical comparability, a science-based evidence hierarchy and risk-based regulatory assessment for biosimilar approval. It also outlines the role of regulatory harmonization in facilitating biosimilar development and access to biological therapies.

Keywords: *Biosimilars, molecular characterization, analytical comparability, regulatory authorization, clinical evaluation, pharmacovigilance.*

P-04/F/014 POSTER · OFFLINE

Navigating the regulatory landscape genetically modified food in India

Anisha kochhar*

Department of Regulatory Affairs, ISF College of Pharmacy, Moga, Punjab
Email: anisha05799@gmail.com

Introduction: Genetic modified (GM) food has gained importance in India due to their potential agricultural nutritional benefits, alongside concerns related to food safety, environmental sustainability, allergenicity, and unauthorized sales.

Aim & Objective: To review the evolving regulatory landscape of GM foods in India, particularly the Food Safety and Standards Authority of India (FSSAI) draft guidelines, and to highlight key regulatory challenges related to safety assessment, labelling, transparency and enforcement.

Methods: A narrative review of the existing regulatory framework and FSSAI draft notification on genetically modified foods was undertaken. Relevant regulatory provisions and approaches to GM food regulations in India and the United States were also considered.

Result: The proposed Indian framework emphasizes scientific risk assessment, including evaluation of potential allergenicity, toxicity, nutritional aspects, and unintended effects. It also addresses labelling requirements, transparency, stakeholder engagement, and measures to control unauthorized GM food products. FSSAI and the Genetic Engineering Appraisal Committee (GEAC) have important regulatory roles.

Summary: Effective implementation and monitoring are essential to strengthen customer protection and regulatory accountability.

Conclusion: A transparent, scientifically rigorous, and effectively enforced regulatory framework is essential for managing GM foods while addressing public health, environmental, and concerns.

Keywords: *Genetically modified foods, FSSAI, GEAC, Food safety, Regulatory framework, labelling.*

P-04/F/015 POSTER · OFFLINE

Quality by Design (QbD)-Driven Regulatory Framework for Intranasal Cyclodextrin-Based Drug Delivery Systems

Gurshabad Singh Sodhi*, Gayatri Bisht

ISF College of Pharmacy and Research, Rattian Road, Moga, Punjab, India
Email: shabadsodhi080@gmail.com

Intranasal nose-to-brain drug delivery offers a promising approach for enhancing central nervous system (CNS) exposure while potentially circumventing limitations associated with systemic delivery and the blood-brain barrier (BBB). Cyclodextrin derivatives, particularly hydroxypropyl-β-cyclodextrin (HP-β-CD) and sulfobutylether-β-cyclodextrin (SBE-β-CD), provide important formulation advantages through improved drug solubilization, stabilization, and modulation of drug–mucosal interactions. However, the complexity of these systems presents challenges related to formulation robustness, scale-up, batch-to-batch consistency, and safety. This presentation proposes a Quality by Design (QbD)-driven regulatory framework based on ICH Q8(R2), Q9, and Q10 principles for systematic development and control of intranasal cyclodextrin-based formulations. A comprehensive Quality Target Product Profile (QTPP) is established, incorporating critical attributes such as drug content, pH, osmolality, viscosity, spray performance, mucoadhesion, mucosal tolerability, drug-release characteristics, and stability. Risk-based assessment can subsequently establish relationships among Critical Material Attributes (CMAs), Critical Process Parameters (CPPs), and Critical Quality Attributes (CQAs), supporting definition of an evidence-based design space. Particular emphasis is placed on cyclodextrin concentration, complexation conditions, mixing parameters, and formulation rheology to minimize variability and ensure reproducible product performance. Regulatory considerations, including excipient safety, FDA Inactive Ingredient Database precedents, analytical validation, stability assessment, and potential applicability of the 505(b)(2) pathway, are integrated into the framework. Overall, this QbD-based strategy provides a structured pathway toward robust, scalable, and regulatory-ready intranasal cyclodextrin delivery systems.

Keywords: *Quality by Design (QbD), Intranasal Drug Delivery, Cyclodextrins, Critical Quality Attributes; ICH Q8/Q9, Regulatory Science*

P-04/F/016 POSTER · OFFLINE

Comparative Analysis of Pharmaceutical Regulatory Requirements Across Emerging Markets

Gangesh Kumar*, Amandeep Singh
ISF college of Pharmacy, Moga-142001, Punjab, India
Email: gangeshkumar074@gmail.com

The pharmaceutical regulatory landscape across emerging markets is characterized by considerable variation in registration procedures, dossier requirements, regulatory pathways, and post-approval obligations. These differences can create challenges for pharmaceutical companies seeking to introduce medicinal products across multiple jurisdictions. This review aims to comparatively analyze key pharmaceutical regulatory requirements across selected emerging markets, with emphasis on regulatory authorities, legal frameworks, marketing authorization pathways, Common Technical Document (CTD) requirements, administrative documentation, quality and stability requirements, bioequivalence and clinical data expectations, labeling, Good Manufacturing Practice (GMP), electronic submissions, pharmacovigilance, and post-approval lifecycle management. Although regulatory convergence initiatives have promoted greater adoption of CTD-based structures and international standards, significant regional differences remain in Module 1 requirements, administrative procedures, documentation, local requirements, review processes, labeling provisions, and post-registration changes. The study further examines the role of regulatory harmonization initiatives and reliance mechanisms in reducing duplication and improving regulatory efficiency. A comparative gap-analysis approach can help identify common, divergent, and market-specific requirements and support the development of efficient regulatory submission strategies. The review highlights the importance of continuous regulatory monitoring and market-specific regulatory intelligence for successful product registration and lifecycle management. Understanding these differences can assist regulatory professionals and pharmaceutical organizations in developing adaptable submission strategies while maintaining compliance with jurisdiction-specific requirements.

Keywords: *Emerging Markets, Regulatory Affairs, Pharmaceutical Registration, CTD, Regulatory Harmonization, Marketing Authorization.*

P-04/F/017 POSTER · OFFLINE

Regulatory Considerations for Cyclodextrins as Novel Excipients: A Comparative Analysis of USFDA, EMA, and CDSCO Guidelines

Yugesh Singh
Department of Regulatory Affairs, ISF College of Pharmacy, Moga 142001, Moga, Punjab, India
Email: yugeshrajput62@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides that are frequently utilized to improve the stability, solubility, and bioavailability of drugs. Global medicinal product approval and lifecycle management are hampered by CDs' uneven classification and regulation as novel excipients across key regulatory bodies, despite their significance in the pharmaceutical industry. The purpose of this study is to compare the safety documentation requirements, approval processes, and regulatory status of cyclodextrin-based excipients under the Central Drugs Standard Control Organization (CDSCO), the European Medicines Agency (EMA), and the United States Food and Drug Administration (USFDA) in order to find any regulatory gaps. The USFDA Inactive Ingredient Database, EMA's "Questions and Answers on Cyclodextrins" (EMA/CHMP/333892/2013), CDSCO excipient guidelines, and position papers from the International Pharmaceutical Excipients Council (IPEC) were among the publicly accessible regulatory guidance documents that were systematically reviewed. Permitted modes of administration, maximum daily exposure limits, and innovative excipient submission processes like the FDA's innovative Excipient Review Pilot Program were among the parameters that were compared. Results: The three agencies' authorized CD derivatives, acceptable dose forms, and documentation criteria differed noticeably, with CDSCO lacking particular CD-specific guidelines in contrast to USFDA and EMA. Innovation in next-generation drug delivery systems can be stimulated and cyclodextrin-based product approvals streamlined by harmonizing novel excipient regulatory regimes backed by solid safety and toxicity evidence.

Keywords: *Cyclodextrins; Novel Excipient; Regulatory Harmonization; USFDA; EMA; CDSCO*

P-04/F/018 POSTER · OFFLINE

Safeguarding Genome Editing: The FDA-NGS Regulatory Approach

Rahul Choudhary

Department of Regulatory Affairs, ISF College of Pharmacy, Moga 142001, Moga, Punjab, India
Email: rahulkoundal025@gmail.com

Introduction: Genome editing technologies, particularly Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR), offer promising approaches for treating genetic and other diseases. However, unintended genomic alterations, including off-target effects and other changes to genome integrity, present important safety concerns that must be assessed before clinical trials.

Aim & Objectives: This review aims to highlight the regulatory importance of next-generation sequencing (NGS)-based safety assessment in the nonclinical evaluation of human genome editing products and to examine the recommendations provided by the United States Food and Drug Administration (FDA).

Methods: The FDA's 2026 draft guidance, *Safety Assessment of Genome Editing in Human Gene Therapy Products Using Next-Generation Sequencing*, was reviewed, with emphasis on sequencing strategies, sample selection, bioinformatics analysis, and data reporting.

Results: The guidance recommends NGS and bioinformatics approaches to identify and characterize potential off-target genomic alterations and changes in genome integrity. It also provides recommendations regarding sequencing strategies, sample selection, data analysis, and reporting.

Summary: NGS-based safety assessment provides a systematic approach for identifying unintended genomic alterations and characterizing potential risks associated with genome editing.

Conclusion: The FDA's 2026 draft guidance provides a structured framework for the nonclinical safety assessment of genome editing products. Its recommendations may support more comprehensive risk characterization before clinical development.

Keywords: *Genome editing; CRISPR; Off-Target; FDA; Next-Generation Sequencing (NGS); Safety Assessment*

P-04/F/019 POSTER · OFFLINE

Regulatory boundaries for nutraceuticals in India: FSSAI Guidance on Functional Food, FSMPs, Dietary Supplements and Novel Foods.

Chandana Pokhrel[1], Abhishek Singh[1], Mansi Sharma[1], Bharti[1], Raghav Mittal[1], Mahima Devi[1], Shubham Thakur[2]*

[1]Department of Regulatory Affairs, ISF College of Pharmacy, Moga-142001, Punjab, India
[2]Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: chandanapokhrel217@gmail.com

To ensure the safety, standardization, and compliance of products, the Indian regulation of nutraceuticals is the responsibility of the Food Safety and Standards Authority of India (FSSAI) as specified by the Food Safety and Standards (Health Supplements, Nutraceuticals, food for special dietary use, Food for Special Medicinal Purpose, Functional food and Novel Food) Regulations 2016. The regulatory scenario of nutraceuticals in India is discussed, and an analysis of provisions of the Food Safety and Standards Act, 2006 is provided, which explains product classification, allowed vs. prohibited ingredients, composition requirements, labelling requirements, health claims, advertising restrictions, and licensing and quality requirements for the manufacturing process. Moreover, it includes the changes introduced in the regulations, the approved and banned ingredients, case studies and challenges, like overlap between FSSAI and CDSCO, 'grey area' ingredients and compliance of e-commerce businesses. It is valuable for scientific evidence and transparent labelling, and should be used as a tool by researchers, producers, regulators, and policymakers involved in the field of nutraceuticals.

Keywords: *FSSAI, Nutraceuticals, FSS Act, Health supplements, Functional Food, Novel Food*

O-04/N/001 ORAL · ONLINE

Role of Artificial Intelligence Chemometric Tools, and Machine Learning in Analytical Chemistry with Special Emphasis on Liquid Chromatography

Rabiya*, Anjana Sharma, Vandana Arora Sethi
Lloyd Institute of Management and Technology, Greater Noida-201306, Uttar Pradesh, India
Email: rabiyasaifi2002@gmail.com

By facilitating data-driven interpretation, prediction, optimization, and automation of intricate analytical procedures, artificial intelligence (AI), chemometrics, and machine learning (ML) are quickly revolutionizing analytical chemistry. Liquid chromatography (LC), especially high-performance liquid chromatography (HPLC), is one of the contemporary analytical methods that produces huge, information-rich datasets that are very susceptible to sophisticated computer tools. There are several opportunities to enhance method development, method optimization, peak identification, separation efficiency, data processing, and quality control when AI and chemometric technologies are integrated with chromatographic analysis. While machine learning algorithms can create predictive relationships between chromatographic parameters and analytical responses, chemometric techniques like principal component analysis (PCA), partial least squares (PLS), multivariate curve resolution (MCR), and design of experiments (DoE) make it easier to extract useful information from complicated chromatographic datasets. Automated peak recognition, retention-time prediction, impurity profiling, sample classification, anomaly detection, and optimization of mobile-phase composition and chromatographic settings are all further supported by AI-assisted methods. In the fields of pharmaceutical, biomedical, food, environmental, and natural product analysis, where complicated matrices and numerous analytes frequently pose difficulties for traditional analytical workflows, these methods are very beneficial. It is anticipated that the use of predictive modelling, automated data collection, and explainable AI would further improve the efficiency, repeatability, and resilience of chromatographic techniques. The basic ideas, uses, benefits, drawbacks, and prospects of AI, chemometrics, and machine learning in analytical chemistry are highlighted in this overview, with a focus on their new uses in liquid chromatography and the development of AI-driven analytical methods.

Keywords: *Artificial Intelligence, Machine Learning, High Performance Liquid Chromatography, Principal Component Analysis, Predictive Modelling*

O-04/N/002 ORAL · ONLINE

Shift in Pharmaceutical Quality Assurance after COVID-19

Rajesh Chhabeelal Patil*
Department of Quality Assurance, M.R.S College, Maharashtra, India
Email: rc.patil1112@gmail.com

The Coronavirus Disease 2019 (COVID-19) pandemic created unprecedented challenges for the global pharmaceutical industry and significantly transformed pharmaceutical quality assurance (QA) systems. Before the pandemic, pharmaceutical QA relied heavily on paper-based documentation, physical audits, manual quality reviews, and traditional Good Manufacturing Practice (GMP) inspections. Lockdowns, travel restrictions, workforce shortages, and disruptions in global supply chains compelled pharmaceutical organizations and regulatory agencies to rapidly adopt innovative quality management approaches. The post-COVID era has accelerated the implementation of digital technologies, including Electronic Quality Management Systems (eQMS), electronic batch records, cloud-based documentation, remote audits, artificial intelligence (AI), machine learning (ML), and Internet of Things (IoT)-based monitoring systems. These technologies have improved operational efficiency, data integrity, regulatory compliance, and risk management. Simultaneously, regulatory agencies such as the FDA, EMA, and WHO adapted their inspection and compliance frameworks to accommodate remote and hybrid quality oversight models. This review explores the evolution of pharmaceutical quality assurance before and after COVID-19, examines the impact of the pandemic on pharmaceutical operations, discusses emerging digital technologies, and highlights the transition toward risk-based and data-driven quality systems. The review further evaluates current challenges, including cybersecurity risks, validation requirements, workforce training, and regulatory harmonization. The findings indicate that the pharmaceutical quality landscape has permanently shifted toward digitalization, continuous monitoring, predictive quality systems, and Pharma 4.0 practices, thereby creating a more resilient and agile pharmaceutical industry.

Keywords: *COVID-19, Pharmaceutical Quality Assurance, eQMS, Remote Audits, Artificial Intelligence*

O-04/N/003 ORAL · ONLINE

Aesthetic Medical Devices: Concept, AI, Regulatory Pathways

Anwesha Ray*, Inderbir Singh
Chitkara College of Pharmacy, Chitkara University
Email: anwesha1204.ccp@chitkara.edu.in

Aesthetic medical devices are used to rejuvenate, reshape, and restore skin and soft tissue, and demand for minimally invasive, low-downtime treatment continues to rise worldwide. Advances in energy-based, injectable and digital technologies have widened the treatment options available to clinicians, making an understanding of their principles, indications and limitations increasingly important. Devices are classified as energy-based (lasers, intense pulsed light, radiofrequency, focused ultrasound, cryolipolysis, electromagnetic muscle stimulation), injectable or implantable, and adjunct or diagnostic. Their action is explained through the principle of selective photothermolysis and the relationship between energy, target tissue, treatment depth, and skin phototype. The clinical pathway from consultation and consent to treatment, aftercare and follow-up is described, together with common complications and preventive measures. Artificial intelligence (AI) applications are reviewed, including skin analysis, outcome simulation, treatment planning and adaptive devices. Current evidence is promising but limited by modest study quality, dataset bias affecting darker skin tones, and data privacy concerns. Illustrative cases and documented safety events involving breast implants, dermal fillers and energy-based devices show how adverse-event reporting can identify risks that pre-market trials do not. Safe and effective aesthetic care depends on appropriate device and patient selection, trained operators, ethical consent and continuous post-market monitoring. AI should support, not replace, clinical judgement, and requires validation across diverse skin types.

Keywords: *aesthetic medical devices; energy-based devices; artificial intelligence; medical device regulation; patient safety*

O-04/N/004 ORAL · ONLINE

Preclinical Data Assessment of the Smart Theranostic Candidate RK-251 Against IND Submission Standards

Rimjhim Sharma*, Inderbir Singh
Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab,140401.
Email: rimjhimsha30@gmail.com

Introduction: The novel theranostic drug candidate RK-251 for breast cancer treatment has found to be effective in its cytotoxic properties in vitro and diagnostics. The research in this drug however has to adhere fully to the legislative regulatory standards for its use in humans.

Aim and Objective: The aim is to conduct an audit of the data from published RK-251 according to international and Indian requirements for IND registration in order to identify key data gaps necessary for such filing.

Methods: The experimental data sets on RK-251 were evaluated according to the CTD Module 3 (Quality/CMC) and CTD Module 4 (Nonclinical) standards. The regulatory references were taken from statutory regulations, namely ICH M3(R2) (Nonclinical Safety), ICH S7A/S7B (Safety Pharmacology), ICH S2(R1) (Genotoxicity), and CDSCO New Drugs and Clinical Trials Rules (2019)

Results: The current data confirms laboratory effectiveness, but there is no required IND safety study. Gaps identified include the following: (1) Lack of GLP-compliant 14/28-day repeat dose toxicity studies on mammals and hERG cardiac safety assessment; (2) Lack of systemic ADME; and (3) Requirement for cGMP batch validation and impurities analysis as per ICH Q3A/B guidelines.

Summary: Although the compound RK-251 exhibits great therapeutic potential, the existing literature contains results from laboratory-based experimentation only. It is important to address the GLP toxicology, pharmacokinetics, and CMC requirements in order to generate the safety data.

Conclusion: Resolving these specific non-clinical and manufacturing gaps will successfully transform this discovery into a regulatory-compliant candidate suitable for Phase I clinical trial filing.

Keywords: *Preclinical Evaluation, IND, RK-251, Regulatory Gap Analysis, ICH Guidelines, CDSCO Rules*

O-04/N/005 ORAL · ONLINE

QbD-Based Optimization of a Stability-Indicating RP-HPLC Method for Gabapentin and Duloxetine HCl

Parth Sharma*, Puneet Nirmal, Divya Chauhan
Lloyd Institute of Management and Technology, Greater Noida, Uttar Pradesh, India-201306
Email: sharmaparth4403@gmail.com

Gabapentin and Duloxetine Hydrochloride are important therapeutic agents used to treat neuropathic pain and their fixed dosing is a useful therapeutic approach. Simultaneous analysis of these compounds is not straightforward as they differ significantly in their physicochemical and chromatographic properties. Although analytical methods are available to identify individual rugs, a systematic approach is needed to optimise the RP-HPLC method for their simultaneous estimation. In particular, the use of the Analytical Quality by Design (AQbD) and Box–Behnken Design (BBD) principals to determine the method of determination of the stability of this combination requires further investigation. Therefore, this study is designed to develop and optimise RP-HPLC for the simultaneous determination of Gabapentin and Duloxetine Hydrochloride based on the principals of AQbD. First, UV spectroscopic investigations and preliminary HPLC tests shall be conducted to select the appropriate conditions for detection and separation. An analytical target profile is then developed to define the desired performance characteristics of the analytical process. A risk assessment shall be carried out to identify chromatographic variables likely to have a significant impact on the performance of the method. These critical parameters will then be studied and optimised by the Box-Behnken design combined with the Response Surface Method. The optimization process shall be based on the selected chromatographic reactions to determine the conditions which will allow a satisfactory separation and overall performance of the method. Forced degradation experiments shall be conducted to demonstrate the stability-indicating capability of the optimized process. The method developed shall then be validated for the relevant analytical parameters as specified in the relevant ICH Guidance Document. Finally, a validated method shall be used for the analysis of Gabapentin and duloxetine hydrochloride in a selected formulation. The study should provide a reliable and reproducible method which can be used for routine testing of pharmaceutical quality control.

Keywords: *Gabapentin; Duloxetine Hydrochloride; Analytical Quality by Design; RP-HPLC; Design of Experiments.*

O-04/N/006 ORAL · ONLINE

Development and Validation of Stability Indicating RP-HPLC Method for Simultaneous Estimation of Alfuzosin Hcl and Tadalafil in Combined Pharmaceutical Dosage Form

Tushar Tomar*, Anjana Sharma, Sumit Kumar
Lloyd Institute of Management and Technology, Greater Noida, Uttar Pradesh, India-201306
Email: tomartushar722@gmail.com

The present study aims to develop and validate a simple, rapid, accurate, precise, and stability-indicating reverse-phase high-performance liquid chromatography (RP-HPLC) method for the simultaneous estimation of Alfuzosin Hydrochloride and Tadalafil in combined pharmaceutical dosage form. Alfuzosin Hydrochloride is an α1-adrenergic receptor antagonist primarily used in the management of benign prostatic hyperplasia, whereas Tadalafil is a phosphodiesterase type-5 inhibitor used in the treatment of erectile dysfunction and related conditions. The proposed analytical method is intended to provide reliable separation and quantification of both drug substances in the presence of their potential degradation products. Chromatographic separation will be achieved using a suitable reversed-phase C18 column with an optimized mobile phase consisting of an appropriate combination of aqueous buffer and organic solvent, under isocratic or optimized chromatographic conditions. The method will be optimized to obtain satisfactory resolution, peak symmetry, theoretical plates, and reasonable retention time for both analytes. Forced degradation studies will be performed under acidic, alkaline, oxidative, thermal, and photolytic conditions to establish the stability-indicating capability of the developed method. The method will subsequently be validated according to ICH guidelines with respect to specificity, linearity, accuracy, precision, robustness, detection limit, quantitation limit, and solution stability. The developed method is expected to be suitable for routine quality control analysis of Alfuzosin Hydrochloride and Tadalafil in combined pharmaceutical dosage forms and for assessment of their stability during pharmaceutical development.

Keywords: *Alfuzosin Hydrochloride, Tadalafil, RP-HPLC, Stability-Indicating Method, Method Development, Method Validation.*

P-04/N/001 POSTER · ONLINE

Nanoparticulate Allicin Delivery for Wound Healing: Potential and Challenges

Pardeep Singh*[1], Madhukar Garg[1], Pooja Mittal[2]

[1]*Chitkara College of Pharmacy, Chitkara University, Punjab, India*
[2]*GITAM Institute of Pharmacy, India*
Email: pardeepnarwal1@gmail.com

Wound healing is a complex and highly regulated process involving overlapping phases of hemostasis, inflammation, proliferation, and tissue remodelling. Conventional wound management primarily relies on antiseptics, antibiotics, topical agents, and wound dressings to control microbial contamination and support tissue repair. However, prolonged antibiotic use, antimicrobial resistance, inadequate drug retention, repeated application, and poor outcomes in chronic or infected wounds highlight the need for alternative and multifunctional therapeutic approaches. Allicin, a major bioactive organosulfur compound generated from garlic, has gained increasing attention because of its broad-spectrum antimicrobial, antioxidant, anti-inflammatory, and potential tissue-repair activities. These properties suggest that allicin may target several biological factors involved in delayed or impaired wound healing. Nevertheless, its therapeutic translation is limited by pronounced chemical instability, rapid degradation, short biological persistence, and difficulty in maintaining effective concentrations at the wound site. Recent advances in nanotechnology provide opportunities to address these limitations through encapsulation and controlled delivery. Nanoparticulate systems can potentially protect allicin from premature degradation, improve its localisation and retention, and provide sustained release at the wound interface. When integrated into soft topical matrices, these systems may additionally improve wound coverage, residence time, application characteristics, and moisture management. This review critically discusses the therapeutic potential of allicin in wound healing, its antimicrobial, antioxidant, and anti-inflammatory mechanisms, and the major challenges of conventional allicin delivery. Furthermore, it examines emerging nanoparticulate and soft delivery strategies as potential approaches to improve allicin stability and site-specific delivery.

Keywords: *Atopic Dermatitis, Nanosponges, Nanosponge Loaded Hydrogel, Controlled Release.*

P-04/N/002 POSTER · ONLINE

Comparison of Regulatory Procedure and Approval of Medical Devices in India & Europe

Kashish Saluja*

Department of Pharmaceutics, JCDM College of Pharmacy affiliated by Pt. B.D. Sharma University of Health Sciences, Rohtak. Rachna Mehta, JCDM College of Pharmacy. •
Email: salujakashish950@gmail.com

The regulatory frameworks governing medical devices have become increasingly complex and crucial for ensuring patient safety and product efficacy due to rapid technological advancements and the expansion of global healthcare markets. This study examines the medical device regulatory frameworks of the European Union (EU) and India, focusing on device classification, approval processes, clinical evaluation, and post-market surveillance requirements. In India, medical devices are regulated under the Medical Devices Rules (MDR), 2017, framed under the Drugs and Cosmetics Act, 1940 and later amendments, whereas the EU operates under the Medical Device Regulation (MDR) 2017/745 and In Vitro Diagnostic Regulation (IVDR) 2017/746.Both regions employ risk-based classification systems, according to the report, but the EU framework—which is supported by CE marking, notified authorities, and centralized databases like EUDAMED (European Database on Medical Devices) - shows a more advanced, standardized, and globally recognized regulatory structure. On the other hand, India has achieved significant progress because of digital platforms like SUGAM (System for Unmanned Gateways Approval of Manufacturers) and centralized regulatory oversight by CDSCO (Central Drug Standard Control Organization) yet, problems with post-market surveillance transparency and data accessibility persist. The study concludes that while India's regulatory ecosystem is steadily strengthening, greater regulatory alignment with international standards and convergence with the EU could improve patient safety, promote innovation, and facilitate the entry of medical devices into international markets.

Keywords: *Medical device, Device classification, Risk, Diagnostic Devices, Rules & Regulations.*

P-04/N/003 POSTER · ONLINE

Comparative Analysis of Generic Drug Approval Regulation in the United States, European Union and India

Mohit Kumar*

Department of Pharmaceutics, JCDM College of Pharmacy, affiliated with Pt. B.D. Sharma University of Health Sciences, Rohtak. Rachna Mehta, JCDM College of Pharmacy

Email: vashishtmohit756@gmail.com

The regulatory framework for generic drugs plays a vital role in ensuring the availability, quality, safety, and therapeutic equivalence of medicines while promoting affordable healthcare. This study presents a comparative analysis of generic drug approval regulations in the United States (US), European Union (EU), and India, with emphasis on regulatory authorities, approval pathways, bioequivalence requirements, quality standards, documentation, and post-marketing surveillance. In the United States, generic medicines are primarily regulated by the U.S. Food and Drug Administration (USFDA) under the Abbreviated New Drug Application (ANDA) pathway, which generally requires demonstration of pharmaceutical equivalence and bioequivalence without repeating the full clinical efficacy and safety studies required for an innovator product. In the European Union, generic medicines are regulated through national competent authorities and the European Medicines Agency (EMA), where applicable, using established marketing authorization procedures and requirements for demonstrating quality, pharmaceutical equivalence, and bioequivalence. In India, generic drugs are regulated primarily by the Central Drugs Standard Control Organization (CDSCO) and relevant state licensing authorities under the Drugs and Cosmetics Act, 1940 and associated rules and regulatory requirements. The Indian system has progressively strengthened its requirements for quality, bioequivalence, manufacturing standards, and pharmacovigilance. The comparative analysis indicates that all three regulatory regions follow science- and risk-based approaches to establish the quality and therapeutic equivalence of generic medicines, although differences exist in approval procedures, regulatory responsibilities, bioequivalence requirements, and post-marketing monitoring. Understanding these similarities and differences can support regulatory harmonization, improve the quality and accessibility of generic medicines, and facilitate their development and approval in global markets.

Keywords: *Generic drugs, Drug approval, Bioequivalence, USFDA, European Union, EMA, CDSCO, Regulatory affairs, Marketing authorization, Pharmacovigilance.*

P-04/N/004 POSTER · ONLINE

A Comparative Study of Regulatory Frameworks and Post Marketing Surveillance Requirements for Vaccines: India, USA, and China

Ruchi*, Manish Garg

Department of Regulatory Affairs, J.C.D.M. College of Pharmacy, Barnala road, Sirsa, India

Email: ruchisharma1049@gmail.com

Vaccines are integral components in the field of public health because they prevent the spread of infectious diseases and reduce mortality and morbidity. Since they are given to large numbers of people, including healthy populations, extensive scientific evaluations and regulatory oversight are necessary at all stages. This study aimed to compare the regulatory aspects and post-marketing requirements of vaccines between India, the USA, and China. The role of regulators, vaccine approval processes, legal and regulatory aspects, manufacturing and quality requirements, post-marketing reporting, pharmacovigilance, and surveillance measures of vaccines were evaluated. In India, the AEFI surveillance system and Pharmacovigilance Program of India monitor vaccine preventable diseases and adverse drug events, respectively. The Vaccine Adverse Event Reporting System and Vaccine Safety Datalink are the surveillance mechanisms used in the USA to monitor the safety of vaccines after their introduction into the market. China, meanwhile, has established surveillance systems for monitoring adverse events following immunization and vaccine safety. In conclusion, post-marketing surveillance is critical for detecting uncommon and unpredictable adverse effects of vaccination and for continually assessing the risk-benefit profile of authorized vaccines. This study identified differences in the regulatory framework, pharmacovigilance, adverse events reporting, and post-marketing requirements for vaccines.

Keywords: *Vaccine regulation; Pharmacovigilance; Post-marketing surveillance; AEFI; Vaccine safety; Regulatory framework*

CATEGORY 5 | 94 ABSTRACTS

Nanotechnology & Translational Research

MODERN
INSTITUTE OF PHARMACEUTICAL SCIENCES

NBA ACCREDITED PHARMACY INSTITUTE IN INDORE

Honourable Late Shri Prabhat Chandra Kharia Dreamer & Founder

From Campus to Corporate: Shaping the Next Generation Pharmaceutical Leaders through Research, Innovation & Industry Eminence



MBA (Pharmaceutical Management), M.Pharm. (Pharmaceutics, Quality Assurance & Pharmacology), B.Pharm, D.Pharm, MBA, BBA, B.com and B.Ed.




Mr. Arun Kharia
President - MGI


Dr. Anil Kharia
Chairman - MGI


Dr. Shantanu Kharia
Vice Chairman - MGI


Dr. Sapna Malviya
Head of Institute - MIPS


Dr. Girish Agrawal
Programme Coordinator - MBA (PM)


Dr. A.K Singh
Director - MIPS

MBA
PHARMACEUTICAL MANAGEMENT
Affiliated to DAVV, Approved by AICTE, NBA Accredited

90% PLACEMENT RECORD
50+ INDUSTRY MENTORS
30+ RECRUITING COMPANIES
20L HIGHEST PACKAGE P.A.
6.5L AVERAGE PACKAGE P.A.
20+ YRS EXPERIENCED FACULTY

BENEFITS OF COURSE

ACADEMIC EXCELLENCE
- Faculty With 20 Years Experience Blending Academics And Industry Expertise.
- Pharma 4.0 Curriculum Aligned With Global Pharmaceutical Industry Advancements.
- Modern AC Classrooms, Seminar Hall and Auditorium Enhance Learning.

TRAINING & SKILL DEVELOPMENT
- Curriculum includes Business Data Analytics and Internship in leading Pharma Industries.
- Focus on Pharma Data Analysis, Dossier Preparation, and Regulatory Documentation.
- Six Weeks of Summer Training in Reputed Pharmaceutical Industries For Real-time Experience.

INDUSTRY INTEGRATION
- Backed With Three Established Pharmaceutical Industries For Practical Exposure and Research Collaboration.
- Guided By 50+ Industry Mentors Offering Insights Into Current Trends and Career Growth.
- Successful Placements at Managerial Positions In Leading Pharmaceutical Organizations.

PROMINENT PLACEMENTS
MACLEODS | LUPIN | novo nordisk | glenmark | Alembic | ThermoFisher SCIENTIFIC | Mankind | Veeda | HETERO | FRESENIUS KABI | Piramal | ipca

AWARDS & RECOGNITIONS

₹75 Lakhs
MSME Idea Hackathon 4.0 & 5.0
MSME Govt. of India
MODERN INCUBATOR
HIBIMP000274

Other Fetched Grants on Research and Development
₹29,35,041
From Various Agencies viz. AICTE, New Delhi | AICTE, ATAL I MPCST, BHOPAL | DST, NIMAT

Grants Fetched ₹10,435,041

ONLY INSTITUTE BACKED UP BY 3 PHARMACEUTICAL INDUSTRIES
MODERN LABORATORIES | NANDANI Medical Laboratories Pvt. Ltd. | NOTION PHARMA PRIVATE LIMITED

20 YEARS OF LAGACY
5000+ ALUMNI
200+ INDUSTRIAL TIE-UP
100+ INDUSTRY MENTORS
3.5 IIC RANKING
04 CAMPUS
20 RESEARCH LABORATORIES
20+ STARTUP SUPPORTED
150+ MOU's SIGNED
50+ PATENTS GRANTED & PUBLISHED

MODERN GROUP OF INSTITUTIONS, INDORE
MODERN CAMPUS : Behind Rewati Range, Alwasa, Sanwer Road, Indore
MODERN CITY OFFICE : FF-36 Scheme No.54, Vijay Nagar, Opposite Meghdoot Garden, Above Punjab National Bank, Indore
+91 73548 80733, +91 7489 902116
Info@moderninstitutes.net www.moderninstitutes.in
moderngroupofinstitutions @mipsindore mips2021

O-05/F/001 ORAL · OFFLINE

Beyond the Brain Barrier: Hybrid Nanoparticles Orchestrating Intelligent Neuro-Theranostics

Shubhi Saxena*, Jaskiran Kaur, Thakur Gurjeet Singh, Mohit Kumar, Ankit Awasthi

Chitkara College of Pharmacy, Chitkara University, Rajpura 140401, Punjab, India
Email: shubhisaxena829@gmail.com

Hybrid nanoparticles (HNPs) that integrate organic and inorganic components have been recognized as one of the most sophisticated solutions in the field of nanomedicine to surpass the physiological limitations of the blood-brain barrier (BBB). By the combination of biocompatibility, flexibility, and the capacity of functionalization of the organic shells with the magnetic, optical, or structural precision of the inorganic cores, HNPs provide receptor-mediated transport, controlled drug release, and multimodal imaging with high efficiency. This review details the molecular mechanisms of HNPs crossing the BBB, such as receptor-mediated, adsorptive, carrier-mediated, and biomimetic transcytosis, and also points to the role of the advanced conjugation chemistries like EDC/NHS coupling, thiol-gold anchoring, click reactions, and redox-cleavable linkers in enhancing targeting fidelity. The therapeutic improvements in the major neurological diseases, i.e., Alzheimer's disease, Parkinson's disease, Huntington's disease, and glioblastoma, are discussed with the help of figures, which illustrate enhanced bioavailability, gene silencing, mitochondrial targeting, and integrated photothermal or magnetic responsiveness. Moreover, the review discusses potential diagnostic applications such as multimodal MRI/PET/NIR-II imaging, molecular biosensing, and theragnostic nanoplatforms, which link the real-time visualization with the targeted treatment. To conclude, we point out the upcoming directions comprising biomimetic coatings, AI-guided nanoparticle design, stimuli-responsive logic-gated systems, and clinically scalable biodegradable hybrids. In sum, HNPs embody a radically different strategy to precision neuro-nanomedicine, thereby providing a seamless avenue for diagnosis, targeted therapy, and continuous disease monitoring within a single intelligent nano system.

Keywords: *Hybrid nanoparticles; Blood-brain barrier; Conjugation chemistries; Multimodal imaging; Molecular biosensing*

O-05/F/002 ORAL · OFFLINE

Polymorphism and nanopolymorphism of cyclodextrins: A new dimension in solid-state encapsulation methods

Askar K. Gatiatulin*, Marat A. Ziganshin, Valery V. Gorbatchuk

Kazan (Volga region) Federal university, Kazan, Russia
Email: askar.gatiatulin@gmail.com

The most applied methods for preparing cyclodextrin (CD) inclusion compounds use additional solvents or mechanochemical activation. Such methods cannot be considered green or energy-efficient. The sealed heating method can be more efficient since it is based on fast interaction between CD and guest only. However, this method is not widely applied because it is not very effective: the degree of encapsulation is not as high as desired. This illustrates a limitation of solid-state processes caused by the structural and thermodynamic features of the commercial CD forms. Their cage-type crystalline structure requires significant rearrangement upon guest inclusion, and low formation energy can result in poor inclusion properties. Methods solving this problem can significantly advance the CD technology. Polymorphism of CDs is a new factor discovered in the past two years. The existence of these preorganized high-energy forms creates new possibilities to revise methods that were traditionally considered ineffective. Thermodynamic studies show that the new polymorphs of β-cyclodextrin (βCD) have higher energy, which leads to improved inclusion properties. An additional factor is so-called nano polymorphism, where nanoparticles are generated from parent polymorphs of βCD. The smaller size of these nanoparticles also provides improvement of their inclusion properties. Overall, βCD polymorphism represents a state-of-the-art method to optimize the preparation of CD inclusion compounds on both laboratory and industrial scales. These forms show mush higher inclusion capacity and higher bioavailability of the product. New preorganized high-energy forms of CDs create a new dimension in solid-state inclusion methods.

Keywords: *Polymorphism, Nanoparticles, Inclusion compound, Sealed heating, Preorganization*

O-05/F/003 ORAL · OFFLINE

Development and In Vivo Evaluation of QbD-Assisted Squalene-based Luliconazole Entrapped Ethosomal Gel for the Skin Fungal Infection

Khushpreet Kaur*, Taqdir Singh

ISF College of Pharmacy& Research, Ghal Kalan, Moga, 142001, Punjab, India
Email: kaurkhushpreet433@gmail.com

Fungal infections pose a significant global health challenge, especially in immunocompromised individuals. Luliconazole (LZL), a newly approved drug for topical fungal infections, faces limitations due to poor skin penetration, short skin retention time, and repeated administration. To address this, lipid nanocarrier-based ethosomal gel formulations at 1% w/w strength were developed and extensively characterized through in vitro, ex vivo, and in vivo studies, comparing them with conventional formulations. The optimized ethosomal formulations exhibited a vesicle size of 209.2±8.52 nm, encapsulation efficiency of 81.51±3.62%, and PDI of 0.198±0.001. These ethosomes were incorporated into a gel with adhesiveness of 1.012 mJ, hardness of 0.17 N, and spreadability ranging from 7.9 to 0.52 g·cm/sec. In vitro release studies showed 84.39±1.5% release for the optimized ETs-gel formulation compared to 45.58±0.9% for the LZL-conventional gel. In-vitro activity against Candida albicans demonstrated superior efficacy of the prepared ethosomal formulations over the conventional gel. Ex vivo studies on porcine ear skin indicated enhanced penetration and skin retention time for the optimized ETs-gel compared to the conventional gel. In-vivo antifungal activity on albino rats confirmed the safety, non-irritant nature, and efficacy of the optimized ETs-gel in topical fungal treatment, with no systemic drug circulation observed. Histopathology studies further supported the efficacy of the optimized ETs-gel formulation. Overall, squalene-based ethosomes emerge as promising carriers for enhancing the topical delivery and localized effectiveness of Luliconazole.

Keywords: *anti-fungal activity · Candida albicans · ethosomes · luliconazole · topical formulation*

O-05/F/004 ORAL · OFFLINE

Functionalized Nanocarriers Via Surface Biomolecules Ligation For Colorectal Cancer Treatment

Priyakshi Sharma*, Akshita

Department of Pharmacy, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315774@isfcp.org

Colorectal cancer is a very common cancer in the world with the rates of morbidity and mortality being high despite the current success. Its treatment is often limited by poor drug selectivity, systemic toxicity, and the development of drug resistance. Nanocarrier based drug delivery systems are showing great potential to enhance the precision and effectiveness of cancer treatments while minimizing adverse effects. Current studies involve the use of functionalized surfaces of nanocarriers with biomolecules like antibodies, aptamers, peptides and folic acid to deliver drugs to their specific targets. Such functionalized nanocarriers, including PEGylated liposomes, polymeric nanoparticles, micelles, and solid lipid nanoparticles can also target particular receptors highly expressed on colorectal cancer cells, like carcinoembryonic antigen, epidermal growth factor receptor, cancer associated glycoprotein-72, and folate receptors. This receptor mediated targeting enhances the uptake of the cell, enables the release of drugs in a controlled manner and decreases tissue damages to normal tissues. It has been demonstrated in both in vitro and in vivo models that these systems increase therapeutic efficacy and overcome drug resistance. This review highlights the recent progress and future potential of biomolecule-functionalized nanocarriers for colorectal cancer therapy, emphasizing their role in improving treatment precision, drug bioavailability, and overall patient safety.

Keywords: *Colorectal cancer, surface biomolecules ligation, Functionalized nanocarriers, drug resistance.*

O-05/F/005 ORAL · OFFLINE

Mitochondria-Targeted Delivery of Bromocriptine via Cerium Vanadate Nanocarriers for Parkinson's Disease

Keerti Mishra*[1,2,3], Manish K. Chourasia[1,4]

[1]*Division of Pharmaceutics and Pharmacokinetics, CSIR-Central Drug Research Institute, Lucknow, Uttar Pradesh, India*
[2]*Jawaharlal Nehru University, New Delhi, India*
[3]*Department of Pharmaceutical Sciences and Natural Products, Central University of Punjab, Bathinda, Punjab, India*
[4]*Academy of Scientific and Innovative Research (AcSIR), Ghaziabad-201002, India*
Email: mishrakeerti45@gmail.com

Parkinson's disease (PD) is a progressive neurodegenerative disorder in which mitochondrial dysfunction and oxidative stress play critical roles in dopaminergic neuronal degeneration. Although bromocriptine mesylate (BM) provides dopaminergic stimulation and has potential neuroprotective effects, its therapeutic utility is limited by poor aqueous solubility, low bioavailability, and inadequate brain delivery. The present study aimed to develop a mitochondria-targeted nanocarrier capable of combining BM delivery with modulation of mitochondrial oxidative stress. Porous cerium vanadate nanoparticles were developed as a BM nanocarrier and surface-functionalized with L-methyl ester tryptophan-conjugated triphenylphosphonium (TPP) to facilitate mitochondrial targeting, generating MT-BM-CNP. The intrinsic Ce^{3+}/Ce^{4+} and V^{4+}/V^{5+} redox properties of the nanocarrier were exploited for antioxidant activity, while the porous architecture enabled BM loading and sustained drug release. The formulation was characterized for physicochemical properties, drug loading, stability, release behavior, and mitochondrial-targeting potential. Its neuroprotective efficacy was subsequently evaluated in a 6-hydroxydopamine-induced experimental model of PD.

MT-BM-CNP demonstrated enhanced formulation stability, sustained BM release, and improved neuroprotective activity compared with free BM. In vivo administration resulted in preservation of nigral dopaminergic neurons, restoration of dopamine levels, and significant improvement in motor performance. Notably, neuronal somata showed greater protection than striatal axon terminals. Overall, mitochondria-targeted cerium vanadate nanocarriers provide a promising strategy for simultaneous BM delivery and regulation of mitochondrial oxidative stress. This approach may enhance the therapeutic potential of BM and represents a potential nanotechnology-based strategy for targeting key pathological mechanisms associated with PD.

Keywords: *Parkinson's disease, Bromocriptine, Mitochondria, Targeted Delivery, nanocarriers.*

O-05/F/006 ORAL · OFFLINE

Solid Lipid Nanoparticles and Nanostructured Lipid Carriers: A Next-Generation Approach to Enhancing Oral Bioavailability of Poorly Water-Soluble Drugs

Anish Giri*

Department of Pharmacy, K.R. Mangalam University, Gurgaon, India
Email: anishgiri946@gmail.com

A large proportion of new drug candidates suffer from poor aqueous solubility, resulting in low and erratic oral bioavailability — a persistent challenge in formulation science. Solid Lipid Nanoparticles (SLNs) and their second-generation counterpart, Nanostructured Lipid Carriers (NLCs), offer a promising solution by encapsulating lipophilic drugs within a lipid matrix at the nanoscale, improving solubility, protecting the drug from degradation, and enhancing lymphatic uptake to bypass first-pass hepatic metabolism. This review examines the comparative advantages of SLNs and NLCs, focusing on their structural differences — SLNs' rigid crystalline lipid core versus NLCs' mixed solid–liquid lipid matrix, which reduces drug expulsion during storage and increases drug-loading capacity. Key formulation techniques (high-pressure homogenization, microemulsion, solvent emulsification) and characterization parameters (particle size, zeta potential, entrapment efficiency, in vitro release) are discussed alongside recent applications in enhancing the bioavailability of BCS Class II and IV drugs. The review also addresses current limitations — including scale-up challenges, physical stability during storage, and regulatory hurdles for nanoparticulate systems — and highlights emerging strategies to overcome them. By consolidating recent advances, this work aims to position SLN/NLC technology as a viable industrial platform for improving the therapeutic efficacy of poorly soluble drugs, with direct relevance to pharmaceutical formulation and industrial pharmacy practice.

Keywords: *Solid Lipid Nanoparticles, Nanostructured Lipid Carriers, Oral Bioavailability, Nanotechnology, Drug Delivery, Formulation Science*

O-05/F/007 ORAL · OFFLINE

Nano-in-Microparticle Dry Powder Inhaler of Hyaluronic Acid–Chitosan Functionalized Nanostructured Lipid Carriers for CD44-Targeted Delivery of Resveratrol in NSCLC

Swati K. Kurtkoti*, Harshaben V. Patel, Ashok N. Mahajan

Department of Pharmaceutics, Indukaka Ipcowala College of Pharmacy, The Charutar Vidya Mandal (CVM) University, New Vallabh Vidyanagar, Anand – 388121, Gujarat, India

Email: swati.kurtkoti@cvmu.edu.in

Nanocarriers provide receptor-level targeting in Non-Small Cell Lung Carcinoma however they are aerodynamically incompatible as liquid nanosuspensions. This study created a formulation of resveratrol in the form of hyaluronic acid–chitosan (HA-CS) functionalized respirable nanostructured lipid carriers (NLCs) which can be reconstituted into the parent NLCs upon administration. Optimization of NLCs was performed using Quality-by-Design approach and the surface engineered with chitosan and hyaluronic acid, which specifically targets CD44. This nano dispersion was spray dried using 5% mannitol at 85°C inlet and characterized with respect to their aerodynamic behaviour, redispersibility and anticancer activity towards A549 cells. Optimized NLCs were obtained with an encapsulation efficiency of more than 90% and were 73.0 nm in diameter, whereas HA-CS coated NLCs were 250.0 nm in diameter. The spray drying produced 91% of free flowing powder with less than 2% residual moisture. The reconstituted particles were found to have a mean diameter of 257.4 nm and PDI decreased from 0.636 to 0.431, along with a shift towards a bimodal distribution, indicating that the nanocarriers remained intact during processing. The MMAD of the powder was 1.10 µm and the fine particle fraction value 38.02%. The IC_{50} of the functionalized carrier was reduced from 38.916 µM (free drug) to 15.22 µM, and the uptake of the drug was also significantly increased at the cellular level as observed by fluorescence microscopy. This spray-dried powder was therefore delivered as a stable respirable powder which again retains its nanoscale targeting identity once administered.

Keywords: *Nano-in-microparticles, Dry powder inhaler, Nanostructured lipid carriers, CD44 targeting, Spray drying*

O-05/F/008 ORAL · OFFLINE

Precision Nanocarrier Therapeutics in Guillain-Barré Syndrome: Pathophysiological Rationale and Cyclodextrin-Based Drug Delivery

Prajjval Bhardwaj*, Varunesh Chaturvedi

Department of Pharmaceutical Sciences, Jaipur National University, Jagatpura, Jaipur, Rajasthan, India

Email: prajj2305@gmail.com

Guillain–Barré syndrome (GBS) comprises heterogeneous, acute immune-mediated polyradiculoneuropathies wherein molecular mimicry triggers antiganglioside antibodies, complement activation and macrophage-mediated nerve injury, producing reversible nodal dysfunction or irreversible axonal degeneration. Despite IVIG and plasma exchange efficacy, substantial patient subsets remain ventilator-dependent or permanently disabled, reflecting therapeutic limitations against established axonal injury and absence of biomarker-guided treatment selection.This review evaluates cyclodextrin (CD)-based nanocarriers for precision GBS diagnosis and adjunctive therapy. Literature synthesis covered clinical, electrophysiological, biomarker and nanotherapeutic studies, assessing CD formulations for mechanistic relevance, formulation feasibility, safety and advantage over standard immunotherapy.GBS pathophysiology reveals complement as a convergent injury pathway, particularly in antibody-mediated subtypes (AMAN, Miller Fisher), whereas corticosteroids, sequential IVIG/PLEX and repeat IVIG lack consistent benefit. CD-nanoparticles enable targeted endoneurial delivery of fragile biologics (complement/FcRn inhibitors) before nodal injury progresses to axonal loss—the critical therapeutic window. Simple CD inclusion complexes improve solubility/stability of small-molecule complement inhibitors, antioxidants and axonal-protective agents; CD-functionalized liposomes or polymeric nanoparticles accommodate peptides, nucleic acids and antibody fragments. Diagnostic applications include CD-stabilized multiplex assays for antiganglioside antibodies, complement fragments and neurofilament light chain, facilitating patient stratification into complement-high, antibody-positive or axonal-degeneration-risk subgroups.Pathophysiology-tailored CD-nanocarriers delivering complement/FcRn inhibitors or neuroprotective adjuncts represent a rational precision platform for antibody/complement-dominant GBS. Proving superiority over IVIG/PLEX requires biomarker-enriched trials demonstrating accelerated neurofilament clearance, functional motor recovery, peripheral-nerve delivery efficacy, complement compatibility, reduced toxicity and nerve function preservation. CD-based delivery remains investigational; IVIG and plasma exchange remain evidence-based first-line standards.

Keywords: *Guillain–Barré Syndrome, blood-nerve barrier, cyclodextrin, nanocarriers, complement inhibition, precision therapeutics*

O-05/F/009 ORAL · OFFLINE

Nanotechnology Approaches for the Treatment of Skin Cancer Melanoma

Aditya Bhushan*, Shamsher Singh Bajwa
Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: adb57123@gmail.com

Skin cancer, especially melanoma, poses a significant clinical dilemma due to its aggressive behavior, ability to metastasize, and the challenges associated with conventional treatments. Current therapeutic methods, including surgical intervention, chemotherapy, radiotherapy, photodynamic therapy, targeted treatment, and immunotherapy, can lead to systemic toxicity, adverse reactions, insufficient tumor penetration, and the development of drug resistance. The advent of nanotechnology has shown promise as a strategy to enhance both the diagnosis and treatment of skin cancer through controlled, targeted, and localized drug delivery. This review highlights recent developments in nanotechnology-based strategies for managing melanoma as well as non-melanoma skin cancers such as basal cell carcinoma and squamous cell carcinoma. The focus is particularly on inorganic nanoparticles like mesoporous silica, zinc oxide, gold, silver, and carbon nanotubes; polymeric nanocarriers, including micelles and dendrimers; and lipid-based systems such as liposomes and solid lipid nanoparticles.

Keywords: *Nanotechnology, Skin cancer, Melanoma, Localized drug delivery, Nanoparticles.*

O-05/F/010 ORAL · OFFLINE

Development and In Vivo Evaluation of QbD-Assisted Squalene-based Luliconazole Entrapped Ethosomal Gel for the Skin Fungal Infection

Khushpreet Kaur*, Taqdir Singh
ISF College of Pharmacy& Research, Rattian Road, Moga, 142001, Punjab, India
Email: khushpreet.kaur5110@gmail.com

Fungal infections pose a significant global health challenge, especially in immunocompromised individuals. Luliconazole (LZL), a newly approved drug for topical fungal infections, faces limitations due to poor skin penetration, short skin retention time, and repeated administration. To address this, lipid nanocarrier-based ethosomal gel formulations at 1% w/w strength were developed and extensively characterized through in vitro, ex vivo, and in vivo studies, comparing them with conventional formulations. The optimized ethosomal formulations exhibited a vesicle size of 209.2±8.52 nm, encapsulation efficiency of 81.51±3.62%, and PDI of 0.198±0.001. These ethosomes were incorporated into a gel with adhesiveness of 1.012 mJ, hardness of 0.17 N, and spreadability ranging from 7.9 to 0.52 g·cm/sec. In vitro release studies showed 84.39±1.5% release for the optimized ETs-gel formulation compared to 45.58±0.9% for the LZL-conventional gel. In-vitro activity against Candida albicans demonstrated superior efficacy of the prepared ethosomal formulations over the conventional gel. Ex vivo studies on porcine ear skin indicated enhanced penetration and skin retention time for the optimized ETs-gel compared to the conventional gel. In-vivo antifungal activity on albino rats confirmed the safety, non-irritant nature, and efficacy of the optimized ETs-gel in topical fungal treatment, with no systemic drug circulation observed. Histopathology studies further supported the efficacy of the optimized ETs-gel formulation. Overall, squalene-based ethosomes emerge as promising carriers for enhancing the topical delivery and localized effectiveness of Luliconazole.

Keywords: *Anti-fungal activity · Candida albicans · ethosomes · luliconazole · topical formulation*

O-05/F/011 ORAL · OFFLINE

Acid-Responsive Gastroprotective Floating Drug Delivery System for Enhanced Oral Bioavailability

Dusar*, Binu Raina

Department of Pharmaceutics, Guru Gobind Singh College of Pharmacy, Yamuna Nagar, Haryana
Email: dusar126@gmail.com

Oral controlled-release formulations aimed at the upper gastrointestinal tract are encountered with significant physiological obstacles, notably rapid gastric transit and brief gastric residence times, which challenge the performance of conventional dosage forms that immediately enter the lower bowel. These transit limitations greatly obstruct therapeutic agents characterized by short elimination half-lives, poor aqueous solubility, and low oral bioavailability, further complicated by extensive first-pass hepatic metabolism. Such delivery issues are particularly acute for acidic, Biopharmaceutics Classification System (BCS) Class II drugs having free carboxylic acid groups, which are primarily absorbed in the gastric milieu where they exist in anunionized, readily absorbable form. To address the issue of rapid clearance and frequent dosing requirements, association of gastro-retentive floating drug delivery systems with acid-responsive polymeric architectures creates a synergistic delivery platform. The carriers providing buoyancy maintain a bulk density lower than gastric fluid to ensure sustained intragastric flotation up to 24 h. The inclusion of polybasic, stimuli-responsive macromolecules plays an important role in controlling release kinetics. In the acidic conditions of the stomach, the protonation of basic functional groups results in swelling of the matrix and forms pores, all while maintaining buoyancy. This acid-induced modification improves wettability and enables controlled drug diffusion at the absorption site, thereby preventing dose dumping, lowering first-pass metabolism, and significantly enhancing oral bioavailability.

Keywords: *controlled release, upper gastrointestinal tract, bioavailability, floating drug delivery systems, macromolecules*

P-05/F/001 POSTER · OFFLINE

Berberine Hydrochloride loaded Transethosomal Gel for the Management of Psoriasis

Vaidehi Nikam, Amarjitsing Rajput*

Department of Pharmaceutics, Poona College of Pharmacy, Bharati Vidyapeeth (Deemed to be University), Erandwane, Pune 411038, Maharashtra, India.
Email: amarjit.rajput@bharatividyapeeth.edu

Berberine HCl loaded transethosomal gel was designed to improve oral absorption, stability and water solubility compared to the pure berberine HCl for the treatment of Psoriasis. The high hydrophilicity of berberine HCl restricts its topical administration hence it was loaded into a transethosomal gel to treat psoriasis. The optimized transethosomes showed particle size (132.3 ± 16.6 nm), polydispersity index (PDI) (0.269 ± 0.01), zeta potential (−21.6 ± 1.1 mV), and entrapment efficiency of 93.8 ± 1.33%. Transmission Electron Microscopy verified the spherical shape of formulated vesicle. The effective encapsulation of the drug within the vesicular matrix and no physicochemical interactions between the drug and excipients was confirmed FTIR, DSC and XRD. Compared to the pure drug dispersion, in vitro drug release showed a noticeably improved release profile of the transethosomal formulation. The developed transethosomal gel demonstrated enhanced drug deposition and epidermal penetration. The formulation's chemical and physical stability during the evaluation period was confirmed by expedited short-term stability testing. The biological tests such as ELISA-based cytokine analysis, antioxidant assay, and anti-proliferative assay demonstrated a significant increase in biological activity of the transethosomal formulation compared to the pure berberine HCl. The experiments on skin irritation verified the gel's biocompatibility and showed that it was suitable for topical application. Thus, results suggest that the Berberine HCl loaded transethosomal gel is promising approach for the management of psoriasis.

Keywords: *Berberine Hydrochloride, Psoriasis, Ultra Deformable carrier, Transethosomes, Transethosomal Gel*

P-05/F/002 POSTER · OFFLINE

Advanced Microneedle Technologies for Targeted Drug Delivery: Opportunities and Challenges

Rishikesh Kumar Singh*, Sania Siddiqui, Vema Kiran

Department of Pharmaceutics, ISF College of Pharmacy, Moga– 142001, Punjab, India
Email: 2504012@isfcp.org

The incidence of breast cancer in women all over the world has contributed to cancer deaths and disease at large, with the occurrence of HR+ breast cancer being predominant among those cases. Letrozole is one of the class III aromatase inhibitors that have been extensively utilised for endocrine therapy because of their remarkable estrogen-suppressing effects. Nevertheless, there are various limitations associated with conventional oral administration of letrozole, including its side effects on other parts of the body, variation in bioavailability, and low adherence to the medication regimen by the patients. The emergence of these issues has made it imperative to discover new ways of delivering drugs. Over recent years, the introduction of microneedles for transdermal drug delivery has been established for cancer treatments, ability to bypass the stratum corneum, and capability of sustained drug delivery. Moving through recent advances in dissolvable microneedles, hydrogel-forming microneedles, and stimuli-responsive microneedles, along with nanotechnology and 3D printing techniques, their clinical usefulness has expanded significantly. Despite major advances in the development of the application of microneedle-mediated delivery of anticancer drugs, Literature on other microneedle-delivered chemo-drugs is limited, such as letrozole. Delivery systems involving letrozole-loaded microneedles can be regarded as a new strategy in the transdermal delivery of drugs for breast cancer treatment. Since this technique has the capability to increase bioavailability, decrease the dose frequency, and minimise adverse effects of pharmacotherapy.

Keywords: *Breast Cancer; transdermal drug delivery; letrozole; Hormone receptor-positive (HR+) Breast Cancer; Aromatase Inhibitors.*

P-05/F/003 POSTER · OFFLINE

Cyclodextrin-based Nanotechnology targeting CD44 for Desmoplastic Tumor Microenvironment: A Translational Prospective

Sania Siddiqui*, Rishikesh Kumar Singh, Vema Kiran

Department of Pharmaceutics, ISF College of Pharmacy, Moga- 142001, Punjab, India
Email: 2504013@isfcp.org

The Desmoplastic Tumor Microenvironment (DTME) has dense extracellular matrix and poor vascular morphology, specifically pancreatic ductal adenocarcinoma, which restricts the penetration of therapeutic agent into tumor tissues. The disruption of tumor microenvironment alters the deposition and distribution of drug in the tumor. There are several constituents in the DTME (solid tumor or gastrointestinal tumor) that can contribute to treatment failure or drug resistance. CD44 is well-recognized transmembrane protein that is highly expressed on the surface of cancer cells and is involved in the development of chemotherapy resistance, invasion, metastasis, and tumor progression. Cyclodextrin-based nanotechnology provides a versatile approach to avoid these barriers by enhancing solubility, stability, and controlled delivery of antitumor drugs. CD44 targeting ligand-hyaluronic acid binds to CD44 and when combined with cyclodextrin, the targeted mediated uptake of anticancer agent within tumor tissues occurs with a minimum toxic effect to non-targeted tissues. This review summarizes the recent advancements on the application of CD44-targeted cyclodextrin nanocarriers for the improvement of drug delivery across the desmoplastic stroma. It allows the co-delivery of chemotherapeutics, nucleic acids, and combination therapies. It also highlights the challenges related to translational technology such as biological variability, manufacturing scalability, regulatory issues, and long-term safety. In general, CD44- targeted cyclodextrin nanotechnology provides a promising approach to overcome stromal barriers and improving treatment outcomes in desmoplastic tumors.

Keywords: *Cyclodextrin, CD44, Desmoplastic Tumor Microenvironment, Pancreatic Ductal Adenocarcinoma, Targeted drug delivery.*

P-05/F/004 POSTER · OFFLINE

Nanomedicine-Based Drug Delivery Strategies to Mitigate Doxorubicin-Induced Cardiotoxicit

Chirag Thakur*, Vema Kiran
Department of Quality Assurance, ISF College of Pharmacy, Moga, Punjab, India
Email: 2507002@isfcp.org

Although doxorubicin (DOX) is a widely used drug for treatment of solid tumors and hematological cancers, clinical use of DOX is limited by its dose-dependent cardiotoxicity, which is linked to oxidative damage, mitochondrial dysfunction, and genotoxic injury in cardiomyocytes via topoisomerase IIβ. Cardio protection is usually achieved through conventional methods such as dose limiting, cardiologic monitoring, and use of cardiac protecting agents; however, none of these strategies fully prevents cardiac damage and may even impair DOX-mediated antitumor activity. Targeted drug delivery via nanomedicine has been recently explored as a means to control biodistribution and to reduce the exposure of uninvolved cardiomyocytes, thereby maximizing the balance of benefits and risks. The present review examines the various advanced platforms of nanoparticles developed to reduce DOX-induced cardiotoxicity, including liposomes, polymeric micelles, nanoemulsions, and polymer-drug conjugates, emphasizing recent advances in polymeric nanocarriers. While there has been tremendous preclinical and clinical success, there remain critical translation hurdles such as limited circulation half-life, immunogenicity, and complicated scale-up manufacturing. Surmounting these obstacles and further advancing the clinical translation of nanomedicine is crucial and will ultimately lead to safer and more effective oncologic therapies.

Keywords: *Doxorubicin; Cardiotoxicity; Nanomedicine; Polymeric nanocarriers; Targeted drug delivery*

P-05/F/005 POSTER · OFFLINE

Advancement of Biodegradable Packaging for Sustainable Food Systems and Nutritional Security: Innovations, Challenges, and Global Perspectives

Aryan Thakur*, Nitin Singh
Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: aryanthakur562006@gmail.com

Introduction: Rising worries about how regular plastic packaging harms the environment have pushed more interest in biodegradable choices for food. Packaging that can break down naturally matters a lot for cutting waste, keeping food fresh, and backing up nutritional security.

Aim & Objectives: This review looks at where biodegradable food packaging stands now, points out fresh materials and methods, examines the main hurdles, and considers worldwide views on building food systems that can last.

Methods: A review built on existing literature was done by digging into published studies, reports, and case examples about biodegradable polymers, bio-based composites, edible coatings, and smart packaging approaches.

Results: Materials like polylactic acid, starch-based polymers, cellulose derivatives, and chitosan show real promise for food packaging. Active and intelligent packaging options help extend shelf life, cut down on spoilage, and make food safer. On the other hand, expensive production, weak mechanical properties, the need for industrial composting setups, and tricky regulations hold back wider use.

Conclusion: Going with biodegradable packaging looks like a solid route toward sustainable food systems since it lowers both environmental pollution and food losses. More research, helpful policies, better technology, and global teamwork will be needed to push past current roadblocks and get these solutions adopted on a large scale.

Keywords: *Biodegradable packaging, Sustainable food systems, Nutritional security, Food safety, Biopolymers, Smart packaging.*

P-05/F/006 POSTER · OFFLINE

Next-Generation Biomimetic Nanocarriers for Precision Drug Delivery: Emerging Innovations and Translational Perspectives

Karan Modgil*, Komal
Department of Pharmaceutics, ISF College of Pharmacy, Moga-142001, Punjab India
Email: 2439433@isfcp.org

Introduction: Medicinal effects are generally limited by the poor target specificity, low bioavailability, fast systemic clearance, and dose-related toxicity of conventional drug delivery systems. Next-generation nanocarriers, which combine biological elements with artificial nanomaterials to better targeted delivery, extend circulation time, avoid immune recognition and boost therapeutic efficacy, are the result of recent developments in biomimetic nanotechnology. For clinical translation and precision medicine, these systems have great potential.

Aim & Objectives: To examine the latest developments in next-generation biomimetic nanocarriers for precision drug administration, with a focus on their design approaches, targeting mechanisms, therapeutic uses, translational potential, present difficulties and prospects for the future.

Methods: Peer-reviewed research publications, review papers, and scientific databases were used in a thorough literature review. A critical analysis was conducted of recent research on biomimetic nanocarriers, such as cell membrane-coated nanoparticles, exosome-inspired nanovesicles, hybrid lipid-polymeric nanoparticles, biomimetic targeting techniques and translational nanomedicine.

Results: Compared to traditional nanocarriers, biomimetic nanocarriers exhibit better targeting efficiency, increased cellular absorption, extended systemic circulation, higher drug stability, and less off-target toxicity. The potential for precision therapeutics has been highlighted by recent developments in cell membrane camouflage, exosome-mimetic systems, stimuli-responsive platforms, and multifunctional nanocarriers, which have demonstrated encouraging preclinical results in cancer, neurological disorders, infectious diseases and inflammatory conditions.

Conclusion: By fusing the benefits of biological systems with cutting-edge nanotechnology, next-generation biomimetic nanocarriers provide a revolutionary approach to precision drug delivery. Their effective conversion into next-generation treatments will depend on ongoing manufacturing process optimisation, safety assessment, regulatory frameworks, and clinical validation.

Keywords: *Biomimetic nanocarriers, Precision drug delivery, Nanomedicine, Targeted therapeutics, Translational medicine, Biohybrid nanotechnology.*

P-05/F/007 POSTER · OFFLINE

Herbal-Drug Interactions in Cancer Patients Receiving Chemotherapy – Focus On St. John's Wort and Turmeric Tea

Harshita*, Ayushreeya Banga, Sourabh Kosey
Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India
Email: harshita2439583@gmail.com

Introduction: The concomitant use of herbal remedies with standard cancer therapy is common among cancer patients. Despite their natural origin, herbal medicines may cause adverse effects, interact with anticancer drugs, and modulate the treatment outcome.

Aim & Objectives: To review herbal-drug interactions in cancer patients undergoing chemotherapy, with special consideration of St. John's Wort and turmeric tea use, and to discuss their clinical implications.

Methods: Narrative literature research was performed using databases of peer-reviewed journals, pharmacological resources, and relevant scientific literature. Published reports on the mechanisms of herb-drug interactions, including the effects on P-glycoprotein, CYP enzymes, and other transporters and metabolic pathways, were included in the analysis.

Results: St. John's Wort was reported to cause significant interactions with various anticancer drugs due to induction of CYP3A4 and P-glycoprotein. Concurrent use of this herbal preparation may lead to decreased efficacy of several cancer therapies. Turmeric and its active compound curcumin were found to interact with CYP enzymes and P-glycoprotein and may increase the risk of bleeding and decrease the exposure to certain anticancer drugs. The clinical relevance of these interactions depends on the dose and formulation of the herbal products.

Summary and Conclusion: Herbal medicines may cause clinically significant interactions with various anticancer drugs. These interactions are difficult to predict due to the complexity of their metabolic pathways. Despite the benefits of phytotherapy agents in cancer patients, their use may be limited by adverse effects, including interactions with standard chemotherapy.

Keywords: *Herbal-drug interactions; Cancer; Chemotherapy; St. John's Wort; Turmeric; Pharmacovigilance*

P-05/F/008 POSTER · OFFLINE

Enhancing therapeutic efficacy of fingolimod via intranasal delivery in an ethidium bromide-induced model of multiple sclerosis

Keshav Kumar Gautam*, Akshita

Department of Pharmacy, ISF College of Pharmacy, Moga,-142001, Punjab, India
Email: 2501055@isfcp.org

Multiple sclerosis (MS) is a chronic inflammatory autoimmune neurological characterized by muscle weakness, numbness, tingling, vision problems, and difficulty in coordination and balance caused by the damage of myelin content around the nerve fibres. The recent literature is evident that along with their lymphocyte Attack prevention mechanism, fingolimod (FNG) can serve as neuroprotective also by ensuring their improved Brain availability. Therefore, in this project brain availability of FNG was enhanced by delivering the FNG in the Form of nanoparticles. Fingolimod-loaded solid lipid nanoparticles (FNG SLNs) were prepared using the solvent evaporation method and formulation factors (lipid concentration; X1, speed; X2, surfactant concentration; X3) and Response were established by factorial design. FNG-SLNs were characterized for particle size, entrapment efficiency and in-vitro drug release. Optimized formulations were characterized for in-vivo efficacy study in ethidium Bromide-induced MS rat model. Obtained data revealed that the particle size and entrapment efficiency of FNG-SLNs optimized formulation was 125.4 nm and 79.86 % w/w respectively. In-vitro drug release study showed an initial burst release of The FNG up to 32.52 % in 30 min followed by sustained drug release up to 78.22 % in 24 h. Furthermore, in-vivo Data of FNG-SLNs on ethidium bromide-induced MS rat model revealed better treatment response by showing Several evidence such as signs of remyelination, restoration of neuron shape, and the recovered oligodendrocytes. To the best of our knowledge this article demonstrates improved efficacy of FNG using SLNs. This study demonstrates the successful development of FNG-SLNs to enhance the therapeutic efficacy of FNG for the treatment of multiple sclerosis.

Keywords: *Multiple sclerosis (MS), intranasal delivery, neuroprotective, solid lipid nanoparticles, QbD.*

P-05/F/009 POSTER · OFFLINE

Lipid Nanoparticle-Masked mRNA Vaccines: A New Frontier in Precision Oncology

Himansu Choudhary*, Kirandeep Kaur

Department of Pharmacy, ISF College of Pharmacy, Moga– 142001, Punjab, India
Email: 2315730@isfcp.org

Nanotechnology deals with the study of matter and materials at the nanoscale level to achieve specific physical properties and characteristics that are not available at larger sizes due to quantum size effects and high surface-area-to-volume ratios. The rapid rise in nanoscience has led to a tremendous potential in medicine, for example, drug delivery, regenerative medicine, wound healing, and surgery. Novel drug delivery utilizing nanotechnology could potentially lead to enhanced drug delivery functions including controlled release and targeting of therapeutics with reduced toxicity, leading to innovative treatment methodologies. Similarly, in cell therapy, nanotechnology can be used to provide a controlled environment that enhances cellular functions, including engineered cells that have better survivability and proliferation rates, which can lead to better tissue engineering options. Nanotechnology has also shown promise in managing wounds and ulcers including diabetic wounds and ulcers through antibacterial properties, enhanced tissue regeneration, and revascularization processes among others. Nanotechnology has also been used in various surgical fields including orthopedics, neurological, plastic and oncology, cardiovascular, ocular, and minimally invasive surgery. It has a wide range of applications including surface engineering, tissue engineering, implants including stem cells scaffolds, nerve regeneration, wound healing, and diagnostic applications. However, nanotechnology faces a number of challenges in the field including toxicity, biocompatibility, ethical, regulatory, and commercialization barriers among others. Overall, nanotechnology has the potential to revolutionize the medical field while also being a great commercial opportunity. Therefore, there is a need for more research and proper clinical trials of nanotechnology based-medical devices and therapeutics to ensure that they are fit for clinical use and commercialization.

Keywords: *Nanotechnology; Drug delivery; Tissue engineering; Wound healing; Nanomedicine; Targeted Therapy.*

P-05/F/010 POSTER · OFFLINE

Cyclodextrin-Based Nanosponges for Targeted Drug Delivery: From Bench to Bedside

Jaspreet Kaur*, Shailja kumari, Arvinder Kaur
Department of Pharmacy, GHG Khalsa College of Pharmacy, Gurusar, Sadhar, Ludhiana, Punjab-141104, India
Email: jaspreetrajarh29@gmail.com

A novel nanotechnology platform for overcoming the drawbacks of traditional drug delivery methods, such as poor water solubility, limited bioavailability, quick drug degradation, and non-specific dispersion, is cyclodextrin-based nano sponges (CDNS). The porous architecture of these three-dimensional, cross-linked polymeric nanocarriers allows them to encapsulate both hydrophilic and hydrophobic therapeutic chemicals, enhancing medication stability, controlled release, and targeted administration. The goal of this study is to provide an overview of the latest developments in cyclodextrin-based nano sponges design, formulation, characterisation, therapeutic uses, and translational prospects in modern pharmaceutical sciences. Using PubMed, Scopus, ScienceDirect, and Google Scholar, through literature search was conducted within emphasis on peer-reviewed publications released between 2020 and 2026. According to recent research, cyclodextrin nano sponges minimize systemic toxicity and side effects while greatly increasing drug-loading capacity, encapsulation efficiency, dissolution rate, permeability, and therapeutic efficacy. These nanocarriers have demonstrated promise uses in the administration of antibacterial, anti-inflammatory, and neurotherapeutic medicines as well as oral, topical, ophthalmic, pulmonary, transdermal, and targeted cancer drugs. Additionally, they are appealing prospects for industrial pharmaceutical development and clinical translation due to their superior biocompatibility, structural plasticity, simplicity of surface functionalization, and scalability. Although preclinical results are encouraging, there are still issues with large-scale production, regulatory approval, long-term safety, and clinical validation. To sum up, cyclodextrin-based nanosponges are a flexible and extremely promising drug delivery platform that could help close the gap between laboratory research and clinical application by providing safer, more efficient, and patient-friendly therapeutic solutions for next-generation precision medicine.

Keywords: *Cyclodextrin, nanosponges, next-generation precision medicine, Targeted drug delivery, Nanotechnology.*

P-05/F/011 POSTER · OFFLINE

Fabrication and Characterization of Teicoplanin-loaded Solid Lipid Nanoparticles based Nanofibers for Enhanced Burn Wound Healing: In vitro and In vivo Insights

Sanha Punj, Renuka*, Kiranjot Kaur, Kavita Devi, Harshika, Neena Bedi
Department of Pharmaceutics, Guru Nanak Dev University, Amritsar.
Email: rkhosla193@gmail.com

Introduction: Burn wound infection remains a formidable clinical challenge because of the escalating antimicrobial resistance and limitations of the conventional formulation therapies like silver sulfadiazine.

Aim and Objective: This study aimed to fabricate and characterize a novel teicoplanin-loaded solid lipid nanoparticles (TCP-SLNs) based nanofibers system to engineer a localized, sustained-release dressing system with enhanced antimicrobial efficacy and accelerated tissue regeneration.

Method: TCP-SLNs were formulated by the solvent evaporation technique and the optimized formulation was characterized by DLS, ATR-FTIR and XRD and its antimicrobial potential was assessed. The SLNs were incorporated into electrospun nanofibers developed using a gellan gum-polyvinyl (GG-PVA) alcohol blend. The in vivo efficacy was evaluated in copper bar-induced second-degree burn wounds infected with MRSA (methicillin-resistant staphylococcus aureus) in Sprague Dawley rat model and parameters like wound contraction, skin irritation and histopathological outcomes against blank SLN-NFs and a marketed silver sulfadiazine (SSD) formulation was evaluated.

Results: The optimized SLN formulation (TCP-SLN-2) achieved a nanoscale particle diameter (61.79 nm), a polydispersity index (0.350), a zeta potential (−8.30 mV) and high drug loading (96%), demonstrating sustained release following Higuchi kinetics. In vivo evaluation of TCP SLN-2 revealed significantly accelerated wound closure by Day 21. Histopathological analysis confirmed reduced inflammation and improved re-epithelialization.

Conclusions: This integrated nanocarrier system offered a promising biocompatible approach for burn wound management, sustained drug delivery and regenerative healing.

Keywords: *Teicoplanin, solid lipid nanoparticles, MRSA, electrospun nanofibers, burn wound healing, antimicrobial resistance.*

P-05/F/012 POSTER · OFFLINE

Cancer nanomedicine: A review of recent success in drug delivery

Gitanjali Mishra*

Department of Pharmacy, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2439420@isfcp.org

Cancer continues to be one of the most difficult global healthcare problems. Although there are various drugs that can be used in cancer treatment, the problem is selectively killing all the cancer cells while reducing collateral toxicity to healthy cells. There are several biological barriers to effective drug delivery in cancer such as renal, hepatic, or immune clearance. Nanoparticles loaded with drugs can be designed to overcome these biological barriers to improve efficacy while reducing morbidity. First generation nanomedicines have received widespread clinical approval over the past two decades, from Doxil® (liposomal doxorubicin) in 1995 to Onivyde® (liposomal irinotecan) in 2015. This review highlights the biological barriers to effective drug delivery in cancer, emphasizing the need for nanoparticles for improving therapeutic outcomes. The clinical trials of Onivyde leading to its approval in 2015 by the Food and Drug Adminstration are highlighted as a case study in the recent clinical success of nanomedicine against cancer. Next generation nanomedicines need to be better targeted to specifically destroy cancerous tissue, but face several obstacles in their clinical development, including identification of appropriate biomarkers to target, scale-up of synthesis, and reproducible characterization. These hurdles need to be overcome through multidisciplinary collaborations across academia, pharmaceutical industry, and regulatory agencies in order to achieve the goal of eradicating cancer. This review discusses the current use of clinically approved nanomedicines, the investigation of nanomedicines in clinical trials, and the challenges that may hinder development of the nanomedicines for cancer treatment.

Keywords: *Cancer, nanomedicine, drug delivery systems, nanoparticles, clinical data.*

P-05/F/013 POSTER · OFFLINE

Review on Berberine-Loaded Herbosomal Gel: A Promising Phospholipid Based Topical Delivery System for the Management of Fungal Skin Infections

Harmanpreet Kaur*, Shweta Kamboj, Dr Loveleen Preet Kaur, Mohit Kumar

Department of Pharmaceutics, Jan Nayak Ch. Devi Lal Memorial College of Pharmacy, Barnala Road, Sirsa-125055, Haryana, India
Email: harmanpreetkaur6332@gmail.com

Fungal skin infections are common dermatological problems that can cause considerable discomfort, irritation, itching and inflammation. Conventional topical antifungal treatments can be associated with poor skin penetration, limited drug retention at the site of infection, frequent application, and reduced therapeutic efficacy. Berberine is a naturally occurring bioactive alkaloid isolated from several medicinal plants and exhibits promising antifungal, antimicrobial, anti-inflammatory and antioxidant properties. However, its poor water solubility and limited bioavailability may restrict its effective topical application. Herbosomal delivery systems for drugs have been found to be a promising approach for the improvement of topical delivery of plant derived bioactive compounds. These systems utilize the herbal or phytoconstituent molecules along with phospholipids to enhance drug inclusion, skin interaction, permeation and retention. Encapsulation of berberine in a phospholipid-based vesicular system may allow its deposition in the skin and provide sustained drug release at the site of the fungal infection. The gel formulation can also enhance patient convenience, spreadability, adherence and residence time on the skin. Such a delivery system may have application in the treatment of superficial fungal skin infections with limited systemic exposure. Although it has promising potential, the challenges of formulation stability, vesicle characteristics, drug–phospholipid interactions, skin irritation, scalability and regulatory issues should be carefully evaluated. To summarize, berberine-loaded herbosomal gel is a phospholipid-based promising topical drug delivery approach to enhance the therapeutic potential of berberine in the management of fungal skin infections.

Keywords: *Berberine, Herbosomes, Phospholipid based delivery, Topical drug delivery, Fungal skin infections, Antifungal activity.*

P-05/F/014 POSTER · OFFLINE

Exosome-Based Cell-Free Therapy: A Novel Approach to Tissue Regeneration and Repair

Kamalpreet Kaur*

Department of Pharmaceutics, ISF College of Pharmacy and Research, Moga-142001, Punjab, India
Email: iamkamalinsan@gmail.com

Exosomes are nanoscale extracellular vesicles secreted by diverse cell types and have emerged as promising therapeutic agents in regenerative medicine. These naturally occurring vesicles contain bioactive molecules, including proteins, lipids, messenger RNAs, microRNAs, and other signalling factors, enabling them to modulate cellular communication and tissue homeostasis. Unlike conventional cell-based therapies, exosome-based approaches offer a cell-free therapeutic strategy that may overcome several limitations associated with direct cell transplantation, including poor cell survival, immune-related complications, and potential safety concerns. Exosomes derived from mesenchymal stem/stromal cells have demonstrated significant regenerative potential by promoting cell proliferation, migration, angiogenesis, extracellular matrix remodelling, and reduction of inflammatory responses. Preclinical studies have reported beneficial effects of exosome-based therapy in the repair of damaged cardiac, neural, bone, cartilage, skin, and other tissues. Their ability to transport therapeutic cargo to target cells makes exosomes attractive candidates for tissue-specific regeneration and personalized medicine. Furthermore, advances in exosome isolation, characterization, engineering, and targeted delivery are expanding their potential clinical applications. However, challenges related to large-scale production, purification, cargo consistency, dosage optimization, storage stability, biodistribution, and regulatory standardization remain important barriers to clinical translation. This review highlights the biological characteristics, therapeutic mechanisms, and regenerative applications of exosome-based cell-free therapy, while discussing current challenges and future perspectives. Overall, exosome-mediated therapy represents a promising next-generation strategy for tissue regeneration and repair, with considerable potential to advance safer and more effective regenerative medicine.

Keywords: *Exosomes, Extracellular vesicles, Cell-free therapy, Regenerative medicine, Mesenchymal stem/stromal cells, Tissue regeneration*

P-05/F/015 POSTER · OFFLINE

Glycyrrhetic Acid-Loaded Microemulsion-Based Konjac Gel for Psoriasis: Enhanced Topical Delivery and Immunomodulatory Effects

Pankaj Popli*, Rajan Swami

Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab, India
Email: pankajpopli7@gmail.com

Psoriasis is a chronic inflammatory skin disorder caused by an immune system imbalance and the excessive production of pro-inflammatory cytokines, which in turn demands the development of potent and safe topical treatments. Glycyrrhetic acid (GA) is a triterpenoid component of licorice root, which shows very strong anti-inflammatory activity, but the efficacy of GA in clinical phases has been hindered by its low water solubility and poor ability to penetrate the skin. The current research investigates a microemulsion (MEs)-based approach to eliminating these problems and increasing the topical administration of GA. MEs containing GA were prepared with Capryol 90 as oil phase, Cremophor/Labrasol, and Transcutol as a Smix and then incorporated into a gel matrix made of konjac glucomannan and Carbopol 940 to increase retention due to the low viscosity of MEs. Several experiments were carried out on the formulation, and then it was characterised with physicochemical properties, rheology, and stability. The formulation was further tested for in vitro release, ex vivo permeation, and in vivo anti-psoriatic effects using an imiquimod-induced mouse model. The formulated system exhibited very small droplet size (25.07±2.18 nm), a narrow particle size distribution, and suitable topical features. The in vivo studies showed the ability to counteract the pathological features of psoriasis, which was also evidenced by the reparative changes in the skin, decreased level of skin inflammatory markers, and lessening of the systemic immune response. The study demonstrated that MEs-based gels are a feasible and efficacious strategy to augment the topical delivery of hydrophobic plant phytoconstituents for the therapy of psoriasis.

Keywords: *Glycyrrhetic acid, Inflammation, Psoriasis, Microemulsion, Konjac Glucomannan*

P-05/F/016 POSTER · OFFLINE

Development and Evaluation of Aloe-Emodin-Loaded Microemulsion Gel for Enhanced Topical Management of Psoriasis

Diwanshu Goyal*, Rajan Swami
Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab, India
Email: diwanshugoyal02@gmail.com

Psoriasis is a chronic inflammatory skin disorder caused by an immune system imbalance and excessive production of pro-inflammatory cytokines, which necessitates the development of potent and safe topical treatments. Aloe-emodin (AE) is a natural anthraquinone derivative obtained from Aloe vera and related plants, which exhibits significant anti-inflammatory and therapeutic potential, but its topical efficacy is limited by poor water solubility and inadequate skin penetration. The present research investigates a microemulsion (ME)-based approach to overcome these limitations and enhance the topical delivery of AE. MEs containing AE were prepared using Capryol 90 as the oil phase, Cremophor/Labrasol and Transcutol as the Smix, and subsequently incorporated into a gel matrix composed of konjac glucomannan and Carbopol 940 to improve skin retention due to the low viscosity of MEs. The formulations were optimized and characterized for physicochemical properties, rheological behavior, and stability. The optimized formulation was further evaluated for in vitro drug release, ex vivo permeation, and in vivo anti-psoriatic activity using an imiquimod-induced mouse model. The study demonstrated that ME-based gels can serve as a promising strategy for enhancing the topical delivery of hydrophobic phytoconstituents such as Aloe-emodin for psoriasis therapy.

Keywords: *Aloe Emodin, Inflammation, Psoriasis, Microemulsion, Konjac Glucomannan*

P-05/F/017 POSTER · OFFLINE

Biomimetic Carbohydrate Polymer Nanoparticles with Cell Membrane Camouflage for Targeted Dual-Therapy of Diabetic Cancer

Gourav Sharma*, Payal Sharma, Mehak Sharma, Ajay Kumar, Mahender Singh Ashawat, Vinay Pandit
Department of Pharmaceutics, Laureate Institute of Pharmacy Kathog
Email: sharmagourav5194@gmail.com

Introduction: Type 2 diabetes mellitus (T2DM) significantly increases the risk of various cancers due to chronic hyperglycemia, hyperinsulinemia, oxidative stress, and persistent low-grade inflammation. Managing cancer alongside diabetes complicates glycemic control, highlighting an urgent need for dual-action therapeutic strategies that address both diseases simultaneously.

Objectives: To develop a carbohydrate polymer-based nanoplatform capable of co-delivering an antidiabetic agent and a chemotherapeutic drug directly to the tumor microenvironment for targeted, dual-condition management.

Methods: Biodegradable carbohydrate polymers such as chitosan, hyaluronic acid, alginate, or dextran will be engineered into nanoparticles encapsulating both therapeutic agents. To improve stealth and tumor accumulation, these nanoparticles will be camouflaged with membranes derived from cancer cells, red blood cells, or leukocytes to evade immune clearance and extend circulation time. Hyaluronic acid will further provide active targeting by binding specifically to CD44 receptors overexpressed on cancer cells.

Results: This biomimetic nano formulation is designed to exhibit prolonged systemic circulation, superior tumor accumulation, and site-specific drug release while minimizing off-target toxicity. Concurrent delivery of both therapeutics aims to simultaneously control blood glucose levels and suppress tumor growth, significantly improving safety and treatment efficacy for comorbidity cases.

Conclusion: Cell membrane-coated, carbohydrate-based nanoparticles offer a promising biomimetic approach for treating diabetes-associated cancer. Future efforts must focus on formulation optimization, physicochemical characterization, in vitro evaluation, and in vivo efficacy and safety assessments to advance this dual-targeted platform toward clinical translation.

Keywords: *Diabetes mellitus, cancer comorbidity, biomimetic nanoparticles, carbohydrate polymers, membrane camouflage, targeted drug delivery.*

P-05/F/018 POSTER · OFFLINE

Development, Optimization, and In Vivo Pharmacokinetic Study of Kaempferol-Loaded Lyotropic Liquid Crystalline Nanoparticles

Avinash S. Poojari*, Yogesh A. Kulkarni, Sarika Wairkar

Shobhabhen Pratapbhai Patel School of Pharmacy & Technology Management, SVKM's Narsee Monjee Institute of Management Studies (NMIMS) Deemed to be University, V.L. Mehta Road, Vile Parle (W), Mumbai, 400056, India

Email: avinashpoojari17@gmail.com

Introduction: Kaempferol, a plant-derived flavonoid, exhibits diverse pharmacological activities, including antioxidant, anti-inflammatory, and immunomodulatory effects, supporting its potential in the prevention and management of various pathological conditions. However, its clinical application is limited by poor aqueous solubility, stability issues, and extensive presystemic metabolism.

Aim & Objectives: The present study aimed to develop, statistically optimize, and evaluate kaempferol-loaded lyotropic liquid crystalline nanoparticles (KF-LLCNs) to improve the oral delivery and bioavailability of kaempferol.

Methods: KF-LLCNs were developed using a top-down method and statistically optimized using the Box–Behnken Design (BBD). The optimized formulation was evaluated for physicochemical characteristics and in vitro drug release, while transmission electron microscopy (TEM) and small-angle X-ray scattering (SAXS) analyses were performed for structural characterization. Pharmacokinetic profiles of KF-LLCNs and plain kaempferol were compared following oral administration in rats.

Results and Discussion: The optimized KF-LLCNs exhibited a particle size of 42.40 ± 4.38 nm, polydispersity index of 0.47 ± 0.05, zeta potential of −29.27 ± 1.50 mV, and entrapment efficiency of 73.35 ± 1.23%. TEM and SAXS revealed the spherical morphology and mesophase structural characteristics. KF-LLCNs demonstrated sustained in vitro release compared with plain kaempferol. Pharmacokinetic evaluation showed 3.33-fold and 3.52-fold increases in Cmax and AUC0–24, respectively, compared with plain kaempferol.

Summary: KF-LLCNs exhibited favourable physicochemical characteristics, sustained release, and enhanced systemic exposure following oral administration.

Conclusion: KF-LLCNs demonstrated potential as an oral delivery system for improving the bioavailability of kaempferol and may support its therapeutic application in various pathological conditions.

Keywords: *Kaempferol, Oral delivery, Nanoparticles, Bioavailability*

P-05/F/019 POSTER · OFFLINE

RVG-Peptide Functionalized Exosome-Mimetic Lipid Nanoparticles for Targeted Delivery of RNA Therapeutics in Alzheimer's Disease: Advances, Challenges and Future Perspectives

Amanpreet Kaur*[1], Komal[2]

[1]*Department of Pharmaceutical Quality Assurance, ISF College of Pharmacy, Moga, Punjab*

[2]*Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab*

Email: amansembhi821@gmail.com

Introduction: Alzheimer's disease (AD) is a progressive neurodegenerative disorder which slowly destroys memory and thinking skills characterized by cognitive decline and limited treatment options. RNA therapeutics offer disease-modifying potential. However, their clinical application is restricted by instability and poor blood–brain barrier (BBB) penetration.

Aim & Objectives: To review the role of RVG-peptide functionalized exosome-mimetic lipid nanoparticles in targeted RNA delivery for AD, focusing on their design, mechanism, therapeutic potential, challenges and future prospects.

Methods: A comprehensive review of published literature was conducted using peer-reviewed research articles, review papers, and scientific databases. Relevant studies on AD pathology, RNA therapeutics, exosomes, lipid nanoparticles, RVG-mediated targeting, and BBB transport were critically examined.

Results: It indicates that RVG-functionalized exosome-mimetic lipid nanoparticles improves BBB crossing, improve neuronal targeting, protect RNA molecules from degradation, and increase therapeutic efficacy while minimizing off-target effects. Recent advances in formulation, characterization, and targeted delivery have demonstrated encouraging preclinical outcomes.

Summary: This review shows current knowledge on RVG-mediated targeted nanocarriers, their mechanism of action, advantages, limitations and translational challenges.

Conclusion: RVG-peptide functionalized exosome-mimetic lipid nanoparticles represent a promising platform for targeted RNA delivery in AD. Further optimization, safety evaluation and clinical studies are required to facilitate their successful clinical translation.

Keywords: *Alzheimer's disease, RNA therapeutics, Exosome-mimetic lipid nanoparticles, RVG peptide, Blood–brain barrier, Nanomedicine.*

P-05/F/020 POSTER · OFFLINE

Gold Nanoparticle for Precision Therapy of Triple- Negative Breast Cancer: Advances in Targeted and Multimodal Treatment

Balram*, Raj Kumar Narang
ISF College Of Pharmacy & Research, Moga (Punjab)
Email: balramchugh6@gmail.com

Triple-negative breast cancer (TNBC) is an aggressive and heterogeneous subtype of breast cancer characterized by the absence of estrogen receptor, progesterone receptor and human epidermal growth factor receptor 2 (HER2). Its high risk of early recurrence and metastasis, with limited therapeutic targets and treatment resistance, highlights the need for innovative precision-based therapeutic approaches. Gold nanoparticles (AuNPs) have emerged as versatile nanoplatforms because of their tunable physicochemical properties, modifiable surfaces, unique optical properties and potential to integrate with multiple therapeutic functions. Recent advances in AuNP-based precision strategies for TNBC have focused on active targeting, drug delivery, photothermal therapy (PTT), photodynamic therapy (PDT) and radiosensitization. Investigated targeting approaches include functionalization of AuNPs toward TNBC-associated targets such as epidermal growth factor receptor (EGFR), CD44, C-X-C chemokine receptor 4 (CXCR4) and membrane-associated heat shock protein 70 (Hsp70), with the aim of improving tumor-cell recognition and therapeutic delivery. AuNP-based platforms have also been explored for multimodal approaches, including chemo-photothermal therapy and radiation enhancement, providing opportunities for synergistic therapeutic effects. Preclinical studies in TNBC cell and animal models have reported promising therapeutic effects; however, but clinical translation remains limited. Major challenges include tumor heterogeneity, target-expression variability, tumor penetration, biodistribution, long-term safety, manufacturing reproducibility and limited clinical evidence. Overall, current evidence supports that AuNPs are promising multifunctional platform for study of targeted and multimodal TNBC therapy. However, further translational research is required to establish their clinical utility.

Keywords: *Triple-negative breast cancer (TNBC), Gold nanoparticles (AuNPs), Precision therapy, Targeted drug delivery, Photothermal therapy.*

P-05/F/021 POSTER · OFFLINE

Chitosan-Based Nanoparticles for Oral Protein and Peptide Delivery: Recent Advances and Bioavailability Enhancement Strategies

Harsh Sharma*
University Institute of Pharmaceutical Sciences and Research, India
Email: harshsharmamdt2003@gmail.com

The oral delivery of therapeutic proteins and peptides remains severely constrained by proteolytic degradation across the gastrointestinal tract, poor mucosal diffusion, limited epithelial permeability, and extensive first-pass metabolism, which collectively limit oral bioavailability to under 1%. Chitosan nanoparticles (CNPs) offer a biocompatible, biodegradable, and mucoadhesive platform engineered to overcome these physiological hurdles. Through cationic electrostatic interactions with negatively charged mucosal surfaces and reversible modulation of epithelial tight junctional proteins (such as claudins and occludins), CNPs substantially prolong gastrointestinal residence time and facilitate paracellular transport. Advanced formulation approaches—such as PEGylation, thiolation, hyaluronic acid coating, and stimuli-responsive or ligand-targeted hybrid nanocarriers— demonstrate encapsulation efficiencies reaching up to 90%, preserving biological potency against acidic denaturation and enzymatic cleavage. Preclinical *in vitro* and *in vivo* models show that CNP formulations of oral insulin, therapeutic enzymes, cytokines (e.g., IFN-α), and oral subunit vaccines significantly enhance systemic absorption, mucosal IgA and systemic IgG titers, and glycemic control while exhibiting acceptable safety profiles at therapeutic doses. Nevertheless, critical translational challenges—including batch-to-batch polymer variability, long-term colloidal stability, large-scale GMP-compliant production, and regulatory standardization—must be systematically resolved to advance CNPs from experimental pipelines into non-invasive, patient-centric clinical nanomedicines.

Keywords: *Chitosan, Nanoparticles, oral delivery, proteins and peptides, mucoadhesive.*

P-05/F/022 POSTER · OFFLINE

Potential Artefacts in Nanoparticles Characterization

Diya*, Viney Chawla, Pooja Chawla

University Institute of Pharmaceutical Sciences & Research, Baba Farid University of Health Sciences, Faridkot
Email: diyachawla456@gmail.com

In order to determine the quality, safety and therapeutic efficacy of nanoparticles, accurate characterization is essential. However, the commonly used techniques- dynamic light scattering (DLS), zeta potential analysis, transmission and scanning electron microscopy (TEM or SEM), atomic force microscopy (AFM) and X-ray diffraction (XRD)-are extremely vulnerable to measurement artifacts that can undermine data reliability and produce false conclusions. Evidence from recent research on the causes and effects of such artifacts across important characterization platforms is gathered. Hydrodynamic size and intensity-weighted distributions in DLS are often distorted by polydispersity, multiple scattering, dust contamination, and improper dispersion medium. Zeta potential measurements frequently produce contradictory stability estimates because they are susceptible to pH, ionic strength, and electrode polarization. Since TEM only generates two-dimensional projections that need to be carefully interpreted, drying-induced aggregation, shrinkage, or morphological deformation can be introduced by electron microscopy techniques because they are ex-situ and vacuum-dependent. Inter-study comparability is further hampered by inconsistent reporting of sample preparation procedures and dispersion media. In order to increase reproducibility in nanoparticle characterization, this summarizes these sources of artifacts, links them to instrument-specific limitations, and suggests best practices, such as orthogonal technique validation, standardized sample preparation, and transparent reporting. For pharmaceutical nanocarriers, such as solid lipid nanoparticles, where precise size, charge, and shape data directly affect formulation stability and biological performance, this awareness is especially crucial. The results highlight the necessity of multi technique, artifact-aware characterisation techniques as a routine procedure in pharmaceutical development and nano particle research.

Keywords: *Nanoparticle characterization, measurement artefacts, Dynamic light scattering, Zeta potential, Transmission electron microscopy.*

P-05/F/023 POSTER · OFFLINE

Lipid Nanoparticles as Translational Drug Delivery Systems: SLNs, NLCs and Liposomes

Prabhashish Singh Saggu*, Mohammad Azahruddin

Department of Pharmacy, ISF College of Pharmacy and Research, Moga-142001 Punjab, India
Email: prabhsaggu2006@gmail.com

Introduction: Lipid-based nanocarriers have emerged as important systems for drug delivery to improve the effectiveness of medicinal substances that are either poorly soluble, unsafe, or eliminated quickly from the body. Among these systems, solid lipid nanoparticles (SLNs), nanostructured lipid carriers (NLCs), and liposomes have advantages such as improved solubilizing capacity, protection from decomposition of loaded drugs, sustained release, and possibility of targeted delivery. The ability of these systems to adapt to different structures and carry different types of therapeutic medications makes them strong candidates for clinical applications.

Aim and Objectives: To explore the potential of lipid nanoparticles as drug delivery systems for translational applications and assess their applications in the pharmaceutical domain. To summarize the features and advancements in SLNs, NLCS, and liposomes. To evaluate their contribution in improving solubility, efficacy, and targeted delivery.

Methods: A literature review on SLNs, NLCs, and liposomes was presented by focusing on their formulation, preparation, properties, drug release, therapeutic uses, safety, scalability, and translational obstacles.

Results: SLNs appear to be appropriate carriers for enhancing drug stability and controlled release. In addition, they can offer increased flexibility in drug loading, compared with conventional liposomes. Meanwhile, both SLNs and NLCs can be used for hydrophilic and lipophilic drugs, while allowing targeted or sustained drug delivery. However, for their successful commercialization, the development of these colloidal systems requires control of particle size, drug loading, stability, sterility, reproducibility, and scalable production.

Conclusion: Lipid nanoparticles combine modern drug delivery developments with specific pharmaceutical applications, increasing drug solubility, stability, bioavailability, and targeting capacity. For clinical applications, lipid nanoparticles must be produced on a large scale, with a long shelf life and safety and uniform quality assurance.

Keywords: *Lipid nanoparticles; Solid lipid nanoparticles; Nanostructured lipid carriers; Targeted drug delivery.*

P-05/F/024 POSTER · OFFLINE

Capecitabine in the Modern Management of Colon Cancer: Clinical Outcomes and Future Perspectives

Manjot Kaur*, Nandini

Department of Pharmacy, ISF College of Pharmacy and Research, Moga-142001, Punjab, India
Email: jotmanjot1310@gmail.com

Capecitabine, an oral prodrug of 5-fluorouracil (5-FU), has become an important treatment option for colon cancer due to its high efficacy and convenient oral administration. Clinical studies have demonstrated its potential to improve survival and delay disease progression, both as monotherapy and in combination with oxaliplatin or irinotecan. In the adjuvant setting, capecitabine has shown favorable outcomes compared with conventional intravenous chemotherapy, while offering greater convenience, treatment compliance, and quality-of-life benefits. However, treatment resistance and adverse effects such as hand-foot syndrome and gastrointestinal toxicity continue to limit its use. Emerging drug-delivery strategies, including nanoparticle-based and targeted delivery systems, aim to enhance therapeutic effectiveness and minimize systemic toxicity. These advances may contribute to improved and more effective approaches for future colon cancer treatment.

Keywords: *Capecitabine, Colon cancer, Adjuvant therapy, Recent NDDS, Clinical trials.*

P-05/F/025 POSTER · OFFLINE

Q_bD-Based Development of Zein Nanoparticles for Gut-Brain Axis-Oriented Management of Neuroinflammation and Metabolic Disorders

Jaydeep Singh Baghel*, Rishi Paliwal

Nanomedicine and Bioengineering Research Laboratory, Department of Pharmacy, Indira Gandhi National Tribal University, Amarkantak, Madhya Pradesh, 484887, India
Email: jpbaghel18@gmail.com

Introduction: Neuroinflammation and metabolic disorders are increasingly associated with dysregulation of the gut-brain axis highlighting the need for delivery strategies that improve the therapeutic efficacy of bioactive agents. Zein a biodegradable and biocompatible plant-derived protein has considerable potential as a nanocarrier because of its ability to encapsulate poorly water-soluble compounds and form stable nanoparticles.

Aim & Objectives: The present work focuses on the systematic development of zein-based nanoparticles intended for gut-brain axis-oriented therapeutic applications using a Quality by Design (QbD) approach.

Methods: A preliminary risk assessment was conducted to identify potential critical material attributes and critical process parameters affecting nanoparticle quality. Formulation and process variables, including drug-to-zein ratio, stirring speed, stirring time, sonication time, solvent ratio, pH, and solvent concentration, were screened for their effects on critical quality attributes, including particle size, polydispersity index, and zeta potential.

Results: The screening study was designed to identify the most influential variables for subsequent formulation optimization and establishment of a robust formulation strategy.

Summary: This systematic QbD-based approach aims to improve understanding of the relationships among formulation variables, processing conditions, and nanoparticle characteristics.

Conclusion: The developed framework supports the rational design of zein-based nanocarriers for the oral delivery of therapeutic agents that modulate gut-brain axis-related neuroinflammatory and metabolic dysfunction.

Keywords: *Zein nanoparticles, Quality by Design, Nanotechnology, Gut-brain axis, Neuroinflammation, Metabolic disorders*

P-05/F/026 POSTER · OFFLINE

FUTURISTIC TRENDS IN NANOPARTICLE CHARACTERIZATION

Deepka*, Viney Chawla, Pooja Chawla, Honey Goel

University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridkot, Punjab, India-151203
Email: deepkachoudhary12@gmail.com

Nanoparticle characterization is a critical component in the development, optimization and quality assessment of advanced nanomaterials and pharmaceutical nanocarriers. The rapid revolution of characterization technologies has transformed the field from conventional particle size measurement towards high resolution, multidimensional, and data driven analysis. This progression from traditional techniques such as sieving, sedimentation, and optical microscopy to modern approaches including dynamic light scattering, electron microscopy, atomic force microscopy and X-ray based methods. These advances have enabled more precise investigation of particle size, morphology, surface characteristics, distribution, and structural properties at the nanoscale. Looking towards the future, the integration of nanotechnology with artificial intelligence (AI), machine learning, advanced imaging, quantum sensing, and predictive modeling is expected to further transform nanoparticles characterization. AI-assisted image analysis and predictive models may facilitate rapid interpretation of complex datasets, while emerging quantum-based sensors could provide improved sensitivity and resolution. Such technologies may support real time, automated and potentially in process characterization of nanoparticles. However, challenges related to standardization, scalability, environmental interference, data quality, and computational reliability remain important consideration. Overall, the convergence of advanced instrumentation, AI-driven analytics, and high-resolution imaging represents a promising direction for faster, more accurate, and comprehensive nanoparticle characterization in pharmaceutical, biomedical, and industrial applications.

Keywords: *Nanoparticles characterization, Nanotechnology, Artificial intelligence, Predictive modeling*

P-05/F/027 POSTER · OFFLINE

Cyclodextrins as Nano-Architects: Engineering Supramolecular Nanocarriers for Advanced Drug Delivery

Yukta Garg*, Raj Kumar Narang, Amandeep Singh

Department of Pharmaceutics, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: yukta@isfcp.org

Introduction: Cyclodextrins (CDs) are cyclic oligosaccharides extensively investigated for their ability to form host–guest inclusion complexes with diverse drug molecules. Beyond their conventional application as solubility and stability enhancers, the unique supramolecular properties of CDs have created opportunities for their integration with nanotechnology. Their hydrophobic cavity, hydrophilic exterior and versatile chemical functionality enable the development of multifunctional nanoscale drug delivery systems.

Aim & Objectives: The present work aims to explore the emerging role of cyclodextrins as functional building blocks in nanotechnology and to highlight their potential in designing advanced drug delivery systems. The objectives include reviewing CD-based nanocarriers, understanding host–guest interactions in nanoscale drug delivery, and evaluating their potential for controlled, targeted and stimuli-responsive delivery.

Methods: A focused literature analysis was performed on recent research concerning cyclodextrin-based nanotechnology, including CD nano sponges, nanogels, nanoparticles, polymeric nanocarriers and CD-functionalized lipid nanocarriers. Their structural characteristics, drug-loading mechanisms, release behaviour and translational potential were comparatively analysed.

Results: The literature indicates that integration of CD chemistry with nanotechnology can provide complementary advantages of molecular encapsulation and nanoscale delivery. CD-based nanostructures offer opportunities for enhanced drug incorporation, improved stability, controlled release and functional surface modification. Host–guest interactions can additionally facilitate reversible drug association and stimuli-responsive release.

Conclusion: Cyclodextrins are evolving from conventional pharmaceutical excipients into versatile supramolecular building blocks for nanomedicine. Their integration with nanotechnology represents a promising strategy for developing intelligent and multifunctional drug delivery platforms with potential translational applications.

Keywords: *Cyclodextrins; Nanotechnology; Nanocarriers; Host–guest interactions; Nanomedicine*

P-05/F/028 POSTER · OFFLINE

Cyclodextrin Artificial Extracellular Vesicles (CD-AEVs): A Biomimetic Nanoplatform for Precision and Translational Drug Delivery

Arashdeep Kaur*, Komal
ISF College of Pharmacy, Moga, Punjab, 142001, India
Email: 2501020@isfcp.org

Introduction: Conventional drug delivery systems face challenges including poor solubility, low bioavailability, premature drug release and limited targeting, particularly for hydrophobic drugs. Cyclodextrin Artificial Extracellular Vesicles (CD-AEVs) are proposed as biomimetic nanocarriers integrating cyclodextrin chemistry, supramolecular self-assembly, targeting ligands and stimuli-responsive components.

Aim & Objectives: To develop and explore CD-AEVs as multifunctional nanocarriers for targeted, controlled and intracellular delivery of therapeutic agents and nucleic acids, with improved drug solubilization, encapsulation, targeting, stimuli-responsive release and co-delivery potential.

Methods: The proposed platform involves cyclodextrin selection, host–guest complexation, supramolecular self-assembly, vesicle formation, surface functionalization, drug and nucleic acid loading and stimuli-responsive release. The architecture is designed to mimic key functional features of extracellular vesicles while retaining the pharmaceutical benefits of cyclodextrins.

Results: CD-AEVs are expected to improve incorporation of poorly soluble drugs, enhance cellular uptake through targeting ligands, and facilitate controlled intracellular release. Their modular structure may enable co-delivery of conventional drugs and nucleic acids supporting multimodal and the precision therapy.

Conclusion: CD-AEVs represent a promising next-generation platform combining host–guest chemistry, vesicle-like structure, supramolecular assembly and stimuli responsiveness. Further optimization of stability, biocompatibility, pharmacokinetics, toxicity, scalability and clinical applicability is required.

Keywords: *Cyclodextrin, CD-AEV, Artificial Extracellular Vesicles, Biomimetic Nanocarriers, Supramolecular Self-Assembly, Targeted Drug Delivery*

P-05/F/029 POSTER · OFFLINE

Glycolic acid-integrated nanostructured lipid carriers of apremilast and quercetin co-delivery for the management of psoriasis

Amit Sharma
Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, 142001, India
Email: amitsharma@isfcp.org

Aim: The goal of this study was to develop and optimize glycolic acid-integrated nanostructured lipid carriers (NLCs).

Methods: The developed NLCs were optimized by 34 Central Composite Design (CCD) and were evaluated for their particle size, polydispersity index (PDI), zeta-potential, drug loading, and entrapment efficiency. Moreover, in-vitro drug release, ex-vivo skin permeation and retention analysis, cytocompatibility using the MTT (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) assay, antioxidant measurements via DPPH (2,2-diphenyl-1-picrylhydrazyl) scavenging assessment for anti-inflammatory effects by observing cytokine inhibition in lipopolysaccharide (LPS)-stimulated macrophages, and invivo irritation potential using the Hen's Egg Test on the Chorioallantoic Membrane (HET-CAM) assay were also evaluated.

Results: The optimized NLCs have a particle size of 121.75 ± 9.18 nm, a PDI of 0.367 ± 0.07, and a zeta potential of −35.77 ± 3.44 mV, indicating a stable formulation. In-vitro assays demonstrated sustained drug release, cytocompatibility, and antioxidant potency with effective reduction of pro-inflammatory cytokines, i.e. interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α). Conclusion: The combined Apremilast (APM)-Quercetin (QRC)-NLC integrated with glycolic acid introduces a promising nanocarrier strategy for the topical treatment of psoriasis.

P-05/F/030 POSTER · OFFLINE

Development and Evaluation of Lipid-Based Nanocarriers for Poorly Water-Soluble Drug

Kuljeet Kaur*, Honey Goel, Pooja Chawla, Viney Chawla

Research Scholar, University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridkot, Punjab 151203
Email: kuljitk302@gmail.com

Oral absorption of lipophilic drugs remains a big hurdle in dosage form design due to poor aqueous solubility and absorption. Our study focusing on the development of lipid-based nanoparticles (Solid lipid nanoparticles and nanostructured lipid carriers) for poorly water-soluble drug to enhance their efficacy. For formulation development, the physicochemical characteristics of the procured drug and lipids were performed. The preformulation studies include drug solubility in different solvents, lipids, melting point and lipid surfactant miscibility. Different methods with different lipids were used for the preparation of lipidic nanoparticles and compared for their particle size and polydispersity. Based on their primary characteristic results, high pressure homogenization method was selected for final preparation using precirol as a solid lipid, castor oil as a liquid lipid, and poloxamer 188 as a surfactant. Different combinations of lipid nanocarriers were developed and optimized using design expert software. The results confirmed that nanostructured lipid carriers were showing better drug encapsulation, drug loading, and drug distribution in the structure due to the less perfect crystalline matrix, small particle size, narrow size distribution and high stability profile. The results confirmed that selection of appropriate lipid, homogenization speed, combination of cosurfactant and surfactant and drug to lipid ratio significantly influence the chemistry of developed nanocarriers.

Keywords: *lipophilicity, Homogenization method, lipid nanoparticles, solubility, encapsulation*

O-05/N/001 ORAL · ONLINE

Nano-carrier Based Formulations for Nail Fungal Infection: Scientific Evidence, Therapeutic Applications and Challenges

Mahima Mishra*, Manish Kumar

KIET School of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh,
Email: mahimatripathi2470@gmail.com

Onychomycosis is a chronic nail fungal infection of the fingers and toes that are caused most commonly by dermatophytes, yeast, and non-dermatophyte mould. Due to the compact keratinized architecture of nail plate, penetrability of usual topical antifungal agents is limited so treatment continues being a challenge. While oral antifungal therapy may offer better clinical outcomes, its use is limited by systemic adverse effects, drug interactions, prolonged length of treatment and a requirement for laboratory monitoring. Nano carrier-based formulations have therefore emerged as a potential approach to improving the local delivery of antifungal drugs toward infected nail tissues. Nano carriers (e.g. liposomes, niosomes, nano emulsions and drug-loaded hydrogels) could increase solubility of the molecule or protect unstable molecules from degrading further enhancing selection as a great carrier in nail disorder treatment. This article reviews several experimental studies demonstrating enhanced nail penetration and antifungal activity of drugs loaded in nanocarriers (including terbinafine, itraconazole, fluconazole or amorolfine as well as some natural antifungals). Direct comparison is difficult because of differences in formulation composition, experimental models used (in vitro or animal), fungal strains, treatment duration and outcome assessment. Among others, physical instability, aggregation of particles (i.e., agglomeration), varying drug payloads and skin or nail irritation are other challenges faced during the formulation phase; while complex manufacturing processes with low scalability potential further complicate things. Further randomized clinical trials with an appropriate design are needed to confirm the therapeutic efficacy, recurrence rates, patient adherence, costs effectiveness and safety in comparison with currently available topical or oral antifungal medications.

Keywords: *Nail fungus, Onychomycosis; Nanocarriers; Drug delivery.*

O-05/N/002 ORAL · ONLINE

Nanoparticles in Lung Cancer

Chamanpreet Kaur*, Shailesh Sharma

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Punjab, India
Email: chamanpreetmann495@gmail.com

Lung cancer remains one of the leading causes of cancer-related mortality worldwide, primarily due to late diagnosis, tumor heterogeneity, and the limitations of conventional therapies such as chemotherapy, radiotherapy, and surgery. By precisely targeting tumor tissue, nanomaterials can reduce side effects and improve bioavailability. Multiple medications and targeted agents can be incorporated into nanoparticles, which improves intestinal absorption, solubility, sustained delivery, and bioavailability. Nanoparticle formulations are a promising option for the inhaled delivery of chemotherapeutic drugs against lung malignancies due to their sustained release and tumor localization properties. Therapeutic systems based on nanoparticles have become extremely popular because of their capacity to selectively target illness locations, efficiently administer hydrophobic medicines, and penetrate past biological barriers. It is mainly accomplished by two methods: active targeting, which involves loading tumor marker molecular recognition ligands onto nanomaterials, and passive targeting, which uses the enhanced penetration and retention (EPR) effect. The EPR effect, however has been shown to work in rodents but not in people. Researchers focused a lot of emphasis on the active targeting nano-drug loading mechanism in light of this. It has also been shown to have a greater affinity and specificity for tumor cells. Through the development of additional and innovative solid ligands or drug delivery methods, we hope that this work can assist biomedical researchers in using nanoparticles (NPs) to treat lung cancer.

Keywords: *Nanoparticles, Lung cancer, Nanomaterials, Chemotherapy*

O-05/N/003 ORAL · ONLINE

NANOPARTICLES IN THE TREATMENT OF BREAST CANCER

Gurminder Kaur*, Shailesh Sharma

Department of Pharmaceutics, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Punjab, India
Email: gurminderbanwait91@gmail.com

Breast cancer remains one of the leading causes of cancer-related morbidity and mortality among women worldwide. Although conventional treatment modalities, including surgery, chemotherapy, radiotherapy, hormone therapy, and targeted therapy, have significantly improved patient outcomes, their effectiveness is often limited by systemic toxicity, poor drug selectivity, multidrug resistance, and tumour recurrence. Nanotechnology, a fast-growing field, offers excellent prospects for the detection and treatment of human cancer. By utilizing nanoparticulate-based platforms, biological barriers can be bypassed, enabling simultaneous targeting of multiple cancers, longer blood circulation, and improved medication accumulation within tumors. This review covers novel nanoparticulate-based technologies for breast cancer nano therapies that are now accessible and practically applicable. The primary or secondary cause of cancer-related mortality for women is breast cancer. The main treatment method for different types of cancer is chemotherapy with drugs. Because of less water solubility of chemotherapy drugs or their inability to pass through membranes, their body absorbs them inadequately, which lowers the treatment's effectiveness. In this review, we focused on nanoparticles as carriers in targeted drug delivery, their characteristics, structure, and the previous studies related to breast cancer This study focuses on the critical role that nanoparticles have had in transforming the treatment of breast cancer by advancing interrelated strategies such as imaging, targeted therapy, and personalized medicine. Due to their distinct physicochemical characteristics, nanoparticles have demonstrated great potential in overcoming therapy constraints that currently exist, such as nonspecific systemic dispersion and drug resistance.

Keywords: *Breast cancer, Gene/Drug delivery, Biomarkers, Diagnostics, Therapeutics, Nanomedicine.*

O-05/N/004 ORAL · ONLINE

AI-Enabled Design, Synthesis and Analytical Profiling of Nano-Cyclodextrin Systems: Integrating CADD, Quality by Design and Nanotechnology for Next-Generation Drug Delivery

Shachindra L Nargund*, Manju Bhargavi

Department of Pharmaceutical Chemistry, Nargund College of Pharmacy, Bengaluru-560085, Karnataka, India
Email: slnargund@nargund.edu.in

Cyclodextrins (CDs) are versatile pharmaceutical excipients capable of forming inclusion complexes with poorly water-soluble drugs, thereby enhancing solubility, stability, bioavailability and therapeutic efficacy. Their integration with nanotechnology has enabled the development of nano-cyclodextrin systems, including nanosponges, polymeric nanoparticles and self-assembled nanocarriers, offering improved drug loading, controlled release and targeted delivery. Emerging artificial intelligence (AI), computer-aided drug design (CADD), molecular modeling and Quality by Design (QbD) approaches are transforming the rational design and optimization of these advanced delivery systems. This presentation highlights an integrated workflow involving computational prediction of host–guest interactions using molecular docking and molecular dynamics simulations, followed by synthesis through cross-linking, self-assembly and nanoprecipitation techniques. Comprehensive analytical profiling employing FTIR, NMR, DSC, PXRD, SEM, TEM, DLS, zeta potential and HPLC is used to characterize structural integrity, particle size, encapsulation efficiency and stability. Nano-cyclodextrin systems offer significant advantages, including enhanced solubility, improved bioavailability, reduced toxicity and site-specific drug delivery. However, challenges such as scale-up, reproducibility, regulatory compliance and long-term stability remain. The convergence of AI, CADD, nanotechnology and QbD provides a robust platform for accelerating nano-cyclodextrin development and advancing precision drug delivery for next-generation healthcare.

Keywords: *Cyclodextrins; Nano-cyclodextrin; Nanotechnology; Artificial Intelligence (AI); Computer-Aided Drug Design (CADD); Molecular Docking.*

O-05/N/005 ORAL · ONLINE

A Comprehensive Review on Nanogels: Advanced Formulation Techniques, Loading Strategies, and Stimuli-Responsive Therapeutic Applications

Ishika*

Department of Pharmaceutics, Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh
Email: ishika1009.mpharm25@chitkarauniversity.edu.in

Nanogels—nanoscale, three-dimensional cross-linked polymeric networks—have garnered significant attention as next-generation nanocarriers for precision therapeutics. Characterized by a tunable particle size (typically 20–200 nm), exceptional colloidal stability, and high water-binding capacity, nanogels provide an optimal thermodynamic environment for encapsulating easily degradable biopharmaceuticals (e.g., siRNA, oligonucleotides, and proteins) as well as conventional low-molecular-weight drugs. This review systematically evaluates current formulation methodologies, critically analyzing chemical cross-linking techniques—such as inverse miniemulsion polymerization, free radical precipitation polymerization, and click chemistry—alongside physical self-assembly driven by electrostatic and supramolecular interactions. Furthermore, we investigate the underlying mechanisms of drug loading, emphasizing how cross-linking density, polymer charge (e.g., using chitosan, hyaluronic acid, or PEGylated architectures), and mesh size dictate encapsulation efficiency and mitigate premature burst release. A major focus is directed toward the design of stimuli-responsive or "smart" nanogels. We detail the integration of thermo-responsive (e.g., poly(N-isopropylacrylamide)-based), pH-sensitive, and redox-cleavable (disulfide-crosslinked) moieties that facilitate precise, spatio-temporal intracellular drug release triggered by the pathological conditions of the tumor microenvironment. By summarizing recent preclinical data, this article highlights the role of nanogels in overcoming complex biological barriers, underscoring their translational potential in targeted oncology, neuropharmacology, and modern theranostics, while addressing the remaining challenges in clinical scale-up and pharmacokinetic profiling.

Keywords: *Nanogels, Stimuli-Responsive Delivery, Polymeric Nanoparticles, Tumour Microenvironment, Smart Nanocarriers.*

O-05/N/006 ORAL · ONLINE

Formulation and Evaluation of Topical Nanoparticulate Drug Delivery System for Onychomycosis

Amruta Chandrakant Menkudale*

Department of Pharmaceutics Sinhgad Technical Education Societie's Sinhgad Institute of Pharmacy, Narhe, Pune 411041. Maharashtra, India.
Email: amrutacmenkudale@gmail.com

Onychomycosis is a chronic fungal infection in which the dense keratinized nail plate limits drug penetration and reduces the effectiveness of conventional topical therapy. The present study aimed to develop and optimize Posaconazole-loaded nanosponges incorporated into nail lacquer (PNS-NL) to enhance localized antifungal delivery, sustain drug release and improve transungual permeation. Posaconazole nanosponges (PNS) were prepared by the emulsion solvent evaporation method and optimized using a Box-Behnken design. The optimized formulation showed a particle size of 230.7 nm, PDI 0.183, entrapment efficiency 92.35% and production yield 79.56%. FTIR, DSC and XRD studies confirmed drug-excipient compatibility and reduced drug crystallinity, while SEM revealed spherical porous nanosponges. The optimized nanosponges were incorporated into nail lacquer, which exhibited satisfactory film-forming properties and 98.25 ± 0.47% drug content. After 8 h, PNS-NL showed 49.34% drug release compared with 24.34% for Posaconazole nail lacquer (PSN-NL). Ex-vivo studies using goat hooves demonstrated improved transungual permeation with PNS-NL (15.43 ± 1.7 %) compared with PSN-NL (6.09 ± 1.7 %), along with enhanced drug retention. Antifungal evaluation against Trichophyton rubrum showed a 31.94 ± 0.82 mm zone of inhibition for PNS-NL. Stability studies indicated satisfactory formulation stability over four weeks. Overall, PNS-NL demonstrated improved drug release, transungual permeation, nail retention and antifungal activity, indicating its potential as an effective localized delivery system for the management of onychomycosis.

Keywords: *Onychomycosis, Nanosponges, Posaconazole, Nail lacquer, anti-fungal.*

O-05/N/007 ORAL · ONLINE

Integrative Evaluation of the Anticonvulsant Potential of Solanum lycopersicum L. Fruit Peel: Network Pharmacology, Molecular Modeling, and In Vivo Validation

Naznin Sarkar[1]*, Anil Kumar K V[1], Harsh V Shah[2]

[1]Department of Pharmaceutical Chemistry, Visveswarapura Institute of Pharmaceutical Sciences, Bengaluru-560070, Karnataka, India [2]Department of Pharmaceutical Chemistry, L. M. College of Pharmacy, Navrangpura, Ahmedabad-380009, Gujarat, India
Email: naznin.sarkar33@gmail.com

Epilepsy is a chronic neurological disorder characterized by recurrent seizures and considerable impact on quality of life. Limitations associated with conventional antiseizure medications highlight the need for additional therapeutic candidates. This study aimed to investigate the anticonvulsant potential of ethanolic Solanum lycopersicum L. fruit peel extract through an integrated computational and experimental approach. LC–MS profiling identified phytoconstituents, followed by drug-likeness and ADMET assessment using MolSoft and pkCSM. Network pharmacology was performed using established bioinformatics tools, followed by molecular docking using AutoDock Vina and 100 ns molecular dynamics simulations using GROMACS. Selected complexes were evaluated for structural stability, binding energetics, MM-PBSA, PCA, and FEL. In vivo anticonvulsant activity was evaluated using the maximal electroshock-induced seizure (MES) model in mice, with phenobarbitone as the standard drug. LC–MS identified 38 phytoconstituents, while network pharmacology revealed 226 overlapping epilepsy-associated targets. CACNA1G and AKT1 were selected for further investigation. β-Carotene showed the highest docking affinity toward CACNA1G (−11.5 kcal/mol), whereas brassicasterol showed the highest affinity toward AKT1 (−11.9 kcal/mol). The selected complexes demonstrated favorable stability and binding energetics. The extract produced a dose-dependent anticonvulsant effect, with 400 mg/kg showing the most pronounced activity. Collectively, these findings support the anticonvulsant potential of S. lycopersicum fruit peel and warrant further investigation as a plant-derived therapeutic candidate for epilepsy.

Keywords: *Solanum lycopersicum; Molecular docking; Molecular dynamics; AKT1; CACNA1G; Anticonvulsant*

O-05/N/008 ORAL · ONLINE

Preparation and Evaluation of Curcumin and Eugenol-Loaded Nanofiber Periodontal Films by Electrospinning

Niketa Bisht*

Department of Pharmaceutical Chemistry, GHG Khalsa College of Pharmacy, Gurusar, Sadhar
Email: nikitabisht2411@gmail.com

The present study aimed to develop and evaluate a polyvinyl alcohol (PVA)-based nanofiber periodontal film containing curcumin and eugenol, with piperine as a bioenhancer, using electrospinning for localized and sustained drug delivery. Different formulations were prepared by varying PVA concentration and flow rate. The optimized formulation, F7, containing 9% w/v PVA and prepared at a flow rate of 0.3 mL/hr, produced smooth, uniform, and bead-free nanofibers with a percentage yield of 69.12%. F7 showed high entrapment efficiencies of curcumin (88.51%), piperine (85.77%), and eugenol (86.44%), along with satisfactory physicochemical and mechanical properties. SEM analysis confirmed the formation of continuous and uniform nanofibers. The formulation exhibited sustained drug release, achieving approximately 96–98% release over 24 h, whereas the pure drugs showed faster release. Drug-release kinetics showed the best fit to the Higuchi model, indicating diffusion-controlled release with anomalous transport. The optimized film remained physically and microbially stable during the 3-month stability study. Molecular docking studies against NF-κB p65 (PDB ID: 4Q3J) demonstrated favorable binding interactions for curcumin, piperine, and eugenol, supporting their potential anti-inflammatory activity. Overall, the developed nanofiber film demonstrated promising characteristics as a localized and sustained periodontal drug-delivery system and warrants further investigation.

Keywords: *Curcumin; Eugenol; Piperine; Electrospinning; Nanofibers; Periodontal drug delivery.*

O-05/N/009 ORAL · ONLINE

Targeting the JAK–STAT Signaling Pathway in Autoimmune Skin Diseases: Therapeutic Advances, Clinical Evidence and Future Perspectives

Kiran Hiralal Patil*

SVKM NMIMS Global University School of Pharmacy and Technology Management Dhule
Email: khpatil2410@gmail.com

Autoimmune skin diseases comprise a diverse group of chronic inflammatory disorders characterized by dysregulated immune responses, persistent inflammation, and significant effects on patients' quality of life. The Janus kinase signal transducer and activator of transcription (JAK STAT) signaling pathway is implicated in the pathophysiology of a number of autoimmune and immunological-mediated dermatological illnesses as a crucial intracellular modulator of cytokine driven immune responses. As a result, focusing on JAK signaling has become a significant therapeutic approach, resulting in the creation of pan-JAK and specific inhibitors with unique pharmacological characteristics. This review addresses the therapeutic potential of JAK inhibitors that target JAK1, JAK2, JAK3, and tyrosine kinase 2 (TYK2) and gives a thorough description of the molecular involvement of the JAK–STAT pathway in autoimmune skin disorders. The effectiveness and safety of these treatments in conditions including psoriasis, psoriatic arthritis, atopic dermatitis, alopecia areata, vitiligo, lichen planus, and other immune-mediated dermatological illnesses are thoroughly examined. In addition to significant safety concerns related to JAK inhibition, special attention is given to illness-specific outcomes, including as clinical response, skin clearance, improvement in disease severity, and patient-reported outcomes. New methods are also investigated, such as topical JAK inhibitors, biomarker-guided treatment, selective kinase inhibition, and sophisticated drug delivery systems. Finally, current challenges and future research opportunities are highlighted to support the development of safer, more selective, and personalized JAK–STAT targeted therapies for autoimmune skin diseases.

Keywords: *Janus Kinase Inhibitors, Autoimmune, JAK-STAT, Cytokines, Tyrosine Kinase, Biomarker.*

O-05/N/010 ORAL · ONLINE

Formulation and Evaluation of CD44-Targeted Liposomes for Synergistic Co-Delivery of Anti-Cancer Drugs in Colon Cancer

Are Pradeepthi*

Research Scholar, Department of Pharmaceutics, MB School of Pharmaceutical Sciences, Mohan Babu University, Tirupati – 517102, Andhra Pradesh, India
Email: pradeepthi.a@gmail.com

Colon cancer remains a leading cause of cancer-related mortality worldwide, and conventional chemotherapy is constrained by systemic toxicity, poor tumour selectivity, and multidrug resistance. Liposomal nanocarriers functionalized with hyaluronic acid allow active targeting of CD44, a receptor overexpressed on colon cancer stem cells, offering a route to tumour-selective delivery of combination chemotherapeutics. This work aims to formulate and evaluate CD44-targeted, PEGylated stealth liposomes for the synergistic co-delivery of two anticancer agents, designated Compound A (a semisynthetic topoisomerase I inhibitor) and Compound B (a natural quinone phytoconstituent), for the treatment of colon cancer. Liposomes were prepared by the thin-film hydration method using hydrogenated soy phosphatidylcholine, cholesterol, and DSPE-PEG2000, followed by surface conjugation with hyaluronic acid for CD44 targeting; formulation variables including lipid ratio, drug loading, PEG concentration, and hyaluronic acid density were optimized using a Box-Behnken design. Liposomes of the target size range with uniform vesicle morphology and reproducible batch formation were successfully prepared. Comprehensive physicochemical characterization (particle size, zeta potential, polydispersity, encapsulation efficiency) and subsequent in vitro and in vivo evaluation are currently in progress and will be presented. Preliminary formulation outcomes support the feasibility of CD44-targeted stealth liposomes as a dual-drug delivery platform for colon cancer, with characterization and efficacy studies ongoing to validate this synergistic co-delivery strategy.

Keywords: *Colon cancer; CD44 targeting; Stealth liposomes; Hyaluronic acid; Co-delivery; Nanomedicine*

O-05/N/011 ORAL · ONLINE

Dual Drug Delivery for Anemia

Geeta Bhagwat*

Department of Pharmaceutical Sciences, D Y Patil University School of Pharmacy, Navi Mumbai
Email: geeta.bhagwat@dypatil.edu

Iron deficiency anemia (IDA) is a common nutritional problem worldwide, especially in women and children. Taking oral iron therapy often causes GIT Irritation, poor absorption, poor compliance, and limited bioavailability. Whereas, administering it parenterally is invasive and can cause unwanted side effects. This urge a need for a new way to deliver iron that is safe, easy to use, and minimally invasive. The present study aimed to develop an iron-loaded Nanostructured lipid nanocarrier (NLCs) incorporated into a dissolving Microneedle Patch.The Nanocarrier were made using Liquid and solid Lipid, surfactants, and stabilizers. The optimized NLCs were incorporated into microneedle patches using a technique called micro molding. The Formulations were evaluated for particle size, polydispersity index, zeta potential, entrapment eficiency, drug release, FTIR analysis for compatibility, morphology, and stability.The optimized NLCs showed about 165nm particle size, PDI of 0.395,and zeta potential of -19.1mV, with high entrapment efficiency and sustained drug release.The patches demonstrated strong mechanical strength, skin insertion, drug distribution, dissolution and transdermal penetration.They stayed stable for one month with no big changes in their properties. These microneedle patches with NLCs are a promising new way to deliver iron through the skin. They could be a better option than current methods for treating iron defciency anemia.

Keywords: *Dual drug delivery, Anemia, Nanocarriers, Iron deficiency, microneedle patches, NLCs.*

O-05/N/012 ORAL · ONLINE

Biogenic Synthesis of Copper Nanoparticles with Psoralea corylifolia Seed Extract: A Novel Approach

Ramyasree Maddu*

Department of Regulatory affairs, Vishnu Institute of Pharmaceutical education and research
Email: ramyasree.maddu@gmail.com

One of the latest fields of study in contemporary nanotechnologies and nanoscience is the application of biomaterials in nanoparticles creation. More and more investigation is being done using green techniques to produce metal oxide nanoparticles in an effort to avoid the potential risks associated with hazardous chemicals in a safe and non-toxic environment. This work represents a fresh approach to nanoscience as we generated copper nanoparticles utilizing extract from Psoralea corylifolia seeds. Upon visual inspection, the hue changed from brown to blue green, indicating unequivocally that copper nanoparticles were synthesized under various parameters, including pH, temperature, concentration ratio, and duration. In addition to their antibacterial action, the produced nanoparticles have been evaluated for their UV visible absorption spectra and particle size studies. The surface plasmon resonance typical of copper nanoparticles was identified by UV-vis analysis, and the characteristic absorption peak was found at 224 nm with a particle size distribution of 117.8 nm. An excellent zone of inhibition was produced by the antibacterial activity against two gram-positive and two gram-negative bacteria. Consequently, it would be advantageous to use these Psoralea corylifolia green nanoparticles in a variety of drug delivery techniques.

Keywords: *Biogenic synthesis, Copper nanoparticles, Psoralea corylifolia, Novel approach.*

O-05/N/013 ORAL · ONLINE

Formulation and Evaluation of nano-emulsion gel of Berberine hydrochloride

Jasvir Kaur Rahelu*, Shubam Kumar

G.H.G Khalsa College of Pharmacy Gurusar Sadhar
Email: sangha5161@gmail.com

Berberine hydrochloride has long been used as a cure by traditional doctors in India and China. Berberine hydrochloride is widely used in indigenous communities for a number of purposes, either as a coloring agent, anti-microbial agent, anti-hypertensive agent, anticancer and for the treatment of numerous illnesses in ayurveda. The aim of study is to develop, formulate and evaluate the penetration and as well as anti- microbial activities of a Berberine hydrochloride loaded nano-emulsion gel. Berberine hydrochloride nano-emulsion gel will increase bio-availability, stability, therapeutic effectiveness, and permeability. Berberine hydrochloride is a naturally occurring polyphenolic compound having anti-inflammatory and anti-microbial properties. But the pharmacological effectiveness was challenging in clinical studies, owing mainly with its poor solubility. The development of Berberine hydrochloride loaded nano-emulsion gel has shown increased topical permeability and anti-bacterial activity. To create the nano-emulsion area with help of pseudo-ternary phase diagram. As a gelling agent, carbopol-934 is applied. Oil in water nano-emulsion was prepared by the water titration method, using Tween 20, glycerol and olive oil such as surfactant, co- surfactant and oil phase. The nano-emulsion was evaluated using particle size, polydispersity index, zeta potential, physical stability, and morphology. Berberine hydrochloride In vitro permeability was investigated using a Franz diffusion cell and diffusion membrane. Berberine hydrochloride nano-emulsion showed more stable compare than Berberine hydrochloride in powder form. Also, nano-emulsion gel increased the penetration flow of Berberine hydrochloride from hydrophilic matrix gel considerably.

Keywords: *Berberine Hydrochloride; Herbal Nano-emulsion; Pseudo-Ternary Phase Diagram; Anti-fungal Activity; In vitro release Study.*

O-05/N/014 ORAL · ONLINE

Nanotechnology-Enabled Intranasal Nose-to-Brain Drug Delivery: A Promising Approach for Epilepsy Management

Amol D. Rahane*, Aarti V. Belgamwar
SVKM NMIMS Global University, Dhule
Email: rahane2211@gmail.com

Epilepsy is a chronic neurological disorder characterized by recurrent seizures and remains a major therapeutic challenge due to pharmacoresistance, systemic adverse effects, inadequate brain exposure, and limited penetration of therapeutic agents across the blood–brain barrier (BBB). Conventional oral and parenteral administration may cause variable bioavailability, hepatic first-pass metabolism, delayed therapeutic action, and subtherapeutic drug concentrations at epileptogenic sites. Nanotechnology-assisted intranasal drug delivery has emerged as a promising approach to overcome these limitations by exploiting the anatomical connection between the nasal cavity and brain. Intranasally administered nanocarriers can facilitate drug transport through olfactory and trigeminal pathways, potentially bypassing the BBB and enhancing brain targeting. Various nanocarriers, including solid lipid nanoparticles, nanostructured lipid carriers, polymeric nanoparticles, nanoemulsions, liposomes, micelles, and chitosan-based systems, have demonstrated potential for improving solubility, stability, nasal residence, mucosal permeation, and controlled drug release. Recent studies have explored intranasal curcumin-loaded lipid nanoparticles, phenytoin-loaded nanostructured lipid carriers, and stimuli-responsive nanodrug systems for seizure management. However, challenges involving mucociliary clearance, limited administration volume, formulation stability, nanoparticle toxicity, nasal deposition, device selection, and confirmation of true brain targeting remain. Future research should emphasize biodegradable, mucoadhesive, targeted, and stimuli-responsive nanocarriers with robust pharmacokinetic, pharmacodynamic, biodistribution, and safety evaluation to facilitate clinical translation.

Keywords: *Epilepsy, Intranasal drug delivery, Nose-to-brain delivery, nanocarriers, nanoparticles, brain targeting.*

O-05/N/015 ORAL · ONLINE

Advancing role of Paclitaxel in Breast Cancer Treatment

Priyanka Kriplani*[1], Rameshwar Dass[1]
[1]Guru Gobind Singh College of Pharmacy, Yamunanagar-135001, Haryana, India
Email: priyanka15n@gmail.com

Introduction: Over last 20 years paclitaxel has emerged as a major cause of death among women's. As a member of taxane family of anticancer agents, it has discrete mode of action and good clinical potential widely used in the management of breast cancer. This normally averts formation of mitotic spindle, halting cell division causing apoptosis. It is used both alone or in combination with other anticancer drugs or treatments in early and metastatic breast cancer.

Methods: Various nanoformulations like ethosomes, novasomes, Nano emulsions, liposomes, nano lipid carriers, solid lipid carriers of paclitaxel alone or in combinations are being studied in literature for conducting invitro studies on cell lines and invivo studies on animals along with clinical trials in humans.

Result and Discussion: Preparing nanoformulations of paclitaxel along with their optimization has contributed significantly to reduce the side effects associated with drug, improved patient compliance thereby overall breast cancer management.

Conclusion: Paclitaxel has contributed a lot towards breast cancer management and its advancements is further creating improved treatment. Nowadays phytoconstituents along with have emerged to improve treatment and reduce side effects increasing the patient compliance.

Keywords: *Breast, Cancer, Combination therapies, Nanoformulations, Paclitaxel*

O-05/N/016 ORAL · ONLINE

Transferosome-Mediated Dermal Delivery: A Promising Strategy for Melasma Therapeutics

Manshu*, Anjali Sharma, Geeta Deswal
Guru Gobind Singh College of Pharmacy, Yamuna nagar (135001), Haryana, India
Email: manshuranamr5911@gmail.com

Melasma is a common, chronic skin condition that causes brown or gray-brown patches on the face. Most common on sun-exposed areas like the cheeks, forehead, bridge of the nose and upper lip. Globally, women account for approximately 90% of all melasma cases. Men make up roughly 10% of cases globally. Conventional topical therapies include depigmenting agents, antioxidants, retinoids and other pigment-modulating formulations, which are often limited by poor skin penetration, instability, irritation, variable therapeutic response and recurrence. Transferosomes emerged as a promising nanovesicular system applied for transdermal and topical drug delivery. Transferosomes are highly deformable lipid vesicles composed of phospholipids and edge activators that enhance flexibility and surface hydrophilicity, enabling them to overcome the barrier properties of the stratum corneum. Their deformable structure allows better interaction with the skin, and hydration-gradient-driven transport facilitates delivery of both lipophilic and hydrophilic compounds, including larger molecules, peptides, proteins, and nucleic acids. This results in enhanced overall permeation, controlled release and improved localised deposition of the therapeutic agents in the skin layers. Additionally, transferosomes increase stability by protecting encapsulated drugs from degradation caused by oxidation, light, and temperature. The study highlights the potential of transferosome nanovesicles as an advanced topical delivery platform that can overcome limitations associated with conventional formulations and improve localised dermal delivery of therapeutic agents for dermatological applications in the management of melasma.

Keywords: *Transferosomes, Nanovesicular delivery, Topical delivery, Dermal delivery, Melasma, Skin penetration, Skin deposition.*

O-05/N/017 ORAL · ONLINE

Recent Advances in Lipid-Based Nanocarriers for Topical Management of Melasma

Nikita Devi*, Anjali Sharma, Geeta Deswal
Guru Gobind Singh College of Pharmacy, Yamunanagar (135001), Haryana, India
Email: nr3972210@gmail.com

Melasma affects 8.8% of Latin American females in the southern USA and 40% of the population in south-east Asia; in Indian studies, men account for roughly 10% to 20.5%, and 20–30% of women aged 40–65 present with facial melasma. Melasma is a common acquired pigmentary skin disorder characterized by a symmetrical macular pigmentation of sunexposed areas like the face. Many topical and systemic therapeutic agents, as well as non-pharmacologic procedural treatments, have been explored for melasma; however, widely used options have drawbacks, including insufficient clinical efficacy, relapse risk, and a high incidence of adverse drug reactions. The conventional modalities had their own limitations, and to address those limitations, nanocarriers are employed to overcome problems with conventional approaches The use of Lipid-based nanocarriers, including solid lipid nanoparticles (SLNs), nanostructured lipid carriers (NLCs), liposomes, nanoemulsions, transferosomes, and ethosomes, has emerged as promising systems for topical delivery of anti-melanogenic agents. Their nanoscale size, lipid composition, and skin-compatible characteristics can enhance drug solubilization, protect active compounds from degradation, improve penetration into the epidermis and superficial dermis, and provide prolonged drug retention and controlled release. Thus, lipid-based nanocarriers are a promising, innovative approach for targeted, controlled, and safer topical therapy for melasma.

Keywords: *Melasma, Topical drug delivery, Lipid-based nanocarriers, Depigmenting agents,*

O-05/N/018 ORAL · ONLINE

A Nanotechnology-Enabled Synergistic Approach to Antibacterial Therapy

Paayush Kumar*, Binu Raina
Department of Pharmaceutics, Guru Gobind Singh College of Pharmacy, Yamuna Nagar, Haryana
Email: paayushkumar8@gmail.com

Antibacterial resistance is a major global health threat. Bacterial antimicrobial resistance was estimated to be associated with more than 4.7 million deaths globally in 2021. Bacteria can develop resistance through mechanisms such as biofilm formation, altered membrane permeability, active drug efflux, and enzymatic degradation, which further complicates the management of bacterial infections. Phytoconstituents have gained attention as potential antimicrobial adjuvants due to their multitarget activity and ability to enhance bacterial susceptibility to conventional antibiotics. However, the clinical potential is often limited by poor aqueous solubility, limited stability, low bioavailability, and inefficient delivery to the desired site. Nanocarriers offer an additional benefit by improving delivery, stability, and therapeutic performance in such combinations. Co-delivering conventional antibacterial agents with phytoconstituents such as flavonoids, alkaloids, and tannins may offer complementary mechanisms of action, potentially enhance antibacterial activity and reduce the need for increased antibiotic exposure. These strategies additionally influence the bacterial defence mechanisms associated with persistence and reduced susceptibility, including biofilm formation and efflux-related resistance. This research aims to develop a nanocarrier that combines an antibiotic and phytoconstituents in a single delivery system to provide enhanced synergistic antibacterial activity as a potential approach to antibacterial resistance.

Keywords: *Antibacterial resistance, mechanism of resistance, Phytoconstituents, bioavailability, Nanocarriers*

O-05/N/019 ORAL · ONLINE

Invasomes as Advanced Vesicular Carriers for Enhanced Transdermal Drug Delivery

Sahil*, Priyanka Kriplani
Guru Gobind Singh College of Pharmacy, Yamunanagar (135001), Haryana, India
Email: sahilsainidhanani1@gmail.com

Transdermal drug delivery systems (TDDS) deliver drugs through the skin to produce local or systemic therapeutic effects. However, the stratum corneum acts as the major barrier, limiting drug permeation through the skin. Major challenges in transdermal drug delivery include the barrier properties of the stratum corneum, drug properties, skin variability, irritation, and limited suitability for high-dose or large-molecular-weight drugs. Invasomes enhance drug permeation by increasing skin lipid fluidity through ethanol and terpenes, while their flexible vesicles help the drug penetrate deeper into the skin. Invasomes are promising vesicular carriers because the combination of phospholipids, ethanol, and terpenes provides greater vesicle flexibility and enhances skin permeation, thereby improving drug delivery across the stratum corneum. Advanced studies can focus on skin deposition, drug permeation kinetics, and long-term stability. They can also include skin safety and in vivo therapeutic efficiency to support their potential for transdermal drug delivery. Additionally, researchers must address current challenges related to physical stability, scale-up, and regulatory considerations. Overall, invasomes represent a promising platform for enhanced transdermal drug delivery, but further research is needed for clinical and commercial translation.

Keywords: *Invasomes, Transdermal delivery, skin permeation, vesicle deformability, terpenes, skin permeation enhancement.*

O-05/N/020 ORAL · ONLINE

Nanotechnology-Based Transdermal Drug Delivery Approaches for the Management of Osteoarthritis

Jatin*, Priyanka Kriplani

Department of Pharmaceutics, Guru Gobind Singh College of Pharmacy, Yamuna Nagar, Haryana
Email: jatinsindhwani233@gmail.com

Introduction: Osteoarthritis is a chronic and progressive joint disorder, mainly associated with joint pain, stiffness, inflammation and reduced physical function. It is an important cause of debility worldwide, and its burden is continuously increasing with population ageing, obesity and other risk factors. According to the Global Burden of Disease (GBD) 2021 evaluation, around 607 million people worldwide had osteoarthritis in 2021. Global cases increased from around 256 million in 1990 to 607 million in 2021, highlighting the disease's growing burden.

Aim & Objective: This study aimed to highlight the potential of nanotechnology-based transdermal drug delivery approaches in managing osteoarthritis, emphasising the limitations of conventional therapy, transdermal delivery challenges, and the possible benefits of nanoformulation.

Results: - Available scientific literature suggests that nanotechnology-based formulations can improve skin permeation and drug delivery through small particle size, improved drug-skin interaction, increased solubility, and controlled drug release.

Conclusion: Nanotechnology-based transdermal drug delivery may be a capable therapeutic approach for OA management. However, additional research is needed to establish clinical effectiveness, safety, and long-term applicability.

Keywords: *Osteoarthritis, Transdermal drug delivery, Nanotechnology, Nano formulation, Skin permeation, Drug Delivery*

O-05/N/021 ORAL · ONLINE

Role Of Inflammation in Wound Healing Via Liposomes

Himansu Saini*, Rameshwar Dass

Guru Gobind Singh College of Pharmacy, Yamuna Nagar-135001, Haryana, India
Email: himansusaini50@gmail.com

Wound healing is a complex biological process in which inflammation plays a vital role in protecting the injured tissue and initiating tissue repair. A controlled and well-regulated inflammatory response can help eliminate microorganisms and damaged cells while supporting tissue regeneration. However, prolonged inflammation leads to delayed healing, resulting in chronic wounds. Liposomes have emerged as a promising drug delivery system that has the ability to improve the drug localization and can provide controlled drug release. This work aims to explore the role of inflammation in wound healing and to understand the involvement of inflammatory responses. The objective is to understand the role of inflammatory cells and their mediators during wound repair, explore the advantages of liposomes in localized drug delivery, and their potential role in tissue repair. Relevant literature was reviewed on inflammation, wound healing, liposomal drug delivery, and tissue regeneration. The available literature indicates that liposomal drug delivery can enhance drug localization and provide sustained release at the wound site, thereby helping regulate excessive inflammation. It also promotes subsequent stages of healing by supporting processes such as cell proliferation, angiogenesis, collagen deposition, and re-epithelialization. Overall, liposomal drug delivery represents a promising strategy for modulating the inflammatory phase of wound healing, leading to effective tissue regeneration.

Keywords: *Wound healing, inflammation, tissue regeneration, angiogenesis, sustained release*

O-05/N/022 ORAL · ONLINE

Transferosomes as Promising Nanovesicular Carriers for Enhanced Skin Delivery

Simran Devi*, Anjali Sharma
Guru Gobind Singh College of Pharmacy, Yamunanagar (135001), Haryana, India
Email: simmigirnu@gmail.com

Transdermal drug delivery remains an attractive alternative to oral and parenteral routes because it avoids hepatic first-pass metabolism, reduces gastrointestinal degradation, and improves patient compliance. The stratum corneum represents a formidable barrier that often limits the permeation of most therapeutic molecules across the skin. Transferosomes, ultra-deformable lipid vesicles composed of phospholipids and an edge activator such as sodium cholate, Span, or Tween, have gained significant attention as innovative carriers that can overcome this barrier. This deformability enables transferosomes to pass through skin pores far smaller than their diameter and penetrate intact skin along the natural hydration gradient, delivering both hydrophilic and lipophilic drugs to deeper skin layers and into systemic circulation without significant vesicle rupture. Overall, transferosomes represent a promising platform for enhanced transdermal delivery. This study focuses on the composition, formulation approaches, and characterization techniques of transferosomes along with current challenges related to physical stability, scale-up, and regulatory considerations.

Keywords: *Transferosomes, transdermal delivery, edge activator, skin permeation, elastic vesicles*

O-05/N/023 ORAL · ONLINE

Role of Nanoformulation in delivery of BCS Class II drugs

Muskan*, Rameshwar Dass
Guru Gobind Singh College of Pharmacy, Yamuna Nagar-Pin no 135001, Haryana, India
Email: mandhanmuskan349@gmail.com

Biopharmaceutics classification system (BCS) Class II drugs are characterized by low aqueous solubility and high membrane permeability, making poor dissolution a major limitation to their oral absorption and bioavailability. Conventional formulations of these drugs may therefore show variable therapeutic effects and require higher doses. Nanoformulation-based drug delivery systems have emerged as an effective approach to overcome these limitations. Reduction of drug particle size to the nanometer range increases the surface area available for dissolution and can enhance the apparent solubility and dissolution rate of poorly water-soluble drugs. Various nanocarriers including drug nanocrystals, polymeric nanoparticles, nanoemulsions, liposomes, solid lipid nanoparticles and nanostructured lipid carriers have been investigated to improve drug solubilization, gastrointestinal absorption, stability and bioavailability. In addition, nanoformulations can provide controlled drug release and depending on the carrier system, improve drug localization and therapeutic performance. This review discusses the fundamental challenges associated with BCS Class II drugs and the highlight the role of nanoformulation (nanoemulsion) strategies in enhancing their dissolution, absorption and bioavailability. The potential advantages, limitations and future perspectives of nanotechnology-based approaches for the delivery of BCS Class II drugs are also discussed.

Keywords: *BCS Class II drugs, Nanoformulations, Nanoemulsions, Solubility enhancement, Drug dissolution, Bioavailability.*

O-05/N/024 ORAL · ONLINE

Lipid Nanocarriers in Topical Drug Delivery: Enhancing Skin Penetration for the Management of Post-Inflammatory Hyperpigmentation

Priyanka Paul*, Anjali Sharma
Guru Gobind Singh College of Pharmacy, Yamunanagar (135001), Haryana, India
Email: paulpriyanka230698@gmail.com

Post-inflammatory hyperpigmentation is a common consequence of inflammatory dermatoses. It is a common dermatological condition characterized by excessive melanin accumulation in the epidermis, dermis, or both which builds up after injury or inflammation from acne, eczema, psoriasis and similar skin conditions. It impacts all skin tones with a heightened predilection for Fitzpatrick skin types (FST) III-VI. Conventional treatments (including arbutin, hydroquinone (HQ), kojic acid, L-ascorbic acid, and azelaic acid) are mainly based on tyrosinase inhibition; however, many depigmenting agents have limitations, including low stability, poor skin permeation, prolonged treatment durations, chemical instability, cytotoxicity and adverse effects such as irritation and dermatitis. Recent advances in nanotechnology have positioned nanostructured lipid carriers (NLCs) as promising platforms for transdermal drug delivery. NLCs incorporate both solid and liquid lipids, creating an imperfect lipid matrix that significantly enhances loading capacity, minimizes drug leakage, and enables tunable release kinetics; they also enhance the penetration and retention of active compounds within the skin, promote controlled release, improve chemical stability, and increase drug accumulation in the epidermis and dermis. In addition, their occlusive properties and strong interaction with the stratum corneum improve dermal delivery of both lipophilic and hydrophilic compounds; this gives formulators more flexibility than conventional drug delivery systems, and evidence so far shows them to be a safer, more reliable option for treating PIH than conventional topical treatments. This study provides a forward-looking perspective on the evolving role of NLCs as next-generation lipid nanocarriers for dermatological therapy and advanced skin care.

Keywords: *Post-inflammatory hyperpigmentation, chemical instability, cytotoxicity, transdermal drug delivery, lipid-based drug delivery.*

O-05/N/025 ORAL · ONLINE

Emerging Frontiers in Lung Cancer Therapeutics: The Convergence of Drug Repurposing and Nanoscale Delivery Systems

Ruhi Saini*, Priyanka Kriplani
Guru Gobind Singh College of Pharmacy, Yamunanagar -135001, Haryana, India
Email: ruhisain2002@gmail.com

Background: Lung cancer is a leading cause of cancer-related mortality worldwide. Conventional cancer treatments are frequently related to systemic toxicity, drug resistance, poor absorption, and limited drug accumulation at the tumour site, despite significant improvements in the field. Drug repurposing is a new approach that investigates the use of licensed medications for novel therapeutic purposes. Repurposed medications can be developed into nanosystems using nanotechnology to enhance their solubility, stability, bioavailability, controlled release, and tumour-specific drug delivery.

Aim: To investigate drug repurposing-based nanoformulation as a viable lung cancer therapeutic strategy.

Objectives: To identify current medications with potential anticancer activity, study their mechanisms of action, develop appropriate nanoformulations, and assess their ability to increase the therapeutic efficacy of repurposed medications for lung cancer.

Results and Discussion: Through mechanisms including prevention of cancer cell growth, activation of apoptosis, suppression of inflammation and angiogenesis, and regulation of key signalling pathways, several licensed medications have shown promising anticancer benefits. By improving drug solubility, stability, bioavailability, cellular absorption, and controlled release, nanoformulation of repurposed medications may overcome many drawbacks of traditional drug administration. It may also reduce undesired systemic exposure and increase drug accumulation at the tumour site. Thus, combining drug repurposing with nanotechnology offers a viable and possibly economical approach to treating lung cancer.

Conclusion: Drug repurposing-based nanoformulation is a viable method for enhancing the therapeutic potential of currently available medications against lung cancer. To determine their safety, efficacy, appropriate formulation, and clinical applicability, more preclinical and clinical research is needed.

Keywords: *Drug Repurposing, Nanoformulation, Nanotechnology, Drug delivery, Anticancer therapy, Tumour targeting*

O-05/N/026 ORAL · ONLINE

Novasomal Nanocarriers for Targeted Therapeutics in Osteoarthritis

Vanshika*, Priyanka Kriplani
Guru Gobind Singh College of Pharmacy, Yamunanagar (135001), Haryana
Email: vanshika72068@gmail.com

Osteoarthritis (OA) is a progressive degenerative joint disorder characterized by cartilage degradation, synovial inflammation, pain, stiffness, and impaired joint function. Conventional pharmacological management primarily relies on non-steroidal anti-inflammatory drugs (NSAIDs), analgesics, and intra-articular therapies, which may provide symptomatic relief but are often associated with limited drug retention, repeated dosing, systemic adverse effects, and inadequate site-specific delivery. Nanovesicular drug delivery systems have therefore emerged as promising approaches for improving the therapeutic performance of anti-osteoarthritic agents. Among these, novasomes represent an innovative class of elastic nanovesicular carriers composed of phospholipids and surfactants, offering enhanced flexibility, drug encapsulation, and controlled drug release. Novasomes may also improve the solubility and bioavailability of poorly water-soluble therapeutic agents and reduce dosing frequency, thereby enhancing patient compliance. Incorporating anti-inflammatory, analgesic, or disease-modifying agents into novasomes could provide a more targeted and controlled therapeutic approach than conventional formulations. Overall, novasome-based delivery systems offer considerable potential for overcoming limitations associated with conventional OA therapy. This study highlights the potential of novasome-based nanovesicular drug delivery as an advanced strategy for OA management.

Keywords: *Osteoarthritis, Novasomes, Nanovesicular, Targeted Drug Delivery, Controlled Release, Anti-inflammatory Therapy.*

O-05/N/027 ORAL · ONLINE

Nanotechnology and Transitional Approaches: Shaping the Next Generation of Pharmaceutical Drug Delivery

Khushi Tiwari*, Shreya Singh
Shiv Bali Singh Groups of Educational and Training Institute, College of Pharmacy, Malwan, Fatehpur, Uttar Pradesh, India
Email: khushitiwari3692@gmail.com

Nanotechnology is emerging as a transformative approach in the pharmacuetical sciences, providing innovative solutions to overcome the conventional drug delivery system By manipulating materials at the nanoscale, nanotechnology enables improved drug solubility, bioavailability, stability and control release to the targeted delivery. Nanocarriers such as nanoemulsions, dendrimers, nanoparticles and nanostructured lipid carriers, dendrimers are highly investigated for delivering drugs to the targeted specific cells and tissues. The transition from conventional formulations to next generation nano enabled therapeutics represented an important advancement and personalized medicine. Hereby the Emerging approaches include: stimuli responsive nanoparticles, smart biomimetic nanoparticles and nanorobotic drug delivery. Have the potential to make drug delivery faster and effective while reducing systemic toxicity. These technology promises in areas such as gene delivery, antimicrobial therapy and neurological disorders. However, challenges related to nanotoxicity, large scale manufacturing and regulatory approval, long term safety must be addressed before widespread clinical application.

Keywords: *Nanotechnology, Nanomedicine, Targeted Drug Delivery, Pharmacuetical Sciences, Nanotoxicity.*

O-05/N/028 ORAL · ONLINE

Smart Nanoparticles in Cancer Therapy: Targeted Delivery for Precision Treatment

Shabnoor Fatma*, Govind Kumar

Shiv Bali Singh Group of Educational and Training Institute, College of Pharmacy, Malwan, Fatehpur, Uttar Pradesh, India
Email: fshabnoor708@gmail.com

Limited efficacy and severe side effects often result in suboptimal outcomes to solid tumor therapies. In contrast, the reduced side effects and potential long-term benefits of tumor immunotherapy offer promise, notwithstanding the challenges of variable patient responses and immune-related adverse events hindering its widespread application. Recent advances in mRNA technology have revolutionized cancer immunotherapy. The versatility of mRNA as a vaccine and therapeutic agent is evident in it overcoming the limitations of traditional approaches by reducing *in vivo* toxicity and enhancing immune response activation. The synergy between mRNA technology and immunotherapy is increasingly being utilized to improve cancer treatment efficacy. One critical aspect of maximizing the therapeutic impact of mRNA-based treatments is the selection of an effective delivery system. Due to their size properties and material characteristics, nanoparticles offer a transformative solution, enabling the targeted and efficient delivery of mRNA to tumor tissues or immune cells. This precision delivery mechanism significantly enhances the effectiveness of immunotherapy, and represents a significant advance in cancer treatment. This review aims to explore how mRNA delivery via nanoparticles enhances tumor immunotherapy. Examination of its applications and challenges provides insights and strategic perspectives to advance this innovative therapeutic approach.

Keywords: *Lipid nanoparticles, mRNA technology, mRNA vaccine, Polymer nanoparticles, Tumor immunotherapy.*

O-05/N/029 ORAL · ONLINE

Development and Evaluation of PLGA-TPGS coated Nanoparticles of Capecitabine

Abhishek Borgude*, Akhil Kumar, Charan Singh, Vikas Sharma, Sankha Bhattacharya

Department of Pharmaceutics, ISF College of Pharmacy, GT Road (NH-95), Ghal Kalan, Moga, Punjab-142001, India
Email: abhishekborgude5@gmail.com

Capecitabine is an oral pro-drug of 5-fluorouracil which is a fluoropyrimidine; however, the delivery of drugs through traditional methods can pose variability in terms of drug exposure and systemic side-effects. Nanoparticle mediated drug delivery provides a means through which drugs can be released and delivered in a controlled manner. In this regard, the aim of the current study was the design and evaluation of capecitabine loaded poly(lactic-co-glycolic acid) (PLGA)- tocopheryl polyethylene glycol succinate (TPGS) nanoparticles. These nanoparticles were synthesized using PLGA, TPGS, capecitabine and polyvinyl alcohol (PVA) via the solvent evaporation technique. The formulations were optimized in terms of polymer and surfactant concentration and evaluated for particle size, polydispersity index (PDI), zeta potential, entrapment efficiency, morphological properties, in-vitro drug release, Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), haemolysis and stability studies. The optimized nanoparticles had a particle size of 291nm, a PDI of 0.222, zeta potential of −0.02 mV, and an entrapment efficiency of 91.07%. The scanning electron microscopy of the particles showed a mostly smooth and spherical shape. The in-vitro drug release showed that these nanoparticles sustained drug release in contrast to plain capecitabine. The results from FTIR and XRD confirmed capecitabine incorporation within the nanoparticles. Haemolytic and stability studies showed the least haemolysis and stability at 2-10°C for 30 days.

Keywords: *Capecitabine; PLGA; TPGS; Nanoparticles; Solvent evaporation; Controlled release.*

O-05/N/030 ORAL · ONLINE

Lipid Polymer Hybrid Nanoparticles for Enhanced Delivery and Bioavailability of Poorly Soluble Drugs

Vikas Kumar Sharma[1, 2, 3*], Shailesh Sharma[1], Rameshwar Dass[3]

[1]*Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela Ropar, Punjab*
[2]*IKG Punjab Technical University, Kapurthala, Jalandhar, Punjab*
[3]*Guru Gobind Singh College of Pharmacy, Yamunanagar, Haryana*
Email: vikas95656@gmail.com

Background: The administration of drugs with low water solubility is a significant challenge in development of pharmaceuticals, as their low solubility in water and slow dissolution may hinder drug absorption and limit oral bioavailability. Lipid–polymer hybrid nanoparticles (LPHNs) are a novel class of nanocarriers that combines the advantages of polymeric and lipid-based systems. The polymeric core maintains stability, improves drug encapsulation, and provides a controlled drug release, whereas the lipid layer enhances drug absorption, biocompatibility, and interaction with biological membranes. These combined properties have contributed to the investigation of LPHNs as carriers of a number of therapeutic substances via a variety of routes. They have the potential to increase drug absorption and bioavailability and hence serve as an effective approach for the administration of poorly soluble drugs .drugs.

Objective: This study aims to highlight recent advances in LPHNs for enhancing the bioavailability of poorly water-soluble drugs with emphasis on their formulation strategies, benefits and future prospects.

Methodology: Relevant literature on LPHNs covering formulation, characterisation, drug-loading capacity, dissolution, absorption and bioavailability will be reviewed. Studies with poorly water-soluble drug (BCS class II) will be reviewed to emphasise current challenges and future prospects.

Conclusion: LPHNs have considerable promise for enhancing the bioavailability of poorly water soluble medicines by combining the advantages of lipid and polymeric systems. More studies are needed to advance these systems and to establish their in vivo performance.

Keywords: *Nanocarriers; Lipid polymer hybrid nanoparticles; Drug delivery; Poorly water-soluble drug; Bioavailability.*

O-05/N/031 ORAL · ONLINE

Dual-Loaded Transethosomal Gel of 5-Fluorouracil and Etoricoxib for Actinic Keratosis

Mandar Kukde*, Sourav Chaudhari, Amit Page

Department of Pharmaceutics, SVKM's NMIMS School of Pharmacy & Technology Management, Shirpur, - 425405, India
Email: mandarkukde8352@gamil.com

Actinic keratosis (AK) is a UV-induced precancerous intraepidermal lesion. Topical 5-fluorouracil (5-FU) permeates the stratum corneum poorly and causes severe local inflammation, limiting adherence. Co-delivery with etoricoxib, a COX-2 inhibitor, may address keratinocyte proliferation and inflammatory signaling together. This study aimed to develop and optimize a 5-FU and etoricoxib co-loaded transethosomal gel and evaluate its performance in AK. Transethosomes were prepared by thin-film hydration using soya lecithin, Tween 80 (edge activator), cholesterol and 10% v/v ethanol in phosphate buffer (pH 6.5), and optimized by a three-factor Box-Behnken design. Optimized vesicles were gelled with Carbopol 934. Release and skin retention were assessed in Franz diffusion cells; efficacy was tested histopathologically in 7,12-dimethylbenz[a]anthracene (DMBA)-induced Swiss albino mice under institutional ethical approval. The optimized vesicles measured 149 nm (Z-average; PDI 0.405) with a zeta potential of −19.7 ± 5.75 mV and entrapment efficiency up to ~80%; Scanning electron microscope (SEM) and Atomic Force Microscopy (AFM) showed discrete, quasi-spherical vesicles. The gel had a viscosity of 18,296 cP, pH 6.2–7.0, and extrudability above 88%. Drug release was sustained over 12 h, and skin retention exceeded that of conventional systems. Histopathology showed near-complete restoration of epidermal architecture and markedly reduced dysplasia versus monotherapy and a marketed formulation, with no toxicity in liver, kidney or spleen. The Box-Behnken-optimized transethosomal gel co-delivering 5-FU and etoricoxib provides sustained release, enhanced skin retention and superior anti-dysplastic efficacy in a preclinical AK model, supporting it as a promising topical alternative to conventional 5-FU therapy.

Keywords: *Transethosomes; Actinic keratosis; 5-Fluorouracil; Etoricoxib; Box-Behnken design; Topical gel*

O-05/N/032 ORAL · ONLINE

Nanotechnology for Tomorrow: Precision, Progress, and Possibilities

Ajay Ramdas Nannar*
Amrutvahini Institute of Pharmacy, Sangamner
Email: ajaynannar05@gmail.com

Nanotechnology has emerged as one of the most transformative scientific frontiers of the 21st century, enabling innovations that transcend traditional boundaries of physics, chemistry, biology, and engineering. Nanotechnology for Tomorrow: Precision, Progress, and Possibilities highlights how nanoscale science is driving remarkable advancements in medicine, energy, electronics, materials, and environmental sustainability. With unprecedented precision at the atomic and molecular level, nanotechnology offers tools to design targeted drug delivery systems, develop sustainable energy solutions, create ultra-strong yet lightweight materials, and revolutionize computing technologies. This work emphasizes not only the current progress in nanoscience but also the immense possibilities it holds for addressing global challenges such as climate change, healthcare, and resource management. By integrating cutting-edge research with visionary applications, this study aims to inspire innovation and collaboration that will shape a future where nanotechnology becomes a cornerstone of societal and technological advancement.

Keywords: *Nanotechnology, Precision, Progress, Possibilities, Technological advancement, Innovation.*

O-05/N/033 ORAL · ONLINE

Nanotechnology-Enabled Cyclodextrin Systems: A Synergistic Approach for Drug Delivery and Therapeutics

Aneke Stephen Somtochukwu*, Sourabh Kosey
Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab.
Email: Stephenaneke66@gmail.com

Cyclodextrin are versatile supramolecular hosts widely applied in pharmaceutical sciences for enhancing solubility, stability, and bioavailability of drugs. At the same time, nanotechnology has transformed drug delivery by enabling precise control over particle size, surface modification, and release kinetics. This study examines the synergistic integration of cyclodextrin chemistry with nanotechnology to develop hybrid systems that address critical challenges in modern therapeutics. Cyclodextrin-based nanocarriers, including polymeric nanoparticles, liposomes, dendrimers, and metallic nanostructures, demonstrate improved encapsulation efficiency, controlled release, and site-specific targeting. Their ability to form inclusion complexes with poorly soluble drugs enhances therapeutic outcomes, while nanotechnology provides structural versatility and functionalization opportunities. Case studies highlight applications in anticancer therapy, antiulcer formulation, and antimicrobial agents, underscoring translational potential across diverse disease areas. Furthermore, the incorporation of green synthesis strategies and biocompatible nanomaterial reflects a commitment to sustainability and patient safety. By bridging supramolecular chemistry with nanotechnology, cyclodextrin-enabled nano systems represent a paradigm shift toward precision medicine, offering solutions to a drug resistance, poor compliance, and formulation instability. This work emphasizes the promise of cyclodextrin-nanotechnology hybrids as next-generation drug delivery platforms, fostering innovation in pharmaceutical research and clinical practice.

Keywords: *Cyclodextrins, Nanotechnology, Drug delivery, Supramolecular chemistry, Precision Medicine.*

O-05/N/034 ORAL · ONLINE

Nanocrystal-Based Approach Exploring the Hedgehog–SMO Axis in Basal Cell Carcinoma

Nitika Sharma*, Sandhya Jaiswal

Chandigarh College of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali, Punjab,140307
Email: ns690213@gmail.com

Basal cell carcinoma (BCC) is the most common non-melanoma skin cancer and is strongly associated with aberrant activation of the Hedgehog signalling pathway, particularly Smoothened (SMO). Targeting this pathway has therefore emerged as an important approach for the investigation of BCC. Among the antifungal agents reported to interfere with Hedgehog signalling, an imidazole antifungal has demonstrated potential for anticancer applications, providing a rationale for investigating its interaction with SMO. The present review aims to explore this interaction through molecular docking and subsequently develop a nanocrystal-based approach for its formulation. Molecular docking will be performed using a suitable SMO protein structure to analyse the predicted binding interactions of the selected antifungal at the target site. Based on its poor aqueous solubility, nanocrystals will be prepared by the antisolvent precipitation method to address its formulation-related limitation. Relevant data was collected through electronic databases including Google Scholar, Pub Med, and Web of science. The developed nanocrystals will be evaluated for particle size, polydispersity index, zeta potential, drug content, solubility, in-vitro dissolution, morphology and solid-state characteristics. The proposed approach is expected to provide preliminary computational insight into drug–SMO interaction and improve the solubility and dissolution behaviour of the drug, thereby supporting further investigation of this antifungal agent against BCC through the Hedgehog–SMO signalling pathway.

Keywords: *Basal cell carcinoma; Nanocrystals; Imidazole antifungal; Molecular docking; Hedgehog signalling; SMO.*

O-05/N/035 ORAL · ONLINE

Nanocrystal-Based Precision Approach Targeting the JNK/MAPK8 Pathway in Osteosarcoma

Archna Kumari*, Sandhya Jaiswal

Chandigarh College of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali, Punjab 140307
Email: ranaarchna506@gmail.com

Osteosarcoma is an aggressive primary bone malignancy that requires innovative therapeutic strategies. The c-Jun N-terminal kinase/mitogen-activated protein kinase8(JNK/MAPK8) pathway regulates cellular stress, proliferation and apoptosis and represents a potential molecular pathway for therapeutic investigation in osteosarcoma. Activation of the ROS/JNK axis has been associated with apoptotic responses and suppression of osteosarcoma cell growth. Disulfiram, an approved drug for alcohol use disorder, has shown anticancer potential through mechanisms involving JNK pathway activation, supporting its investigation for therapeutic repurposing in osteosarcoma. However, its limited aqueous solubility presents a significant constraint on its pharmaceutical performance. The present study aims to investigate the potential mechanistic association of disulfiram with JNK/MAPK8 and develop a nanocrystal-based formulation for further investigation in osteosarcoma. Relevant literature was collected through Google Scholar, PubMed and Web of Science. Molecular docking was performed using AutoDock Vina to evaluate binding interactions between disulfiram and JNK1/MAPK8. Nanocrystals were prepared using the antisolvent precipitation method and evaluated for particle size, polydispersity index, zeta potential, drug content and morphology. Molecular docking is anticipated to provide insights into the possible interaction of disulfiram with JNK1/MAPK8. The proposed nanotechnology-based approach may overcome formulation-related limitations and improve the pharmaceutical performance of disulfiram, while integration of molecular modelling with nanocrystal-based delivery may support further preclinical investigation in osteosarcoma.

Keywords: *Osteosarcoma; Nanocrystals; Disulfiram; Molecular Docking; JNK1/MAPK8*

P-05/N/001 POSTER · ONLINE

Curcumin-Infused Nanostructured Lipid Carriers: A Promising Strategy for Enhancing Skin Regeneration and Combating Microbial Infection

Tripti Chhetri*, Amit Chaudhary, Rajnish Srivastava, Nitin Verma

Chitkara University School of Pharmacy, Chitkara University, Baddi-174103, Himachal Pradesh, India
Email: tripti1015.mpharm25@chitkarauniversity.edu.in

Background: Curcumin possesses anti-inflammatory, antioxidant, and antimicrobial properties relevant to wound healing, but poor aqueous solubility limits its bioavailability. Nanostructured lipid carriers (NLCs) offer a strategy to improve curcumin's solubility, stability, and skin retention for topical wound applications. Objectives: To develop curcumin-loaded nanostructured lipid carriers (CURC-NLCs). To characterize and evaluate the antioxidant and antimicrobial properties of the developed CURC-NLCs. To investigate the in-vivo wound-healing efficacy of CURC-NLCs using a rabbit full-thickness skin injury model.

Methods: CURC-NLCs were prepared by emulsion-evaporation-solidification using glycerol monostearate, capric acid, and lecithin at three curcumin concentrations (0.25–0.75% w/v), then characterized by SEM, TEM, DLS (particle size, PDI, zeta potential), and entrapment efficiency/drug loading. Total phenolic content and DPPH antioxidant activity were measured, and antimicrobial activity was assessed against five bacterial strains and one fungal strain. In vivo efficacy was evaluated in rabbits (n=18) with dorsal full-thickness wounds treated with carbopol alone, curcumin-carbopol gel, or CURC-NLC-carbopol gel, tracked over 21 days with wound closure measurement and histopathology.

Results: CURC-NLCs showed particle sizes of 59–69 nm, zeta potentials of −16 to −27 mV, and entrapment efficiency up to 96.75%. They exhibited 8.5-fold higher antioxidant activity than free curcumin and roughly 2-fold greater antimicrobial potency. In vivo, CURC-NLC-treated wounds achieved 60.39% closure by day 7 versus 51.62% (curcumin) and 31.85% (control), reaching 93.73% closure by day 14, with improved histopathological angiogenesis and re-epithelialization.

Conclusion: CURC-NLCs significantly enhance curcumin's antioxidant, antimicrobial, and wound-healing properties, supporting their potential as a topical therapeutic for cutaneous wound management.

Keywords: *Nanostructured lipid carriers; Curcumin; Wound healing; Antioxidant; Antimicrobial; Skin regeneration.*

P-05/N/002 POSTER · ONLINE

Nanocubosomes Co-Loaded with Curcumin and Temozolomide for Synergistic Colon Cancer Therapy: Overcoming Adaptive Treatment Tolerance via Albumin-Mediated Targeting

Satyam Sahu*, Amit Chaudhary, Rajnish Srivastava, Naresh Rangra

Chitkara University School of Pharmacy, Chitkara University, Baddi-174103, Himachal Pradesh, India
Email: satyam1014.mpharm25@chitkarauniversity.edu.in

Background: Adaptive treatment tolerance (ATT) arising from failed drug internalization, lysosomal efflux, and multidrug resistance (MDR) protein activity is a major obstacle in colon cancer chemotherapy. Curcumin (Cur), a natural P-glycoprotein (P-gp) inhibitor, can chemosensitize cancer cells to temozolomide (TMZ), whose clinical utility is limited by a short half-life and poor tumor penetration.

Objective: To develop nanocubosomes co-loaded with curcumin and temozolomide (CTNCs) for simultaneous chemosensitizer–chemotherapeutic delivery to HCT-116 colon cancer cells, and to evaluate their physicochemical properties, cellular uptake mechanism, cytotoxicity, and ability to overcome ATT through P-gp downregulation.

Methods: CTNCs were prepared by modified emulsification using glyceryl monooleate (lipid phase), Pluronic F127 (surfactant), and bovine serum albumin (stabilizer), followed by sonication and lyophilization. Formulations were characterized for particle size, zeta potential, morphology, drug loading, entrapment efficiency, colloidal stability, and pH-dependent release. HCT-116 cell studies assessed uptake kinetics, endocytic mechanism, cytotoxicity (IC50), apoptosis, and P-gp expression.

Results: CTNCs exhibited a particle size of 150.8±5.6 nm, zeta potential of −35.2±2.3 mV, and high entrapment efficiency (67.43% Cur, 75.55% TMZ). Release was pH-triggered, favoring the acidic lysosomal environment over physiological pH. Cellular uptake was 3-fold higher than free drugs via clathrin-mediated, albumin receptor-triggered endocytosis. CTNCs achieved lower IC50 values, greater apoptosis (35.3% vs. 16.65%), and significant P-gp downregulation compared to free Cur/TMZ.

Conclusion: CTNCs provide a synergistic, albumin-targeted nanocarrier strategy that overcomes ATT in colon cancer by combining enhanced cellular uptake with curcumin-mediated P-gp inhibition, improving TMZ efficacy against HCT-116 cells

Keywords: *Nanocubosomes; curcumin; temozolomide; colon cancer; P-glycoprotein; adaptive treatment tolerance*

P-05/N/003 POSTER · ONLINE

Nanotechnology-Based Approaches for the Management of Chemobrain

Simranjeet Kaur*

Department of Pharmaceutical Sciences, UPES, India
Email: simranjeetkaurmutta@gmail.com

Background: Chemobrain or chemotherapy-related cognitive impairment, is a common and debilitating complication of cancer chemotherapy, characterized by deficits in memory, attention, learning, and executive functions. Despite advances in cancer treatment, no effective pharmacological therapies exist. The non-specific cytotoxicity of chemotherapeutic agents often impairs central nervous system function, leading to persistent cognitive deficits. Chemobrain has been reported in over 75% of patients receiving chemotherapy, with 17–34% experiencing persistent cognitive dysfunction post-treatment.

Methods: A comprehensive literature review was conducted. Studies utilizing nanotechnology based delivery systems such as phospholipid complex, liposomes, solid lipid nanocarrier and polymeric nanocarriers for herbal/ natural products in chemobrain models were analyzed. Parameters including solubility enhancement, pharmacokinetic improvement, oxidative stress reduction, neuroinflammatory modulation, cognitive performance recovery, and overall efficacy were systematically evaluated to determine therapeutic potential.

Results: Nano-formulated herbal compounds exhibited remarkable improvements in physicochemical and pharmacokinetic properties compared to their free drug. These formulations demonstrated sustained drug release and improved permeability across the blood–brain barrier, leading to higher drug accumulation in brain tissues. Behavioural and cognitive assessments in preclinical models confirmed significant enhancement in learning, memory retention, and overall cognitive performance, highlighting the superior efficacy of nanotechnology-based formulations compared to conventional therapies.

Conclusion: Nanotechnology based delivery of natural products offers an innovative and effective approach for managing chemobrain. By enhancing solubility, stability, bioavailability, and therapeutic efficacy, these systems hold great promise for developing targeted interventions to alleviate chemotherapy induced cognitive deficits and improve the quality of life in cancer survivors.

Keywords: *Nanotechnology, Chemobrain, Polymeric nanocarriers, Natural products, Chemotherapy.*

P-05/N/004 POSTER · ONLINE

Microneedle-Integrated Nanovesicular Carriers for Precision Therapeutics: Innovations Beyond Conventional Transdermal Delivery

Deepika Bhawsar*[1], Manish Kumar[2]

*[*1]Assistant Professor, Department of Pharmaceutics, Indore Institute of Pharmacy, Indore*
Research Scholar,
[2]Department of Pharmaceutics, KIET School of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh, India
Email: deepikabhawsar85@gmail.com

The microneedle (MN) integrated nanovesicular platform is a promising next generation platform that transcends the conventional transdermal drug delivery and potentially introduces precision therapeutics. The barrier function of the stratum corneum has hindered its clinical use for a long time, although transdermal delivery offers excellent patient adherence, prolonged drug action and prevents first pass metabolism. To bypass this, microneedles develop a temporary painless microchannel for the minimally invasive transport of drugs, and nanovesicular carriers increase the stability, bioavailability, targeting and controlled release of the therapeutic payloads. When combined, these two enable a synergistic delivery platform that can deliver a wide range of therapeutics, such as small molecules, peptides, proteins, vaccines, nucleic acids and regenerative biomolecules. The review provides a comprehensive overview of different microneedle technologies and nanovesicular drug carriers like liposomes, transfersomes, ethosomes, niosomes, extracellular vesicles, exosomes, solid lipid nanoparticles and nanostructured lipid carriers. Leveraging these advancements, critical challenges are also explored, such as stability, scalability, standardization, safety, and regulatory approval, along with emerging areas including stimulus-responsive smart systems, exosome-based delivery, 3D-printed microneedles, AI-driven formulation optimization, and personalized therapeutics. In conclusion, MN-integrated nanovesicular platforms represent a major step toward the minimally invasive, targeted, and controlled drug delivery systems. As advancements in biomaterials, nanotechnology, manufacturing, and regulatory science continue to make strides, these hybrid systems hold the promise of becoming key players in the future of precision and personalized medicine.

Keywords: *Microneedles; Nanovesicular carriers; Transdermal drug delivery; Controlled release; Personalized medicine; Drug delivery systems.*

P-05/N/005 POSTER · ONLINE

Spray-Dried Microparticles of Nelfinavir Mesylate for Aids Treatment: Design Optimization, In-Vitro and In-Vivo Evaluation

Naisha Kalra*, Akashdeep Singh

Chitkara College of Pharmacy, Chitkara University, Rajpura, Punjab
Email: naishakalra8@gmail.com

The current endeavour was aimed to fabricate spray dried Nelfinavir Mesylate particles (SDNPs) that upon reconstitution with body fluids releases amorphous Nelfinavir Mesylate with enhanced oral bioavailability. For this purpose, feed mixture was prepared containing solubilized NFM, solid substrate and solvent system. The NFM was solubilized in a mixture of Maisine 35-1 (200 mg), Tween80 (500 mg) and Transcutol HP (300 mg). Three different solid substrates with high specific surface area were used: Neusilin® UFL2, (magnesium aluminometasilicate), Aerosil 200® (colloidal silica) and Syloid 244 FP® (porous silicon dioxide). Central composite design-response surface methodology (CCD-RSM) with three-factor (two numeric and one categorical) at three-level was used to select the appropriate solid substrate and to develop optimized SDNPs. The solid characterization by scanning electron microscopy, differential scanning calorimetry and powder X-ray diffraction studies indicated the absence of crystalline NFM in the formulations. The drug distribution analysis using raman spectroscopy suggested uniform distribution of amorphous NFM in optimized SDNPs-1 formulation. The transmission electron microscopy revealed the spherical structure of reconstituted SDNPs that releases amorphous NFM with globules size less than 110 nm. The solid substrate had significant and positive effect in drug dissolution; the mean dissolution time of NFM loaded in SDNPs was considerably improved. The bioavailability study resulted in enhanced magnitude of Cmax and AUC for SDNPs. The tissue distribution studies exhibited significantly higher brain and lymph nodes distribution as compared to putative form. Overall, the results pointed towards the overwhelming response of the SDNPs to be used for HIV treatment.

Keywords: *Nelfinavir Mesylate, Spray Drying, AIDS, Bioavailability, Central Composite Design.*

P-05/N/006 POSTER · ONLINE

Electrospun Nanofibers in Drug Delivery: Advances, applications and Future Perspective

Riya R Shah*, Sameer Lakade

Savitribai Phule Pune University, Rasiklal M Dhariwal Institute of Pharmaceutical Education and Research, Chinchwad.
Email: riyashah9158@gmail.com

Electrospinning is a versatile nano-fabrication technique that produces ultrafine fibers with diameters ranging from nanometres to micrometres. Electrospun nanofibers have emerged as a promising platform for pharmaceutical drug delivery due to their high surface-area-to-volume ratio, tunable porosity, extracellular matrix-like structure, and ability to incorporate diverse drugs and polymers. This review examines recent advances in electrospinning principles, polymer systems, drug encapsulation, release mechanisms, and characterization. Particular emphasis is given to coaxial and emulsion electrospinning, stimuli-responsive nanofibers, natural bioactive compounds, and integration with microneedles for controlled drug delivery. Applications in oral, transdermal, wound healing, pulmonary, ophthalmic, and oncological delivery are discussed. Key challenges, including large-scale manufacturing, residual solvent toxicity, regulatory requirements, and clinical translation, are also highlighted. Future perspectives include personalized point-of-care electrospinning, green solvents, biosensor-integrated systems, and artificial intelligence-guided process optimization, highlighting the potential of electrospun nanofibers for advanced and personalized pharmaceutical drug delivery.

Keywords: *Electrospinning, Nanofibers, Drug Delivery, Controlled Release, Bioderadable Polymers*

P-05/N/007 POSTER · ONLINE

Cyclodextrin-Based Nano sponge Gel for Dual-Action Management of Lichen Planus Pigmentosus: An Anti-Inflammatory and Anti-Pigmentary Approach

Arnav Thakur*

Department of Pharmacy, ISF College of Pharmacy and Research, Moga - 142001, Punjab
Email: arnavt2806@gmail.com

Lichen planus Pigmentosus (LPP) is a chronic pigmentary condition which causes persistent brown to slate-grey patches, which are mainly on sun-exposed areas of the skin. The treatment can be difficult because only reducing inflammation does not always lead to the complete improvement of the pigmentation disease. This suggests that both inflammation and abnormal melanin production may need to be addressed together or with a dual approach. In this poster presentation, a cyclodextrin-based nano sponge gel idea is proposed as a dual-action topical approach for LPP disease treatment. Relevant studies on some dermatological disease like LPP, lichen planus, and related pigmentary disorders were reviewed and assessed to understand the inflammatory and pigmentation pathways involved in these disease mechanisms. Curcumin was considered for its reported anti-inflammatory properties, while glabridin was selected for its anti-tyrosinase and anti-melanogenic effects in these diseases. Cyclodextrin-based nano sponges may further improve the solubility, stability, skin retention, and controlled release of these poorly water-soluble compounds. On the basis of the available evidence, a curcumin–glabridin nano sponge gel could supposedly act on both inflammation and pigmentation while providing sustained topical delivery. However, this specific combination has not yet been adequately studied in LPP. Therefore, further formulation development, in-vitro, ex-vivo, and biological studies are needed to establish its effectiveness and safety. This approach may offer a promising direction for developing a more targeted topical treatment for LPP disease.

Keywords: *Lichen planus Pigmentosus, Cyclodextrin nano sponge, Curcumin, Glabridin, Topical drug delivery, Controlled release.*

P-05/N/008 POSTER · ONLINE

Biomimetics Nanomedicines for Targeting Cancer

Shreeya Ratikant Chalekar*, Sachin Rede

Rasiklal M Dhairiwal Institute of Pharmaceutical Education and Research, Savitribai Phule Pune University, Chinchwad, Maharashtra, India
Email: Email-shreeyachalekar242@gmail.com

Biomimetic nanoparticles have recently emerged as a novel drug delivery platform to improve drug biocompatibility and specificity at the desired disease site, especially the tumour microenvironment. Conventional nanoparticles often encounter rapid clearance by the immune system and have poor drug-targeting effects. The rapid development of nanotechnology provides an opportunity to integrate different types of biomaterials onto the surface of nanoparticles, which enables them to mimic the natural biological features and functions of the cells. This mimicry strategy favours the escape of biomimetic nanoparticles from clearance by the immune system and reduces potential toxic side effects. Despite the rapid development in this field, not much has progressed to the clinical stage. Thus, there is an urgent need to develop biomimetic-based nanomedicine to produce a highly specific and effective drug delivery system, especially for malignant tumours, which can be used for clinical purposes. Here, the recent developments for various types of biomimetic nanoparticles are discussed, along with their applications for cancer imaging and treatments.

Keywords: *biomimetic, active targeting, nanoparticles, cancer therapy, immunotherapy, imaging*

P-05/N/009 POSTER · ONLINE

Light Activated Drug Delivery System

Prem Rajendra Pitaliya*

Rasiklal M. Dhariwal College of Pharmaceutical Education and Research, Pune, Maharashtra, India.
Email: pitaliya.prem.1400@gmail.com

Controlled drug delivery systems have gained significant attention due to their ability to enhance therapeutic efficacy while minimizing side effects. Among various stimulus-responsive systems, light-activated drug delivery systems (LADDS) represent an advanced and non-invasive approach for site-specific and temporally controlled drug release. These systems utilize specific wavelengths of light such as ultraviolet (UV), visible, and near-infrared (NIR) radiation to trigger drug release from photo-responsive carriers. The mechanism involves photo-cleavage, photo-isomerization, or photothermal effects that destabilize or alter carrier structures, leading to controlled drug release at the desired site. Various carriers including liposomes, polymeric nanoparticles, hydrogels, micelles, and dendrimers have been developed using photo-responsive materials such as azobenzene, coumarin, spiropyran, and gold nanoparticles. LADDS offer numerous advantages such as precision, reduced systemic toxicity, and improved patient compliance. However, limitations including poor tissue penetration, phototoxicity, and formulation complexity restrict widespread clinical application. Recent advances focus on NIR-responsive systems, smart nanocarriers, and dual-stimuli approaches. This review provides a detailed overview of principles, materials, mechanisms, applications, advantages, limitations, recent advances, and future perspectives of light-activated drug delivery systems.

Keywords: *Light-activated drug delivery, photo-responsive materials, nanoparticles, controlled release, near-infrared light.*

P-05/N/010 POSTER · ONLINE

Development and Evaluation of Bergenin-Loaded Nanovesicles for Improved Drug Release and Mucosal Permeation

Ankit S. Kediya*, Shagufta A. Khan

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur., Institute of Pharmaceutical Education and Research, Wardha, Maharashtra.
Email: ankitkediyaaa@gmail.com

Bergenin is a bioactive compound with reported antioxidant, anti-inflammatory and neuroprotective properties. However, its poor aqueous solubility and low membrane permeability as a BCS Class IV drug limit its pharmaceutical application. The present study aimed to develop bergenin-loaded nanovesicles and evaluate their drug-release and permeation attributes across excised goat nasal mucosa. Bergenin-loaded nanovesicles were prepared using phospholipids, cholesterol and Span 60 by the thin-film hydration technique and optimized using a Design of Experiments (DoE) approach. The optimized formulation exhibited a mean vesicle size of 156.3 ± 4.94 nm, a polydispersity index of 0.218 ± 0.03 and a zeta potential of −18.9 ± 0.9 mV. It showed an entrapment efficiency of 88.36 ± 2.6%, drug loading of 22.82 ± 0.6% and satisfactory drug content. Transmission electron microscopy showed nearly spherical, smooth and discrete vesicles ranging from 53 to 111 nm. In-vitro release study in PBS pH 7.4 revealed 35.95±3.98% free bergenin dissolution in 8 h whereas nanovesicles produced significantly greater rate of bergenin release ranging from 70.34±2.59 to 93.71±3.55% in 8h. Ex-vivo permeation studies, using nasal mucosa obtained from goats that had been excised, found that the cumulative amount of bergenin that permeated from the optimized nanovesicles was about 3.19 times greater than that from plain bergenin. The studies on nasal mucosal compatibility showed no sign of considerable tissue damage. The results indicate that nanovesicular encapsulation is able to improve the delivery properties of bergenin by achieving high drug entrapment, offering a sustained release and enhancing its ability to pass through the nasal mucosa.

Keywords: *Bergenin, Nanovesicles, Mucosal permeation, antioxidant, anti-inflammatory.*

P-05/N/011 POSTER · ONLINE

Development and Optimization of Nanosponge-Based Topical Drug Delivery System for Enhanced Bioavailability

Purva Bhandari*

Department of Pharmaceutics, Bhupal Noble's University, Udaipur, Rajasthan, India
Email: purvabhandari715@gmail.com

Introduction: Topical drug delivery can generally provide localized drug action and may reduce unwanted systemic exposure. Nanosponges are generally porous nanosized carriers, offer potential for improving drug incorporation and providing controlled drug release.

Aim & Objectives: The study aimed to develop and optimize a nanosponge-based topical drug delivery system for enhanced bioavailability of a selected antifungal drug and to identify suitable formulation conditions for subsequent incorporation into a topical gel.

Methods: Nanosponges were prepared by the emulsion solvent evaporation method using ethyl cellulose as the polymer and polyvinylpyrrolidone (PVP) as a stabilizing agent. 3^2 factorial design have been used, drug-to-polymer ratio and stirring speed as formulation and process variables. Prepared formulations were evaluated for relevant physicochemical characteristics and drug-release performance, followed by selection of an optimized formulation.

Results: Variation in drug-to-polymer ratio and stirring speed influenced the physical characteristics and performance of the nanosponge formulations. Experimental observations were used to identify a formulation with desirable characteristics for further development into a topical gel.

Summary & Conclusion: The study supports the potential of nanosponge as a carrier system for topical drug delivery. Optimization of formulation and process variables may facilitate development of a suitable nanosponge-based topical formulation with the objective of enhancing drug bioavailability at the site of application.

Keywords: *Nanosponges; Topical drug delivery; Bioavailability; Emulsion solvent evaporation; Ethyl cellulose; Antifungal drug*

P-05/N/012 POSTER · ONLINE

QbD-Driven Development and Optimization of Inhalable Spray-Dried Erlotinib Procubosome Microparticles for Sustained Pulmonary Delivery in NSCLC

Gurman Singh*

Department of Pharmaceutics, Chitkara College of Pharmacy, Chitkara University, Punjab
Email: gurmanbhinder09@gmail.com

Non-small cell lung cancer (NSCLC) is a leading cause of morbidity and mortality worldwide. Erlotinib (ERB), a first-line tyrosine kinase inhibitor, shows strong potential inNSCLC treatment but suffers from poor water solubility, low oral bioavailability, and high dose-related toxicities. To develop a more feasible, potent and stable sustained release formulation of ERB, an inhalable spray-dried procubosome microparticles (SDPM) system was optimized employing QbD approach. Initially, the risk assessment using an Ishikawa diagram assisted the recognition of high-risk parameters which affect the finished product i.e., glyceryl monooleate: poloxamer 407 (GMO: P407, w/w), polyethylene glycol 200 (PEG200) concentration, and inlet temperature. Further, Box-Behnken design was employed to study the effect of these screened parameters on yield, device removal efficiency, aerosolization efficiency, fine particle fraction, drug content, and reconstituted particle size of ERB-SDPM. The optimized formulation showed suitable aerodynamic properties with an acceptable mass median aerodynamic diameter (MMAD) of 3.29 = 0.53 um and a fine particle fraction (FPF) of 62.8 + 3.63%. Further, spectral analysis revealed no sign of ERB-excipients interaction, suggested stability of ERB in prepared ERB-SDPM. In-vitro drug release studies showed a sustained release profile and increased solubility in artificial lysosomal fluid (pH 4.5), acetate buffer (pH 5.5), and Gamble's solution (pH 7.4) compared to unprocessed ERB. Moreover, the ERB-SDPM formulation gave promising IC50 value against A549 cell lines, indicating improved therapeutic response compared to pure ERB. Therefore, it can be concluded that the ERB-SDPM formulation could offer a promising local sustained delivery system for the treatment of NSCLC.

Keywords: *Erlotinib, Non-small cell lung cancer (NSCLC), procubosome, microparticles, sustained delivery.*

P-05/N/013 POSTER · ONLINE

AI Engineered Cyclodextrin Nano Vectors for Precision SiRNA Delivery: From Supramolecular Design to Gene Silencing

Gitana*[1], Himanshu Kumar[2]

[1]Department of Pharmacy, ISF College of Pharmacy, Moga, Punjab, India- 142001
[2]Department of Pharmacognosy, ISF College of Pharmacy, Moga, Punjab, India- 142001
Email: gitana.tasnsh@gmail.com

Small interfering RNA (siRNA) therapeutics are a promising means of targeted gene silencing; however, clinical implementation of these therapeutics is hampered by their instability, degradation, inefficient cellular uptake and targeted delivery into cells. Cyclodextrins have demonstrated their utility as super molecular nano vectors for siRNA transport, protection and structural changes to regulate siRNA distribution. Artificial intelligence (AI) combined with supramolecular drug-delivery design offers a new approach to address these challenges. AI and machine learning can be used to predict and optimize cyclodextrin derivatives based on the crucial parameters, including siRNA binding, particle size, surface charge, stability, uptake and release properties in cells. The target specificity and delivery efficiency of nano vectors can, therefore, be improved using an AI-development design-optimization framework. After cellular internalization, optimized nano vectors can facilitate the release of siRNA within cells and facilitate the degradation of the target mRNA by the RNA interference mechanism, finally leading to targeted gene silencing. The concept combines all the elements of molecular engineering that are enabled by artificial intelligence, supramolecular chemistry of cyclodextrins, nanotechnology and RNA therapeutics into a single precision delivery platform. Such a strategy can help to expedite rational development of second-generation siRNA delivery systems and facilitate the creation of more effective, selective and individualized gene-silencing drugs.

Keywords: *Artificial Intelligence, Cyclodextrin, Nano vectors, siRNA, Gene Silencing.*

P-05/N/014 POSTER · ONLINE

Cubosomes: A Nanostructured Platform for Accelerated Wound Healing

Suyash Vadehra*

Chitkara University, Punjab, India
Email: suyashvadehra6@gmail.com

Cubosomes are nanoparticles with a bicontinuous cubic liquid crystalline structure that are created when stabilizers like poloxamer 407 are dispersed in lipids like monoolein in water. They can transport hydrophilic, lipophilic, and amphiphilic medications simultaneously, because of their substantial internal surface area and honeycomb-like lattice of lipid bilayers and aqueous channels. Cubosomes' thermodynamic stability, biodegradability, and bioadhesion makes them ideal for skin delivery. Wound healing process involves haemostasis, inflammation, proliferation, and remodelling, requiring fibroblast migration, collagen deposition, and new vessel formation. Infection, oxidative stress, or poor formulation retention can disrupt this process. Cubosomes' cubic phase mimics stratum corneum lipid organisation, loosening the skin barrier and enhancing drug penetration beyond plain gels. As cubogels, they gain a shear-thinning texture, skin-friendly pH, and low irritation, producing faster wound contraction, better collagen buildup, and improved tissue organisation. The exposed lipidic surface of the cubic phase's mucoadhesive and membrane-mimicry characteristics strongly adhere to wound exudate and epithelial tissue, improving retention time and reducing loss after dressing changes. Cubosomes integrate with skin cells more efficiently as the bilayer mimics native cell-membrane lipid organization, increasing the drug's biocompatibility and cellular absorption. Cubosomes have been prepared for Carvedilol-loaded cubogel with Moringa oleifera extract for accelerated excision-wound closure in rats. Curcumin-loaded cubosomal smart gels showed strong antibacterial activity and sustained release. Mannosylated chitosan-coated berberine hydrochloride cubosomal hydrogels targeted macrophages to promote repair. Simvastatin-loaded cubosomal nanoparticles enhanced skin permeation and accelerated wound closure in rats. Hesperidin-loaded cubogel improved the stability and bioavailability of hesperidin, promoting full-thickness wound repair.

Keywords: *Cubosomes, Simvastatin, Nanoparticles, Wound healing, Oxidative stress.*

P-05/N/015 POSTER · ONLINE

Formulation and Evaluation of Eudragit RSPO Based Azelastine Hydrochloride Nanoparticles for Ocular Inflammation

Kishan Singh*, Asha Dhakal, Beauty Behera and Ruhi Ali
Delhi Institute of Pharmaceutical Sciences and Research, New Delhi, India - 110017
Email: kishan7singh2003@gmail.com

Azelastine hydrochloride (AZL HCl) eye drops show poor ocular bioavailability because of rapid tear turnover and drainage, which forces frequent dosing. This work aimed to develop Eudragit RSPO based AZL HCl nanoparticles to prolong corneal residence and improve permeation. Nanoparticles were prepared by a modified nanoprecipitation method using drug:polymer ratios of 1:1, 1:2 and 1:3 (NP1–NP3) with 0.1% PVA as stabilizer, then lyophilized using mannitol. They were evaluated for particle size, zeta potential, entrapment efficiency, FTIR, DSC, XRD, SEM, in vitro release and ex vivo transcorneal permeation across goat cornea. Particle size increased with polymer content, from 168 ± 3.56 nm (NP1) to 208 ± 4.88 nm (NP3). All batches had a positive zeta potential due to the quaternary ammonium groups of Eudragit RSPO. NP1 showed the highest entrapment efficiency (88.07 ± 0.93%). FTIR showed no significant drug–excipient interaction, and the absence of the drug's melting endotherm in DSC suggested an amorphous or molecularly dispersed state. SEM showed spherical particles. NP1 released 25.90% of the drug over 8 h, while 88.40% was released from the plain solution within 6 h, indicating sustained release. Transcorneal permeation of NP1 (4.86%) was about 2.3-fold higher than the marketed formulation (2.07%), and corneal hydration stayed within the normal range (75–80%), suggesting no corneal damage. Thus, Eudragit RSPO nanoparticles of AZL HCl may be a promising approach for topical ocular delivery with reduced dosing frequency.

Keywords: *Azelastine hydrochloride, Eudragit RSPO, nanoparticles, nanoprecipitation, ocular delivery.*

P-05/N/016 POSTER · ONLINE

Beyond Micelle Formation: Correlating Physicochemical Principles of Polymeric Nanomicelles with Membrane Permeability

Sumant Sindhi*, Shalu Shukla, Sandhya Jaiswal
Chandigarh College of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali, Punjab,140307.
Email: sumant.sindhi2003@gmail.com

Polymeric nanomicelles are nanoscale, self-assembled colloidal structures formed from amphiphilic block copolymers. This review presents an integrated correlation between the molecular self-assembly, physicochemical behavior, and permeation-enhancing potential of these systems, offering a mechanistic basis for their role in improving the solubility, permeability, and overall bioavailability of therapeutic agents. In aqueous media, the hydrophobic segments of these polymers disrupt water's hydrogen-bonding network, creating a thermodynamically unfavourable, low-entropy state. Above the critical micelle concentration (CMC), polymer chains cluster to shield hydrophobic segments from water, releasing this ordered water and increasing overall entropy, thereby driving spontaneous self-assembly into a core–shell architecture a hydrophobic core surrounded by a hydrophilic shell (corona).This core–shell architecture is not fixed in dimension its size, shape, and aggregation number are governed by the molecular packing parameter, a geometric ratio of hydrophobic tail volume to hydrophilic head area, with lower values favouring spherical structures whose size is largely dictated by hydrophobic tail length. Poorly water-soluble drugs partition into this hydrophobic core based on drug–polymer compatibility, enabling solubilization. While micelles are thermodynamically stable above the CMC, their kinetic stability, reflecting how readily individual polymer chains exchange between the micelle and surrounding medium, determines sustained drug release. Collectively, these structural and physicochemical properties enable nanomicelles to function as effective nanocarriers, influencing not only drug solubilization but also the extent of drug permeation across biological membranes. The hydrophobic core, having already solubilized the drug, sustains a favourable concentration gradient that drives passive diffusion across the membrane; the hydrophilic corona promotes mucoadhesion, prolonging residence time at the absorption site and sustaining this gradient; the amphiphilic, surfactant-like character of the polymer itself enables transient fluidization of the lipid bilayer, increasing membrane permeability; and certain polymers additionally inhibit efflux transporters such as P glycoprotein, reducing drug expulsion from cells and enhancing net permeation. This mechanistic correlation underscores the rational basis for employing polymeric nanomicelles as an effective platform for permeation-enhanced drug delivery.

Keywords: *Polymeric nanomicelles; Amphiphilic block copolymers; Self-assembly; Critical micelle concentration; Membrane permeability.*

P-05/N/017 POSTER · ONLINE

Spray-Dried Liquid Crystalline Microparticles System for Targeted Sustained Pulmonary Delivery of Afatinib: Design Optimization and *In-vitro* evaluation

Tamanna Sharma*, Akashdeep Singh
Chitkara college of pharmacy, Punjab, India
Email: shtamanna2005@gmail.com

Non-small cell lung cancer (NSCLC) accounts for more than 85% of all lung cancer cases and remains a leading cause of cancer-related mortality worldwide. Afatinib (AFT), a second-generation irreversible epidermal growth factor receptor (EGFR) tyrosine kinase inhibitor, is widely used for the treatment of EGFR-mutated NSCLC. However, its therapeutic effectiveness is limited by poor aqueous solubility, low oral bioavailability, and dose-dependent systemic adverse effects. The present study aimed to develop inhalable afatinib-loaded spray-dried liquid crystalline microparticles (AFT-SLCM) for localized and sustained pulmonary delivery using a Quality-by-Design (QbD) approach. Risk assessment using an Ishikawa diagram identified glyceryl monooleate: poloxamer 407 (GMO: P407, w/w) ratio, propylene glycol (PG) concentration, and spray-drying inlet temperature as critical variables affecting product quality. Further, these variables were optimized through a Box–Behnken design to investigate their influence on production yield, device recovery efficiency, aerosolization efficiency, fine particle fraction, drug content, and reconstituted particle size. The optimized formulation demonstrated favorable aerodynamic performance with a mass median aerodynamic diameter (MMAD) of 3.69 ± 0.73 µm and a fine particle fraction (FPF) of 71.4 ± 3.73%, indicating efficient deposition in the deep lung region. Physicochemical characterization confirmed successful incorporation of AFT within the liquid crystalline matrix without significant drug–excipient interactions. *In vitro* release studies revealed sustained drug release and enhanced dissolution in simulated lung fluids. Furthermore, the optimized formulation exhibited improved cytotoxic activity against A549 lung cancer cells compared with pure AFT. Overall, AFT-SLCM represents a promising inhalable platform for targeted and sustained pulmonary delivery in NSCLC therapy.

Keywords: *Non-small cell lung cancer (NSCLC), lung cancer, Spray-Dried Liquid Crystalline Microparticles, Afatinib.*

P-05/N/018 POSTER · ONLINE

Development of Carbazole Lipidic Nanoparticles for Topical Delivery

Ishita*, Pulkit Madan, Komal Saini
Chandigarh College of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali, Punjab, Pin Code 140307.
Email: 2527904.mphar.ccp@cgc.edu.in

Carbazole possesses promising antifungal activity; however, its poor aqueous solubility and low skin permeation limit topical application. The present study aimed to develop carbazole-loaded solid lipid nanoparticles (C-SLNs) and incorporate them into a gel system to enhance topical delivery and stability. C-SLNs were prepared using micro-emulsification followed by high-speed homogenization employing Compritol® 888 ATO as lipid and Tween 80 with soya lecithin as surfactants. Optimized nanoparticles were characterized for particle size, polydispersity index (PDI), zeta potential, drug content, ATR, DSC, and stability. The optimized SLNs were incorporated into a Carbopol hydrogel and evaluated for pH, viscosity, spreadability, occlusion, and stability. Optimized C-SLNs exhibited a mean particle size of 235.5 nm, PDI of 0.522, and zeta potential of −31.6 mV. Drug content was found to be 89.6%. ATR and DSC confirmed successful encapsulation and partial amorphization of carbazole. The SLN-based hydrogel showed skin-compatible pH (5.5 ± 0.25), pseudoplastic behavior, superior occlusive properties (71.26% at 24 h), and satisfactory stability for two months at 25 °C. The developed C-gel demonstrates favorable physicochemical properties and stability, making it a promising nanocarrier system for topical antifungal delivery.

Keywords: *Carbazole, Lipidic Nanoparticles, Topical antifungal delivery, Carbopol hydrogel, Optimization.*

CATEGORY 6 | 100 ABSTRACTS

Medicinal & Organic Chemistry



O-06/F/001 ORAL · OFFLINE

Integrated Pharmacophore-Guided 3D-QSAR and Molecular Docking Studies Reveal Novel 1,3,4-Thiadiazole Derivatives as Promising α-Glucosidase Inhibitors

Debarshi Mondal *, Priya Devi, Debarshi Kar Mahapatra

Chitkara College of Pharmacy, Chitkara University, Rajpura 140401, Punjab, India
Email: debarshi1066ps.phd25@chitkara.edu.in

Diabetes mellitus is a long-term disorder of metabolism in which the blood glucose level is consistently elevated, most often as a result of insulin resistance and gradual deterioration of the ability of the pancreatic β-cells to produce insulin. Type 2 diabetes mellitus (T2DM) is the most prevalent form of diabetes mellitus, accounting for 90% of all cases. α-glucosidase plays a critical role in carbohydrate digestion and postprandial glucose absorption; it is an important therapeutic target in the management of T2DM. The 1,3,4-thiadiazole motif has demonstrated interesting α-glucosidase inhibitory activity and was explored using an integrated Computer-Aided Drug Design (CADD) strategy. The dataset of 34 reported derivatives has been subjected to pharmacophore modelling, three-dimensional quantitative structure–activity relationship (3D-QSAR) modelling (both atom-based and Gaussian field-based), molecular docking, R-group optimization, and ADMET predictions and prediction of inhibitory activity. Based on the validated pharmacophore ($AADHR_3$) and 3D-QSAR models, bulky hydrophobic groups at the R_1 position and electron-withdrawing groups at the R_2 position were found to be beneficial for α-glucosidase inhibition. Five compounds were identified through molecular docking that had binding affinities similar to or greater than the reference inhibitor acarbose (−6.260 kcal/mol), whereas the designed compounds DM1 (−7.625 kcal/mol), DM2 (−7.418 kcal/mol) and DM3 (−7.284 kcal/mol) showed higher binding affinities and desirable interactions with catalytic residues Arg281, Asp282, Asp404, Asp518, Asp616, His674, and Phe525. The drug-likeness and pharmacokinetic properties were predicted using ADMET analysis. The integrated computational strategy has revealed a promising template in the rational design and optimization of potent α-glucosidase inhibitors for the successful treatment of T2DM.

Keywords: *α-Glucosidase inhibitors; 1,3,4-thiadiazole; Pharmacophore modelling; 3D-QSAR; Molecular docking*

O-06/F/002 ORAL · OFFLINE

Integrated Pharmacophore-Guided Atom-Based 3D-QSAR, Molecular Docking, Virtual Screening, and ADMET Analysis for the Identification of Novel 1,3,4-Thiadiazole-Based Aldose Reductase Inhibitors

Priya Devi*, Debarshi Mondal, Debarshi Kar Mahapatra

Chitkara College of Pharmacy, Chitkara University, Rajpura 140401, Punjab, India
Email: priya1070ps.phd25@chitkara.edu.in

Diabetes mellitus is a lifelong chronic metabolic condition with chronic hyperglycemia, the commonest being type 2 diabetes mellitus (T2DM), a consequence of insulin resistance and progressive β-cell dysfunction. The polyol pathway is activated by chronic hyperglycemia and is a therapeutic target of interest for the development of diabetic complications, especially in the role of Aldose Reductase (AR). A Computer-Aided Drug Design (CADD) approach was used to determine and optimize novel 1,3,4-thiadiazole-based Aldose Reductase inhibitors in this study. Finally, a dataset of 30 reported derivatives has been analyzed by pharmacophore modelling, atom-based 3D-QSAR, molecular docking, structure–activity relationship (SAR) analysis, R-group enumeration, virtual screening, and ADMET prediction. The validated pharmacophore model (AHHRR_1) and the 3D-QSAR model showed that hydrophobic and electron-withdrawing groups are beneficial for improving the inhibitory activity of the compounds, while bulky polar groups are unfavorable for the activity. Hierarchical molecular docking has shown that compounds 04, 01, 02, 10 and 11 had better binding affinities than the reference inhibitor Epalrestat. In addition, the docking score of the designed derivative (PD01) was the highest, with a score of −10.605 kcal/mol, and the interaction was also stable, including hydrogen-bonding, hydrophobic interaction, π–π stacking, π–cation and halogen-bonding interactions with the conserved catalytic residues of Aldose Reductase. The drug-likeness, physicochemical properties, membrane permeability and oral absorption were predicted to be favorable from the ADMET analysis. The integrated computational approach has pointed out that PD01 and the 1,3,4-thiadiazole scaffold are good candidates in the rational design of new Aldose Reductase inhibitors that could be used to control diabetes-associated complications.

Keywords: *Aldose reductase inhibitors; 1,3,4-thiadiazole; Pharmacophore modelling; 3D-QSAR; Molecular docking*

O-06/F/003 ORAL · OFFLINE

In- silico Evaluation of Pyrrolopyrimidine Derivatives as Novel Bruton's Tyrosine Kinase (BTK) Inhibitors for B- Cell Malignancies

Sakshi Pahwa*, Vivek Asati

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: sakshipahwa75@gmail.com

Bruton's tyrosine kinase is a critical therapeutic target in B-cell malignancies and autoimmune disorders owing to its central role in B-cell receptor signaling. A dataset of 45 reported pyrrolopyrimidine derivatives was subjected to pharmacophore modeling and 3D-QSAR analysis to design novel compounds; they were subsequently generated through R-group enumeration based on the QSAR data and further evaluated through molecular docking and virtual screening. The model AADHR_1 was chosen as the best pharmacophore model. The atom-based model exhibited an excellent correlation coefficient (R2 = 0.8831) and cross-validation coefficient (Q2 = 0.8675), while the field-based model demonstrated a correlation coefficient of R2 = 0.8498 and Q2 = 0.855. A total of 1752 compounds were generated through R-group enumeration for the production of new compounds. Among them, R1 demonstrated the best binding affinity (−7.87 kcal/mol, PDB ID: 5P9J) with key binding interactions at TYR551, GLN412 and LYS430. Molecular dynamics (MD) simulations further confirmed the stability of these interactions under dynamic conditions. Furthermore, ADME and physiochemical properties confirmed drug likeness and favorable pharmacokinetic profile of the designed compounds. These findings highlight R1 as a promising lead candidate and demonstrate the effectiveness of integrated computational strategies for the rational design of next-generation BTK inhibitors suitable for further experimental validation.

Keywords: *BTK inhibitors; pyrrolopyrimidine; 3D-QSAR; molecular dynamics.*

O-06/F/004 ORAL · OFFLINE

In Silico Exploration of Algal-Derived Anticancer Agents: Insights from Molecular Docking, Dynamics, DFT and Toxicity Profiling

Harshvardhan Gupta*, Preeti Patel

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: harshvardhangupta43@gmail.com

Marine algae are a rich source of bioactive metabolites with significant potential in anticancer drug discovery. This research aimed at investigating red and brown algal compounds utilizing a structure-based drug discovery strategy to assess the molecules with an integrative computational workflow involving molecular docking, molecular dynamics (MD) simulations, density functional theory (DFT) calculations and ADMET profiling. A custom library of 32 algal-derived compounds was tested against cancer-related target proteins (PDB IDs: 4PYP and 5U6B). Among these, CNP0218077 and compound 13 have better binding affinities than common chemotherapeutic agents, doxorubicin and 5-fluorouracil. MD simulations carried out in triplicate confirmed that these protein–ligand complexes were stable, as evidenced by good RMSD and RMSF plots. Moreover, DFT calculations showed advantageous electronic behaviors characterized by low HOMO–LUMO energy gaps and powerful binding energies, implying a high rate of reactivity and molecular stability. The drug-like properties and safe profiles of the lead candidates were supported by ADMET and toxicity analyses. This comprehensive investigation highlights the potential of marine algae-derived compounds as promising anticancer agents, paving the way for their further development and experimental validation in drug discovery pipelines.

Keywords: *Marine algae; anticancer agents; molecular docking; molecular dynamics simulation; density functional theory (DFT).*

O-06/F/005 ORAL · OFFLINE

Rational Design and Biological Evaluation of Novel JNK1-Targeting Peptide Inhibitors for the Management of Type 2 Diabetes

Anupama*, Hidul Islam

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: sachdevaanupama11@gmail.com

Type 2 diabetes mellitus (T2D) is a major global metabolic disorder characterized by impaired insulin sensitivity and persistent dysregulation of glucose homeostasis. Hyperactivation of c-Jun N-terminal kinase 1 (JNK1) plays a critical role in the development of insulin resistance, making it an attractive therapeutic target. The present study aimed to rationally design and evaluate novel peptide-based inhibitors targeting JNK1 for the management of T2D. A structure-based pharmacophore model combined with virtual screening was employed to identify and optimize five novel JNK1-targeting peptides, designated JKPs 1–5. Among the synthesized candidates, JKP-5 demonstrated the most promising binding profile, exhibiting high affinity for JNK1 with a dissociation constant (Kd) of 40.16 ± 2.11 nM and excellent target selectivity. Further evaluation confirmed its favorable serum stability and cellular permeability. In insulin-resistant HepG2 cells, JKP-5 significantly enhanced glucose uptake and restored intracellular glycogen content without producing detectable cytotoxicity. Importantly, in diabetic Db/db mice, treatment with JKP-5 reduced non-fasting blood glucose levels, improved glucose tolerance, and decreased serum insulin levels, collectively indicating enhanced insulin sensitivity. Notably, JKP-5 did not induce hypoglycemia in normal mice, supporting its favorable safety profile. Overall, this study identifies JKP-5 as a potent and selective lead peptide capable of targeting JNK1-mediated insulin resistance. These findings highlight the potential of rational structure-based design and peptide synthesis as promising approaches for developing targeted and safer therapeutic candidates for type 2 diabetes.

Keywords: *Type 2 diabetes; JNK1; peptide inhibitors; insulin resistance; rational drug design; glucose uptake; JKP-5.*

O-06/F/006 ORAL · OFFLINE

Probing New 3-Hydrazinyl Indole Phenacetamide Derivatives as Multitarget Anti-Alzheimer's Agents: Synthesis, In Vivo, In Vitro, and In Silico Studies

Anjlee*, Hidul Islam

ISF College of Pharmacy, Moga, Punjab, India
Email: 2501014@isfcp.org

Alzheimer's disease (AD) is a complex and multifactorial neurodegenerative disorder involving cholinergic dysfunction, amyloid-β accumulation, tau pathology, oxidative stress, and neuroinflammation, thereby highlighting the need for multitarget therapeutic strategies. The present study focused on the design and synthesis of a novel series of 3-hydrazinyl indole phenacetamide derivatives as potential multi-target-directed ligands targeting key enzymes implicated in AD, including acetylcholinesterase (AChE), butyrylcholinesterase (BChE), and β-secretase (BACE1). The synthesized derivatives were initially evaluated for in vivo anti-inflammatory activity, leading to the selection of compounds 5a–f, 5h, 5j, and 5o for further biological investigation. Subsequent in vitro enzyme inhibition studies identified compounds 5a–c, 5j, and 5o as the most promising cholinesterase inhibitors, which were further subjected to comprehensive in vivo evaluation. Among the investigated compounds, derivative 5a, an N-phenylacetamide indole bearing an unsubstituted phenylhydrazinyl side chain, demonstrated the most remarkable pharmacological profile. It produced significant cognitive enhancement and improved spatial memory, with activity comparable to or superior to the reference drug donepezil. Furthermore, compound 5a attenuated histopathological alterations and reduced multiple AD-associated pathological markers, including AChE, BACE1, amyloid-β, and phosphorylated tau. It also favorably modulated oxidative stress and inflammatory biomarkers, particularly GSH and IL-1β. Compounds 5a–c additionally demonstrated moderate in vitro BACE1 inhibitory activity. Molecular docking studies revealed favorable interactions of the most active derivatives with key amino acid residues within the AChE and BACE1 binding pockets, while molecular dynamics simulations confirmed the stable binding of compound 5a throughout the simulation period. Collectively, these findings identify compound 5a as a promising multitarget lead candidate capable of simultaneously modulating cholinergic dysfunction, amyloidogenic pathways, oxidative stress, and neuroinflammation. The study highlights the therapeutic potential of 3-hydrazinyl indole phenacetamide derivatives as a promising scaffold for the future development of effective multi-target therapeutics against Alzheimer's disease.

Keywords: *Alzheimer's disease; multitarget-directed ligands; 3-hydrazinyl indole; acetylcholinesterase; butyrylcholinesterase; BACE1; molecular docking; molecular dynamics.*

O-06/F/007 ORAL · OFFLINE

In Silico Exploration of Algal-Derived Anticancer Agents: Insights from Molecular Docking, Dynamics, DFT and Toxicity Profiling

Saloni Sharma*, Hidul Islam

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga – 142001, Punjab, India.
Email: 2501090@isfcp.org

Marine algae are a rich source of bioactive metabolites with significant potential in anticancer drug discovery. This research aimed at investigating red and brown algal compounds utilizing a structure-based drug discovery strategy to assess the molecules with an integrative computational workflow involving molecular docking, molecular dynamics (MD) simulations, density functional theory (DFT) calculations and ADMET profiling. A custom library of 32 algal-derived compounds was tested against cancer-related target proteins (PDB IDs: 4PYP and 5U6B). Among these, CNP0218077 and compound 13 have better binding affinities than common chemotherapeutic agents, doxorubicin and 5-fluorouracil. MD simulations carried out in triplicate confirmed that these protein–ligand complexes were stable, as evidenced by good RMSD and RMSF plots. Moreover, DFT calculations showed advantageous electronic behaviours characterized by low HOMO–LUMO energy gaps and powerful binding energies, implying a high rate of reactivity and molecular stability. The drug-like properties and safe profiles of the lead candidates were supported by ADMET and toxicity analyses. This comprehensive investigation highlights the potential of marine algae-derived compounds as promising anticancer agents, paving the way for their further development and experimental validation in drug discovery pipelines.

Keywords: *Marine Algae; anticancer; DFT; HOMO-LUMO; ADMET;*

O-06/F/008 ORAL · OFFLINE

Design and Synthesis of Isatin–Quinazoline Derivatives as Potential EGFR Inhibitors: Integrated Computational and In Vitro Studies

Renuka Sharma*, Tomojit Bhattacharjee, Ankush Kumar, Thakur Gurjeet Singh, Rohit Bhatia

Chitkara College of Pharmacy, Chitkara University, Rajpura-140401, Punjab, India
Email: sharmarenuka966@gmail.com

A new series of isatin-fused indolo [2,3-b] quinoxaline derivatives (TB–TB7) were developed and accessed as potential epidermal growth factor receptor (EGFR) inhibitors. The compounds were synthesized via a microwave-assisted cyclo-condensation reaction using substituted isatin derivatives and o-phenylenediamine analogues, forming the desired tetracyclic heterocyclic scaffold in moderate to excellent yields. Structural characterization was performed using various analytical methods like, FT-IR, 1HNMR, 13CNMR, and mass spectrometry. The synthesized derivatives were assessed for in-vitro anticancer activity against the human lung cancer cell line (PC-9) using the MTT assay. Among the tested compounds TB3 showed the most potent cytotoxic activity with an IC50 value of 17.38 µM comparable to the erlotinib drug 18.67 µM. In addition, TB3 gave significant EGFR inhibitory activity with an IC50 value of 0.26 µM. Molecular docking studies of the EGFR kinases domain (PDB ID: 1M17) showed strong bonding affinities for TB3 & TB5 with docking scores of -8.4 kcal & -8.6 kcal/mol, respectively surpassing that of Erlotinib (-7.5 kcal/mol). A 100 ns molecular dynamics simulation of the EGFR-TB3 complex confirmed excellent conformational stability supported by stable RMSD, RMSF, radius of gyration, SASA and hydrogen-bond profiles. MM-PBSA calculations revealed favorable binding free energy (ΔG-bind = −20.36 kcal/mol), predominantly driven by van der Waals and electrostatic interactions. Furthermore, DFT studies showed favorable electronic properties with a HOMO–LUMO energy gap of 3.64 eV. ADMET analysis confirmed acceptable drug-likeness, high gastrointestinal absorption and the absence of major toxicity alerts. These results confirmed TB3 as a potential lead scaffold for the development of novel EGFR-targeted anticancer agents.

Keywords: *EGFR, anticancer activity, molecular docking, molecular dynamics, MM-PBSA, DFT analysis.*

O-06/F/009 ORAL · OFFLINE

Isatin-Based Quinazoline Derivatives: Synthesis, Molecular Dynamics, and In Vitro Assessment of Antidiabetic Potential

Samarth Kumar*, Sahil Jaidka, Ankush Kumar, Thakur Gurjeet Singh, Rohit Bhatia

Chitkara College of Pharmacy, Chitkara University, Rajpura-140401, Punjab, India
Email: samdudeja55@gmail.com

A series of substituted indolo[2,1-b] quinazoline-6,12-diones (SJ1-SJ8), which consists of already published derivatives (SJ1-SJ5) and newly synthesized derivatives (SJ6-SJ8), has been studied for their possible α-amylase inhibitory property as an antidiabetic lead compound. The synthesized derivatives have been identified by spectroscopic and analytical methods and tested for their in vitro α-amylase inhibitory activity. The most potent inhibitory activity among the tested derivatives was shown by SJ2 (IC50 = 18.49 ± 0.06μM), similar to the reference drug acarbose (IC50 = 16.26 ± 0.02 μM). The second-best activity was observed for the newly identified derivative SJ8 (IC50 = 19.67 ± 0.19 μM). Molecular docking and 100 ns molecular dynamics simulations supported favorable and stable interactions of SJ2 in the α-amylase active site, while MM-PBSA analysis showed favorable binding energetics. The electronic properties of SJ2 were also clarified by DFT and molecular electrostatic potential analyzes, and in silico ADMET profiling indicated promising predicted drug-like and pharmacokinetic properties. To summarize, SJ2 is a promising lead for α-amylase inhibition, which needs further optimization and biological validation. Future evaluation against α-glucosidase and relevant in vivo models will be essential to determine the more general antidiabetic potential of this scaffold.

Keywords: *α-Amylase inhibition, Antidiabetic potential, Molecular docking, Molecular dynamics simulation, indoloquinazolinedione.*

O-06/F/010 ORAL · OFFLINE

Design and Synthesis of Novel Coumarin- Piperazine Hybrids as Dual Inhibitors of α-Glucosidase and Aldose Reductase for the Management of Type 2 Diabetes and Associated Complications

Preety Kumari*, Sant Kumar Verma

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India.
Email: kashyappreety0901@gmail.com

Type 2 diabetes mellitus (T2DM) is a major metabolic disorder associated with persistent hyperglycaemia and the development of long-term diabetic complications. Inhibition of α-glucosidase can reduce postprandial hyperglycaemia, whereas inhibition of aldose reductase may help attenuate glucose-induced complications by modulating the polyol pathway. The present study aims to design and synthesize novel coumarin- piperazine hybrids as dual-target inhibitors of α-glucosidase and aldose reductase. Molecular hybridization of the coumarin and piperazine pharmacophores was employed to develop structurally diverse hybrid molecules. Structure-based molecular docking and pharmacophore/3D-QSAR studies were performed to investigate their binding interactions and predict their inhibitory potential. The designed compounds were synthesized and characterized using FT-IR, 1H NMR, 13C NMR, Mass Spectrometry, and elemental analysis. The synthesized compounds were evaluated in vitro for α-glucosidase and aldose reductase inhibitory activities, followed by determination of IC_{50} values. Selected potent compounds were further investigated in a streptozotocin-nicotinamide-induced diabetic animal model to assess their antihyperglycemic and protective effects against diabetic complications. The study is expected to establish structure-activity relationships and identify promising dual-target molecular scaffolds for further development as potential antidiabetic agents.

Keywords: *Coumarin; Piperazine; a-Glucosidase; Aldose Reductase; Type 2 Diabetes Mellitus; Diabetic Complications.*

O-06/F/011 ORAL · OFFLINE

Imidazo[1,2-a] pyridine as a Privileged Scaffold in Neurodegenerative Drug Discovery: SAR and Therapeutic Perspectives

Jashanpreet Kaur*, Rajnish Srivastava, Naresh Kumar Rangra, Amit Chaudhary

Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India-174103
Email: jashanpreet.kaur@chitkarauniversity.edu.in

Background: Alzheimer's disease (AD) and Parkinson's disease (PD) are complicated neurodegenerative disorders comprising of interconnected phenomena like oxidative stress, neuroinflammation, neurotransmitters imbalances, protein misfolding, mitochondrial dysfunction and neuronal cell death. The inability of symptom based and mono-therapeutic drugs has paved the way for development of multi-target directed small molecule (SME). One such heterocyclic core is imidazo [1,2-a] pyridine, which holds promise for structural modification and synthesis of CNS acting molecules.

Aim: The main objective of the current critical review is to evaluate the SAR of imidazo[1,2-a] pyridine-based SMEs against the AD/PD associated targets.

Methodology: The critical analysis of literature was performed by PRISMA, which took into account such aspects as substituent types, positions, electronic and lipophilic properties, pharmacophore combinations, and linker properties. The activity towards AD-related targets, such as AChE, BChE, and BACE1, as well as the mechanisms of action in PD patients, was analyzed alongside molecular docking, molecular dynamics, antioxidation, neuroprotection, and in vivo studies.

Critical Perspective: Substitution and pharmacophore hybridization may become the strategy for achieving better target recognition and multifunctional effects. However, the absence of systematic SAR studies, which include such factors as target interaction, ADMET properties, BBB permeation, cell neuroprotection, and validation in vivo, is regrettable. The comparative SAR information concerning the connection between structure fragments of the imidazo[1,2-a] pyridine and the mechanisms of AD/PD is insufficient as well.

Conclusion: The imidazo [1,2-a] pyridine moiety can be considered a prospective lead compound for SMEs with multitarget action. The integration of structure-based and computational biological approaches may prove useful for the development of optimized SMEs with improved multitarget profile and brain pharmacophore properties as efficacious neuroprotectors of AD and PD.

Keywords: *Imidazo[1,2-a] pyridine; Structure–activity relationship; Alzheimer's disease; Parkinson's disease; Small-molecule entities; Multitarget-directed ligands; Neuroprotection.*

O-06/F/012 ORAL · OFFLINE

Design, Synthesis, and Evaluation of Novel Purine-2,6-dione Derivatives as Potent DPP-4 Inhibitors for Type 2 Diabetes Management

Prashant Pratap Singh*, Priya Bisht and Sant Kumar Verma

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142 001, Punjab, India
Email: prashantpratapsingh09@gmail.com

This study aimed to design and evaluate novel purine-2,6-dione derivatives based on the linagliptin scaffold as potential DPP-4 inhibitors with complementary *in vitro, in vivo*, and *in silico* evaluation. Two series comprising sixteen derivatives, 1,3-dimethyl-3,7-dihydro-1H-purine-2,6-diones (PB01-PB10) and 3,7-dihydro-1H-purine-2,6-diones (PB11-PB16), were synthesized and evaluated for DPP-4 inhibitory activity and cytotoxicity. The most active compounds were further investigated in a high-glucose-induced HepG2 cellular model for reactive oxygen species (ROS), mitochondrial superoxide, and cellular DPP-4 expression. Antidiabetic activity was assessed in streptozotocin-nicotinamide (STZ-NA)-induced diabetic mice using acute and chronic blood glucose measurements, oral glucose tolerance test (OGTT), body-weight assessment, and DPP-4 expression analysis by immunohistochemistry (IHC), flow cytometry, and RT-qPCR. Molecular docking and 140 ns molecular dynamics simulations were used to investigate ligand-target binding and complex stability. All synthesized derivatives showed no cytotoxicity up to 100 µM in HepG2 cells. PB01 and PB11 exhibited the strongest DPP-4 inhibition, with IC50 values of 15.66 ± 2.546 nm and 16.16 ± 1.214 nm, respectively, compared with 15.37 ± 2.481 nm for linagliptin. At 15 nm, both compounds reduced high-glucose-induced ROS, mitochondrial superoxide, and cellular DPP-4 expression. In STZ-NA diabetic mice, PB01 and PB11 at 5 and 10 mg/kg reduced elevated blood glucose levels and improved OGTT responses. Treatment did not produce a significant adverse change in body weight compared with the normal group. Reduced hepatic DPP-4 expression was further supported by IHC, flow cytometry, and RT-qPCR. Molecular dynamics simulations showed stable PB01-DPP-4 and PB11-DPP-4 complexes over 140 ns. The findings identify PB01 and PB11 as potent purine-2,6-dione-based DPP-4 inhibitors with consistent enzyme-level, cellular, and animal-model activity. Their favorable cytotoxicity profile, antihyperglycemic effects, suppression of oxidative stress and DPP-4 expression, and sustained protein-ligand complex stability support further preclinical investigation of these compounds for T2DM.

Keywords: *DPP-4 inhibitors, Purine-2,6-diones, Type 2 diabetes mellitus, Molecular dynamics simulation.*

O-06/F/013 ORAL · OFFLINE

Rational Design and Synthesis of Novel Biphenyl Thiazolidinedione Conjugates as Inhibitors of Protein Tyrosine Phosphatase 1B for The Management of Type 2 Diabetes

Pritik Tripathy*, Sant Kumar Verma

Department of Pharmaceutical Chemistry & Analysis, ISF College of Pharmacy Moga- 142001 (Punjab), India
Email: tripathypritik@gmail.com

The search for effective protein tyrosine phosphatase 1B (PTP1B) inhibitors remains an unmet therapeutic goal, and to address this, we rationally designed a series of novel biphenyl thiazolidinedione conjugates (**8a–n**). All the designed molecules cleared the *in-silico* absorption, distribution, metabolism, excretion, and toxicity screening as well as the drug-likeness criteria. A ligand–target binding study identified the N-methyl benzoic acid derivative (**8j**) as the most promising candidate, showing extensive and plausible interactions with the phospho-tyrosine (pTyr) loop of PTP1B, a distinctive bidentate binding mode that supports selectivity for PTP1B over other PTPs. The designed analogues (**8a–n**) were synthesized and evaluated for their in vitro PTP1B inhibitory potency, in vivo anti-hyperglycemic efficacy, and effects on body weight and pancreatic safety. Compounds 8a–n displayed moderate to good PTP1B inhibition (IC_{50} = 5.897–48.150 µM) relative to Suramin (IC_{50} = 11.104 µM), and their *in-vivo* efficacy was time-dependent, ranging from inferior to better than that of Pioglitazone. Among the series, **8j** emerged as the strongest pre-clinical candidate, combining good in vitro potency (IC_{50} = 5.897 µM) with improved in vivo efficacy and the added benefits of weight control and pancreatic safety compared with glitazone therapy.

Keywords: *Biphenyl, Diabesity, Insulin Resistance, Protein Tyrosine Phosphatase 1B, Thiazolidinedione Type 2 Diabetes Mellitus.*

O-06/F/014 ORAL · OFFLINE

C-5-Arylidene-Thiazolidine-2,4-dione Analogs Against Aldose Reductase: Design, Synthesis, Biological Evaluation, and Computational Insights

Manoj Baidya*, Rajiv Patel, Sant Kumar Verma*

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Ghal Kalan, Punjab, India
Email: manojbaidya90@gmail.com

In this study, a novel series of twelve C-5-arylidene-N-(benzyl)-thiazolidine-2,4-dione derivatives (9a-9l) was designed and synthesized via a four-step synthesis process, N-substitution, and Knoevenagel condensation, and characterized using FT-IR, ^{1}H NMR, and ^{13}C NMR spectroscopy. All compounds were evaluated *in vitro* for AR inhibitory activity, with compounds 9h and 9a found as the most potent, showing IC_{50} values of 0.98 and 1.05 µM respectively, surpassing the reference drug epalrestat (IC_{50} = 1.20 µM). Compounds 9l and 9i also displayed moderate inhibitory activity, with IC_{50} values of 1.36 and 2.47 µM. The four most active compounds (9a, 9h, 9i, and 9l) were further assessed for *in-vivo* anti-hyperglycemic activity in a streptozotocin-nicotinamide-induced diabetic mouse model, where all significantly reduced blood glucose levels at every time interval without the weight-gain liability associated with pioglitazone. Molecular docking studies revealed strong binding affinities (-10.21 to -11.81 kcal/mol) within the AR active site, mediated by hydrogen bonding and hydrophobic/π interactions, outperforming epalrestat (-8.157 kcal/mol); molecular dynamics simulations of the most active compound, 9h, confirmed complex stability over 500 ns. *In-silico* ADME predictions showed compliance with Lipinski's rule of five with minimal violations, while computational toxicity profiling using ProTox 3.0 indicated that all compounds were non-toxic, non-irritant, and inactive against hepatotoxicity, cytotoxicity, and PPAR-γ liability endpoints. Collectively, these findings highlight C-5-arylidene thiazolidine-2,4-dione derivatives, particularly 9h and 9a, as promising lead candidates for further development as safe and potent AR inhibitors for managing diabetic complications.

Keywords: *Aldose Reductase, Anti-Hyperglycaemic, Diabetes Mellitus, In Silico Toxicity, Molecular Dynamics, Thiazolidine-2,4-dione.*

O-06/F/015 ORAL · OFFLINE

Computational Discovery of Marine Algal Metabolites as Potential Anticancer Agents: Integrated Docking, Molecular Dynamics, DFT and ADMET Analysis

Mustahidul Islam*, Preeti Patel

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, India
Email: hidul369@gmail.com

Marine algae represent a promising reservoir of structurally diverse bioactive metabolites with considerable potential for anticancer drug discovery. This study aimed to identify potential anticancer candidates from red and brown algae using an integrated structure-based computational drug discovery approach. A curated library of 32 marine algal-derived compounds was evaluated against cancer-associated protein targets (PDB IDs: 4PYP and 5U6B) using molecular docking, followed by molecular dynamics (MD) simulations, density functional theory (DFT) calculations, and ADMET profiling. Among the screened compounds, CNP0218077 and compound 13 demonstrated favorable binding affinities compared with the reference chemotherapeutic agents doxorubicin and 5-fluorouracil. Triplicate MD simulations further supported the stability of the selected protein–ligand complexes, as indicated by favorable RMSD and RMSF profiles. DFT analysis revealed suitable electronic characteristics, including relatively narrow HOMO–LUMO gaps and favorable interaction energies, suggesting promising molecular reactivity and stability. Furthermore, ADMET and toxicity profiling indicated acceptable drug-likeness and predicted safety characteristics for the lead candidates. Overall, the findings highlight marine algal metabolites as promising scaffolds for anticancer drug discovery and provide computationally prioritized candidates for subsequent experimental validation.

Keywords: *Marine Algae; Anticancer Drug Discovery; Molecular Docking; Molecular Dynamics Simulation; DFT; ADMET Profiling.*

O-06/F/016 ORAL · OFFLINE

Discovery, Lead Identification and Exploration of Potential Oxadiazole Derivatives in Targeting STAT3 as Anti-Cancer Agents

Parnav Mishra, Vivek Panwar

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: parnav1006.mpharmchem25@chitkarauniversity.edu.in

Oxadiazoles an important heterocyclic scaffold of medicinal importance in the field of drug discovery. In the study, a library of oxadiazole based compounds was selected for screening against STAT-3 as anti-cancer target. STAT3 is a potential target of interest in cancer therapy. A total of 544 screened library of compounds was subjected to molecular docking against STAT-3 (6NJS and 6NQU). The compounds with good dock score and binding interactions were further subjected to in-silico ADME analysis followed by toxicity estimation. A total of 141 hits were selected against 6NJS and 50 hits against 6NQU and further screened for kinetic properties and drug likeliness. The compounds were screened on the basis of physicochemical properties, solubility, gastrointestinal absorption, BBB permeability, synthetic accessibility, Lipinski and other violations. Best compounds obtained after ADME analysis were further subjected for toxicity analysis. Carcinogenicity, mutagenicity, Ames and other important parameters were considered for toxicity-based screening. The best leads thus obtained (compound 114 and 40) were further subjected to molecular dynamics against the respective target proteins. MD simulations were run to access the stability of C-114 and C-40 along with the dynamic behaviour of both complexes for about 100 ns and shows good stability with the proteins.

Keywords: *ADME, Anti-cancer agents, MD simulations, Oxadiazole, STAT3.*

O-06/F/017 ORAL · OFFLINE

Design, Synthesis, and Molecular Docking Studies of Sulfonyl Substituted Chromene Derivatives as Anticancer Agents

Aman*, Rohit Bhatia, Vivek Asati

ISF College of pharmacy and research, Rattian road, Ghal kalan – 142001, Moga, Punjab, India
Email: amanrai6780@gmail.com@gmail.com

This study explores the role of estrogen in breast cancer development through ERα and ERβ receptors and highlights the significance of aromatase in estrogen biosynthesis. Chromene-based compounds, known for their anticancer properties, were synthesized with sulfonyl substitutions to enhance their efficacy. The MTT assay on MCF-7, MDA-MB-231, and HCT-116 cancer cell lines showed that (Z)-N-(3 cyano-2H-chromen-2-ylidene) benzenesulfonamide (AN1) and (Z)-N-(6 bromo-3-cyano-2H-chromen-2-ylidene) methanesulfonamide (AN13) had strong cytotoxic activity. Aromatase inhibitory assay shows that compound AN1 and AN13 show good inhibitory activity with IC50 values 0.20 and 0.24 µM. Docking studies revealed that these compounds fit well at the active site of the aromatase enzyme, with AN1, AN2, AN3, AN7, AN8, and AN13 showing docking scores of –9.1, –9.0, –8.8, –8.0, –8.6, and –7.8 respectively, compared to Exemestane with –9.3. ADME predictions indicated good drug-like properties, suggesting that these chromene derivatives could be effective anticancer agents.

Keywords: *Chromene, Anticancer, Aromatase, Breast Cancer, Cell Lines, Exemestane.*

O-06/F/018 ORAL · OFFLINE

Design, Synthesis and Biological Evaluation of Rhodanine Derivatives as Anti-Cancer Agents

Kumari Kajal*, Rohit Bhatiya, R.K. Narang

Department of Pharmaceutical Chemistry, ISF College of Pharmacy
Email: kajal94188@gmail.com

Cancer remains a major health concern due to uncontrolled cell growth and alterations in normal cellular signaling. The present study focuses on the design, synthesis, and biological evaluation of rhodanine derivatives as potential anticancer agents. Rhodanine was selected as the core scaffold because of its structural versatility and reported biological potential. A rational drug-design approach was used to develop substituted rhodanine derivatives, which were investigated through molecular docking, ADME prediction, toxicity assessment, and synthetic studies. Molecular docking was carried out against the HER2 receptor (PDB ID: 3PP0), and compound KK16 showed the highest docking score of −7.525 kcal/mol, indicating a favorable predicted interaction with the target receptor. The designed compounds were further evaluated using SwissADME, and most compounds complied with Lipinski's Rule of Five, suggesting acceptable preliminary drug-like properties. ProTox-II analysis predicted relatively low toxicity for several compounds, although some organ-specific toxicity signals were observed and require further experimental validation. The synthetic work included the preparation of rhodanine intermediates, O-benzylated aromatic aldehydes, and substituted rhodanine derivatives, followed by preliminary characterization using IR spectroscopy. Further in-vitro evaluation against selected cancer cell lines will be undertaken to determine the anticancer activity of the synthesized compounds. Overall, the computational and preliminary synthetic findings indicate that rhodanine derivatives may serve as promising candidates for further investigation in anticancer drug discovery.

Keywords: *Rhodanine derivatives, Anticancer agents, HER2 receptor, Heterocyclic compounds*

O-06/F/019 ORAL · OFFLINE

Novel C-3 and C-20 Derived Analogs of Betulinic Acid as Potent Cytotoxic Agents: Design, Synthesis, *In vitro* and *In silico* Studies

Neelabh Verma*, Nidhi Gupta

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, GT Road, Ghal Kalan- 142001, Moga, Punjab, India
Email: neelabhverma98@gmail.com

Novel betulinic acid (BA) derivatives were designed and synthesized by modifying the C-3-OH group and the C-20 olefinic bond to obtain potential antitumor agents. The cytotoxic activities of the target compounds were evaluated by MTT assay using six human cancer cell lines, including MCF-7 (breast cancer), A549 (lung cancer), HCT-116 (colon cancer), MOLT-4 (leukemia), PC-3 (prostate cancer), and MiaPaCa-2 (pancreatic cancer). Most derivatives exhibited higher cytotoxic activity than BA derivatives, and compounds 9b, 9e, 10, and 11a were the most active. Notably, compound 11a showed the most potent cytotoxic activity, with IC50 values of 7.15, 8.0, 3.13, 13.88, 8.0, and 6.96 mM against MCF-7, A549, HCT-116, MOLT-4, PC-3, and MiaPaCa-2 cell lines, respectively.

Keywords: *Betulinic acid; Anti-Tumor agents; MTT assay; Density functional theory; Molecular docking; Molecular dynamics; MMP-2; PARP-1; TRAF2.*

O-06/F/020 ORAL · OFFLINE

Design and Synthesis of Potential N-Substituted 5-Benzylidenethiazolidine-2,4-Dione Derivatives as α-Amylase Inhibitors

Pratyushi De*, Vivek Asati

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India.
Email: depratyushi28@gmail.com

Diabetes mellitus is a major metabolic disorder, and inhibition of α-amylase is an established strategy for controlling postprandial hyperglycaemia. In the present study, computational and synthetic approaches were integrated to identify novel N-substituted 5-benzylidene-thiazolidine-2,4-dione (TZD) derivatives as potential α-amylase inhibitors. A dataset of 36 TZD derivatives was subjected to atom-based and field-based 3D-QSAR studies, followed by pharmacophore modelling, R-group enumeration, virtual screening, molecular docking, and MM-GBSA analysis. The pharmacophore model AHRRR_1, comprising one hydrogen-bond acceptor, three aromatic ring features, and one hydrophobic feature, demonstrated strong predictive performance. R-group enumeration generated 64,800 compounds, which were progressively filtered using Lipinski's rule of five and hierarchical virtual screening to identify promising candidates. Molecular docking revealed favourable interactions of the selected compounds with key α-amylase active-site residues, particularly THR163 and ARG195. Among the designed compounds, compound 7a exhibited the best docking score (−7.722 kcal/mol) and favourable binding free energy (−71.655 kcal/mol). The selected derivatives were subsequently synthesized and characterized using spectroscopic techniques and evaluated for in-vitro α-amylase inhibitory activity. Compound 7a showed the highest inhibitory potency with an IC_{50} value of 1.9 ± 0.103 μM, outperforming the reference inhibitor acarbose (IC_{50} = 2.975 ± 0.004 μM). Overall, the integrated computational and experimental findings identify N-substituted 5-benzylidene-TZD derivative 7a as a promising lead for further development of α-amylase inhibitors for potential antidiabetic applications.

Keywords: *Diabetes mellitus, α-Amylase inhibitors, Thiazolidine-2,4-dione, 5-Benzylidene-thiazolidine-2,4-dione, Pharmacophore modelling, MM-GBSA, Virtual screening, Acarbose.*

O-06/F/021 ORAL · OFFLINE

Computational Approaches for the Discovery of Novel Chromen-2-one Derivatives as 5-HT1A Inhibitors for the Treatment of Schizophrenia

Shivangi Gupta, Dr Vivek Asati*

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, GT Road, Ghal Kalan -142001, Moga, Punjab, India
Email: guptashivangi706@gmail.com

Schizophrenia is a complex neuropsychiatric disorder defined by positive, negative and cognitive symptoms, and limitations of existing antipsychotic therapies continue to fuel the search for more selective and effective methods of treatment. In the present study, a novel integrated computational drug-design framework was utilized to explore novel chromen-2-one derivatives as potential 5-HT1A receptor antagonists. Key structural features for receptor inhibition were determined by ligand alignment, field-based and atom-based 3D QSAR modeling and pharmacophore mapping of a biologically relevant ligand dataset. The validated pharmacophore model emphasized complementary hydrogen-bonding, hydrophobic, aromatic, and ionic interactions that supported rational ligand design. Based on these structural insights, a diverse virtual library was generated by R-group enumeration and systematically refined by pharmacophore-based screening, drug-likeness evaluation, and molecular docking. The prioritized compounds showed favorable binding interactions within the 5-HT1A receptor involving key active-site residues through hydrogen bonding, π–π stacking and hydrophobic contacts. Among the candidates identified, compounds 1A and 1B demonstrated particularly consistent receptor engagement and good conformational stability. In silico ADMET evaluation also suggested attractive drug-like and central nervous system-related pharmacokinetic profiles for the top hits. Molecular dynamics simulations supported the persistence of ligand–receptor interactions and underlined the conformational stability of the prioritized complexes. In conclusion study shows the importance of integrating computational modeling, pharmacophore-guided molecular design, virtual screening, docking, ADMET prediction, and molecular dynamics to identify promising chromen-2-one scaffolds for further development as potential 5-HT1A receptor inhibitors. These findings offer a rational basis for subsequent experimental validation and optimization toward improved antipsychotic candidates.

Keywords: *5-HT1A inhibitors; 3D-QSAR; pharmacophore mapping; virtual screening; R-group enumeration.*

O-06/F/022 ORAL · OFFLINE

Design and synthesis of novel dual inhibitors of dipeptidyl peptidase-4 (DPP-4) and protein tyrosine phosphatase 1b (PTP1B) for the management of type 2 diabetes

Rupali Kohal*, Sant Kumar Verma

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab
Email: rupalikohal10@gmail.com

Type 2 diabetes mellitus (T2DM) is a multifactorial metabolic disorder characterized by impaired insulin secretion and insulin resistance, highlighting the need for therapeutic strategies capable of addressing both abnormalities. Dipeptidyl peptidase-4 (DPP-4) and protein tyrosine phosphatase 1B (PTP1B) are important molecular targets involved in glucose homeostasis. DPP-4 inhibition enhances incretin-mediated insulin secretion, whereas PTP1B inhibition can improve insulin sensitivity. Therefore, simultaneous inhibition of DPP-4 and PTP1B represents a rational multitarget approach for the management of T2DM. The present study proposes the design and synthesis of novel dual DPP-4/PTP1B inhibitors through molecular hybridization of pyrimidine-2,4-dione and thiazolidine-2,4-dione (TZD) pharmacophores. The designed derivatives will be evaluated using a combination of computational approaches, including molecular docking, molecular dynamics simulation, density functional theory (DFT), drug-likeness, and *in silico* ADME prediction, to identify promising candidates for synthesis. The synthesized compounds will be purified and characterized by FT-IR, ^{1}H-NMR, ^{13}C-NMR, and HRMS techniques. The biological evaluation will involve *in vitro* DPP-4 and PTP1B inhibitory assays, followed by determination of IC_{50} values and structure-activity relationship analysis. Promising derivatives will subsequently be investigated for antihyperglycaemic activity using the streptozotocin-nicotinamide (STZ-NA)-induced diabetic mouse model. Selected biochemical, hematological, and histopathological parameters will also be assessed to investigate the biological response and safety profile. The study is expected to provide novel pyrimidine-2,4-dione-TZD hybrids with dual DPP-4/PTP1B inhibitory potential and establish a rational framework for the development of multitarget-directed candidates for T2DM management.

Keywords: *DPP-4, PTP1B, STZ-NA, Dual target, Pyrimidine-2,4-dione, TZD*

O-06/F/023 ORAL · OFFLINE

Design, Synthesis, *In-Vitro* and *In-Silico* Evaluation of 1,3,4-Oxadiazole-2-Thione Hydroxamic Acid Derivatives as Potential Anticancer Agent

Shivani Kasana*, Preeti Patel

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab-142001, India
Email: shivikk5@gmail.com

Abstract: The present study describes the design, synthesis and biological evaluation of a novel series of 1,3,4-oxadiazole-2-thione derivatives bearing hydroxamic acid functionality as potential anticancer agents targeting histone deacetylases (HDACs). The compounds were synthesized through a multistep strategy involving the preparation of substituted benzohydrazides, cyclization to generate the corresponding 1,3,4-oxadiazole-2-thione scaffold, followed by N-substitution with suitable carboxylic acid linkers and subsequent conversion to hydroxamic acid derivatives. The synthesized compounds were structurally characterized using spectroscopic and analytical techniques, including ^{1}H NMR, ^{13}C NMR and HRMS. The synthesized derivatives were evaluated for their *in-vitro* anticancer activity against MCF-7 human breast cancer cells using the sulforhodamine B (SRB) assay. Among the evaluated compounds, IVA10 emerged as a potent derivative with an IC_{50} value of 3.26 ± 0.22 µM, compared with 2.04 ± 0.33 µM for the reference standard, demonstrating promising antiproliferative activity. To investigate the possible molecular basis of its activity, molecular docking studies were performed against the HDAC target (PDB ID: 1C3S) using BIOVIA Discovery Studio. IVA10 demonstrated favourable accommodation within the HDAC active-site region, with a CDOCKER energy of 38.83 and CDOCKER interaction energy of 61.82, along with key hydrogen-bonding, hydrophobic/π and metal-associated interactions. Molecular dynamics simulations further supported the stability of the ligand–protein complex through analysis of RMSD, RMSF and protein–ligand hydrogen-bond interactions. DFT calculations were additionally performed to investigate the electronic properties, while ADME and toxicity prediction studies were employed to assess the drug-likeness and preliminary safety profile of the synthesized derivatives. Overall, the findings identify IVA10 as a promising lead molecule and support further optimization of 1,3,4-oxadiazole-2-thione hydroxamic acid derivatives as potential HDAC-targeting anticancer agents.

Keywords: *Benzohydrazides, 1,3,4-oxadiazole-2-thione, Breast cancer, CDOCKER.*

O-06/F/024 ORAL · OFFLINE

In silico Screening of Benzimidazole Derivative as Dual TLR4 and IL6 Inhibitors for Rheumatoid Arthritis

Sonu Sharma*, Preeti Patel

Department of Pharmaceutical Chemistry, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India.
Email: sonusharma86601@gmail.com

Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder characterized by persistent synovial inflammation, progressive joint destruction, and functional impairment. Toll-like receptor 4 (TLR4) and interleukin-6 (IL-6) are key mediators of inflammatory signaling involved in RA pathogenesis and progression. Therefore, simultaneous targeting of TLR4 and IL-6 may provide a rational strategy for identifying potential anti-rheumatoid agents. The present study aimed to explore benzimidazole derivatives as potential dual inhibitors of TLR4 and IL-6 using a structure-based computational approach. A series of benzimidazole derivatives was designed through systematic structural modifications, followed by molecular docking against TLR4 and IL-6 to evaluate binding affinity, orientation, and interaction patterns. Key hydrogen-bonding, hydrophobic, and other stabilizing interactions were analyzed to identify compounds with favorable binding profiles toward both targets. The computational screening approach enabled prioritization of promising dual-target candidates for subsequent synthesis and biological evaluation. Overall, this study highlights benzimidazole as a promising scaffold for the rational development of multi-target therapeutic candidates against RA.

Keywords: *Rheumatoid arthritis; Benzimidazole derivatives; Toll-like receptor 4 (TLR4); Interleukin-6 (IL-6); In silico screening.*

O-06/F/025 ORAL · OFFLINE

Design, Synthesis, and Antidiabetic Activity of New Furan-Clubbed 1,2,3-Triazole Derivatives as α-Glucosidase Inhibitors

Navneet Sharma*, Vivek Asati
Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India
Email: navi4749@gmail.com

Diabetes mellitus is a major metabolic disorder characterized by persistent hyperglycaemia, and inhibition of carbohydrate-digesting enzymes such as α-glucosidase is an established strategy for controlling postprandial blood glucose levels. The present study aimed to design, synthesize, and evaluate novel furan-clubbed 1,2,3-triazole derivatives as potential α-glucosidase inhibitors and antidiabetic agents. A series of ten derivatives, PD1–PD10, was synthesized and characterized using FT-IR, ^{1}H NMR, ^{13}C NMR, and LC-MS techniques. The synthesized compounds were evaluated for in vitro α-glucosidase inhibitory activity using 4-nitrophenyl-α-D-glucopyranoside as substrate, with acarbose as the reference standard. The most promising compounds were further investigated in streptozotocin-nicotinamide-induced diabetic mice, and molecular docking studies were performed against α-glucosidase (PDB: 3L4U). Among the synthesized derivatives, PD10 exhibited the highest inhibitory activity with an IC_{50} of 13.83 µM, followed by PD1 (14.88 µM) and PD6 (19.75 µM), compared with acarbose (32.02 µM). PD10 demonstrated promising in vivo antidiabetic effects, including improved glucose tolerance and favourable changes in diabetes-associated biochemical parameters and tissue alterations. Molecular docking supported its favourable binding within the α-glucosidase active site, with interactions involving Trp406 and His600. Overall, the findings identify PD10 as a promising lead scaffold for further optimization and development of novel α-glucosidase inhibitors for diabetes management.

Keywords: *α-Glucosidase; Antidiabetic; Furan; 1,2,3-Triazole; Acarbose; PD10.*

O-06/F/026 ORAL · OFFLINE

Fragment-Based Drug Design and Virtual Screening of Thiazolidine-2,4-dione Derivatives as Potential Antidiabetic Agents: Synthesis and In Vivo Evaluation

Ashish Kumar*, Sankar Gupta
ISF College of Pharmacy, Moga, Punjab
Email: ashishkuamr@isfcp.org

Diabetes mellitus is a metabolic disease characterized by persistent hyperglycemia and the development of various associated complications. The present study integrates fragment-based drug design (FBDD) and virtual screening approaches to investigate the antidiabetic potential of newly synthesized thiazolidine-2,4-dione derivatives. Novel derivatives were designed using fragment-based strategies and evaluated through pharmacophore-based virtual screening and molecular docking, leading to the identification of twelve promising candidate compounds. Among these, SP4e and SP4f exhibited the highest docking scores of −9.082 and −10.345, respectively. Prime MM/GBSA analysis revealed binding free-energy values of −19.9, −16.1, and −13 kcal/mol for SP4e, SP4f, and pioglitazone, respectively. Molecular dynamics simulations further supported the stability of the predicted protein–ligand complexes. Both compounds also improved lipid profiles by reducing total cholesterol, triglyceride, and low-density lipoprotein (LDL) levels while increasing high-density lipoprotein (HDL) levels. Analysis of PPAR-γ expression in mouse tissue revealed a value of 4.200 ± 0.24 in the disease-control group, compared with 7.68 ± 0.65 and 7.84 ± 0.431 for SP4e and SP4f, respectively. Furthermore, in a zebrafish model, both compounds reduced blood glucose levels and lipid peroxidation while enhancing glutathione levels and catalase activity. In vitro evaluation using the HEK-2 cell line demonstrated EC_{50} values of 826.7 for SP4e and 739.0 for SP4f, whereas pioglitazone exhibited an EC_{50} of 575.2. Collectively, these computational and experimental findings suggest that SP4e and SP4f are promising candidates for further investigation as potential antidiabetic agents targeting PPAR-γ.

Keywords: *Fragment-based drug design, Thiazolidine-2,4-dione derivatives, Diabetes mellitus, Pharmacophore-based virtual screening, Molecular docking, Molecular dynamics simulation*

P-06/F/012 POSTER · OFFLINE

Pharmacological Mechanism, Administration Protocols, and Public Health Impact of Naloxone in Opioid Overdose Reversal

Amit Singh*, Anmolpreet Singh, Parminder Gangar, Monika

University Institute of Pharmaceutical Sciences and Research, Sadiq Road, Society Nagar, Faridkot, Punjab - 151203, India
Email: uramxt@gmail.com

Naloxone is a life-saving emergency medicine that rapidly reverses an opioid overdose. Naloxone is synthetic morphine derivative. Naloxone IUPAC name is (5α,14α)- 17-allyl-4,5-epoxy-3,14-dihydroxymorphinan-6-one. Naloxone is commonly used in comatose patient as therapeutic and diagnostic Agent. Acute opioid toxicity caused by potent illicit and synthetic opioids, such as diamorphine (heroin) and fentanyl, possess a major public health threat characterized by lethal respiratory depression. Naloxone is a drug that occupies the same sites as opioid drugs to exert its effect. It reverses an overdose and performs its function by acting directly on the brain within two minutes to block the effects of the opioid drug, restoring normal breathing and relieving the patient's respiratory distress. It is administrated as intramuscular injection or non-invasive intranasal formulations. Bioavailability of this drug in intramuscular injection is more. Brand name of this drug is Narcan. The pharmacological profile of naloxone is marked by high safety, zero addiction potential, and an absence of clinical effect in the absence of exogenous opioids. Naloxone acts as a competitive opioid receptor antagonist with high affinity for mu-opioid receptors. It rapidly reverses opioid-induced respiratory depression by displacing full agonists from central nervous system receptors, naloxone antagonist typically within two minutes. It is very easy to use and very effective in nature.

Keywords: *Naloxone, opioid antagonist, Narcan, acute respiratory depression.*

P-06/F/001 POSTER · OFFLINE

Integrated Computational Design and Discovery of Novel Indole-Linked Guanidine Derivatives as BACE1 Inhibitors for Alzheimer's Disease

Appu Kumar*, Vivek Asati

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: appukumar4505123@gmail.com

Amyloidogenic pathway is an important therapeutic target that includes β-Site amyloid precursor protein cleaving enzyme-1 (BACE1) which is an important enzyme in the disease. A multi-step computational drug design method, which includes pharmacophore modeling, 3D-QSAR, molecular docking, pharmacophore guided virtual screening, molecular dynamics (MD) simulation and ADME analysis, was used to search for new BACE1 inhibitors with an indole scaffold. The 3D-QSAR model DDHRR_1 had the highest survival score (5.7767), and the 3D atom-based and field-based 3D-QSAR models showed good predictive ability (R^2/Q^2: 0.9386/0.9753 and 0.8492/0.6644, respectively). Of all the reported compounds, compound B38 (3i) showed the highest binding affinity of −6.567 kcal/mol with BACE1 (PDB ID: 4DJU). The total number of novel compounds generated by the R-group enumeration was 5,880 with compound R1 possessing the highest binding affinity (−10.339 kcal/mol) and pharmaceutical properties. The results indicate that R1 is a promising lead candidate and validated the use of integrated computational approaches to the rational design of novel BACE1 inhibitors for experimental testing.

Keywords: *AD, BACE1, 3D-QSAR, MD, ADME.*

P-06/F/002 POSTER · OFFLINE

Design, Synthesis and Antidiabetic Evaluation of 2-Thioxo-4-thiazolidinone Derivatives as PTP1B Inhibitors

Kajal Rani[1]*, Sant Kumar Verma[2]

[1]Dept. of Pharmaceutical Chemistry, Rayat Institute of Pharmacy, Railmajra-144 533, Punjab, India
[2]Dept. of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142 001, Punjab, India
Email: kajalchoudhary4019@gmail.com

Protein Tyrosine Phosphatase 1B (PTP1B) is a validated therapeutic target for Type-2 Diabetes Mellitus and obesity due to its role in negative regulation of insulin and leptin signaling. In this study, a series of 2-thioxo-4-thiazolidinone derivatives (KS01-KS28) were rationally designed as target-selective PTP1B inhibitors. Molecular docking studies of all derivatives showed favourable binding orientations and key interactions within the catalytic pocket of PTP1B. In silico ADME and toxicity predictions indicated good pharmacokinetic properties and low toxicity risks for the designed compounds. Based on docking and ADME results, the derivatives were synthesized and evaluated for in vitro PTP1B inhibitory activity. The synthesized compounds showed moderate to significant inhibition. KS02 (IC50 = 9.79 ± 1.11 µM) and KS01 (IC50 = 11.03 ± 1.16 µM) emerged as the most potent inhibitors, with activity comparable to the reference inhibitor suramin (IC50 = 11.24 ± 1.13 µM). Further, KS01 and KS02 were evaluated for in vivo antidiabetic activity in diabetic mice. Both compounds significantly improved body weight, lipid profiles, liver enzyme levels, GLP-1, and inflammatory markers including TNF-α, IL-β, and IL-10. Hematological parameters also showed improvement. Histopathological studies of liver, kidney, and pancreas demonstrated good safety profiles for both compounds, comparable to pioglitazone. To validate binding stability, 500 ns molecular dynamics simulations and DFT analysis were performed. The simulations revealed sustained protein-ligand binding with minimal conformational fluctuation. MM-GBSA calculations further confirmed favorable binding free energies for KS01 and KS02. In conclusion, KS01 and KS02 are potent, safe, and stable PTP1B inhibitors with promising antidiabetic potential and can be considered as lead candidates for Type-2 Diabetes therapy.

Keywords: *PTP1B Inhibitor; 2-Thioxo-4-Thiazolidinone; Antidiabetic Activity; Molecular Docking; Molecular Dynamics; Drug Design*

P-06/F/003 POSTER · OFFLINE

Fragment-based drug design with virtual screening to identify novel thiazolidine-2,4-dione derivatives as PPAR-γ agonists

Priyanka*

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab- 142001
Email: gujjarpriyanka011@gmail.com

Diabetes mellitus, marked by chronic hyperglycaemia and metabolic complications, requires safer and more effective therapies. This study integrated fragment-based drug design with virtual screening to identify novel thiazolidine-2,4-dione derivatives as PPAR-γ agonists. From a library of 7,000 virtually generated compounds, SP4e and SP4f were selected as lead candidates based on superior docking scores (−9.082 and −10.345 kcal/mol) and MM/GBSA binding free energies. Molecular dynamics simulations validated the stability of their interactions with the PPAR-γ receptor. In vitro, both compounds demonstrated potent PPAR-γ transactivation in HEK293 cells, with EC_{50} values of 826.7 nM (SP4e) and 739.0 nM (SP4f), comparable to pioglitazone. In streptozotocin-induced diabetic mice, oral administration of SP4e and SP4f (10 mg/kg) produced significant hypoglycaemic effects and improved lipid profiles by reducing total cholesterol, triglycerides, and LDL while increasing HDL. They also enhanced PPAR-γ expression in pancreatic tissue. Supporting results from a zebrafish model further confirmed their ability to reduce oxidative stress. These findings establish SP4e and SP4f as promising antidiabetic agents targeting PPAR-γ.

Keywords: *Diabetes mellitus, Molecular dynamics, PPAR-γ, Thiazolidine-2,4-dione.*

P-06/F/004 POSTER · OFFLINE

Synthesis, Characterization and Antimicrobial Evaluation of Surface-Active Salicylate-Based Ionic Liquids

Subir Nandi*, Preeti Patel

Department of Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India.
Email: nandisubir2003@gmail.com

Ionic liquids (ILs) have gained significant interest in pharmaceutical and biomedical research due to their unique physicochemical properties, structural tunability, and potential biological applications. Surface-active ionic liquids containing biologically active ions are particularly attractive because they can combine the properties of ionic liquids with the intrinsic activity of their constituent ions. In the present study, salicylate-based surface-active ionic liquids were synthesized using suitable cationic surfactants and salicylate as the counter ion. Benzalkonium salicylate (BzSal) and cetylpyridinium salicylate (CetPySal) were prepared through an ion-exchange/metathesis approach. The synthesized ionic liquids were subsequently subjected to spectroscopic and biological evaluation. UV–Visible spectroscopic analysis was performed to investigate their characteristic absorption behaviour and provide supportive evidence for the formation of the synthesized ionic-liquid systems. Furthermore, antimicrobial activity was evaluated against selected bacterial strains to assess the biological potential of the prepared ionic liquids. The synthesized compounds demonstrated characteristic UV–Visible absorption profiles and showed promising antibacterial activity.

Keywords: *Benzalkonium salicylate, Ionic liquids, cetylpyridinium salicylate, UV.*

P-06/F/005 POSTER · OFFLINE

Substituted Benzenesulfonyl Piperazine Derivatives as Selective and Reversible MAO-A Inhibitors: A Multi-Target Approach for Antidepressant Drug Development

Nitin Jangra*, Naresh Kumar Rangra

Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India-174103
Email: nitin1014.mpharmchem25@chitkarauniversity.edu.in

Introduction: Monoamine oxidase-A (MAO-A) is a key target for antidepressant drug development, and selective, reversible inhibitors offer improved safety over older non-selective agents. Piperazine scaffolds are promising candidates for such inhibitors.

Aim and Objectives: The present study aimed to design and synthesize a novel series of substituted benzenesulfonyl piperazine derivatives (NP1-NP16) and evaluate their potential as selective MAO-A inhibitors. The objectives included assessing enzyme inhibitory potency and isoform selectivity, evaluating cytotoxic and neuroprotective effects on neuronal cells, determining antioxidant potential, and validating in vitro findings through in vivo behavioral models and molecular docking studies.

Material and Methods: Sixteen derivatives were synthesized and screened for MAO-A/MAO-B inhibition using the Amplex Red assay. Cytotoxicity and neuroprotection were assessed on SH-SY5Y cells, antioxidant activity via DPPH assay, and antidepressant-like behavior using FST and TST in vivo models, with fluoxetine as standard. Molecular docking supported the biological findings.

Results: Most derivatives selectively inhibited MAO-A. NP4 and NP12 were the most potent (IC50 = 0.25 ± 0.04 µM and 0.46 ± 0.02 µM) and reversible inhibitors. NP4 showed 52-fold selectivity for MAO-A over MAO-B. Both compounds were non-toxic, neuroprotective, and showed ~50% radical scavenging at 1 mM (DPPH). In FST, both matched fluoxetine's efficacy; in TST, both outperformed it. Docking confirmed strong MAO-A active-site binding.

Summary: A new series of benzenesulfonyl piperazine derivatives was synthesized and evaluated for MAO-A inhibitory, antioxidant, neuroprotective, and antidepressant-like properties. Compounds NP4 and NP12 emerged as lead candidates, showing potent and selective MAO-A inhibition alongside favorable safety and efficacy profiles in cellular and behavioral models.

Conclusion: NP4 and NP12 are promising, selective, multi-targeted MAO-A inhibitors combining antidepressant efficacy, neuroprotection, and antioxidant activity, warranting further development as novel antidepressant candidates.

Keywords: *Monoamine oxidase-A (MAO-A); Piperazine derivatives; Benzenesulfonyl analogs; Antidepressant activity; Molecular docking.*

P-06/F/006 POSTER · OFFLINE

Comparative Evaluation of Waste-Derived Biochar's for Adsorptive Remediation of Persistent Organic Pollutants in Contaminated Water

Tushar Parmar[1]*, Nitin Verma

[1]*Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India*
Email: tushar1012.mpharmchem25@chitkarauniversity.edu.in

Introduction: Persistent organic pollutants (POPs) in water from agriculture pesticides and perfluorooctanoic acid (PFOA) poses a threat to the environment and human health. Waste derived biochar's such as bamboo waste, agricultural and forestry residues are carbon negative and inexpensive adsorbents for remediation of water containing POPs.

Aim: In this work waste derived biochar's (pristine and KOH modified) produced at different pyrolysis temperatures (300-900 °C) are systematically studied in terms of the changes in structure and mechanisms as well as efficiency in the removal of aqueous POPs.

Methods: Waste derived biochar's were produced using waste biomass and modified using KOH activation at 700-900 °C. Physicochemical characterisation included SEM, zeta potential, Raman spectroscopy, FT-IR, BET surface area, XRD and analysis. Batch studies were performed on adsorption kinetics, isotherps (Langmuir, Freundlich and Sips), thermodynamic studies, regeneration studies over five cycles and pH effects.

Results and Discussion: The mesopores were developed and the number of carbon defects (ID/IG = 1.127) increased at higher temperatures (900 °C) during KOH activation. A very high surface area (2924.7 m2 g-1) was obtained. The maximum adsorption capacity of PFOA onto KBC-900 was found to be 487.89 mg g-1 at pH 3. The adsorption data fit the pseudo second order rate equation and also the Freundlich and Sips isotherps implying chemisorption occurred with multi layered adsorption on a heterogeneous surface. The adsorption interactions that were occurring included pore filling, hydrophobic interactions, π-π interactions, electrostatic interactions. The modified biochar's also showed >90% removal from real waters and 75.69% capacity after five regeneration cycles in 50% methanol.

Summary & Conclusion: This work has compared the performance of waste derived biochar's modified with alkali at high temperatures. These chars produced from biowaste are shown to be highly porous and can be regenerated multiple times and are therefore sustainable materials for the removal of POPs and also for waste valorisation.

Keywords: *Waste-Derived Biochar; Persistent Organic Pollutants; PFOA; Pesticides; KOH Activation; Adsorption Mechanisms; Wastewater Remediation.*

P-06/F/007 POSTER · OFFLINE

In Vitro Anticancer Evaluation of Substituted Amino-Alkyl-Rhodamine Derivatives Against the MCF-7 Human Breast Cancer Cell Line

Rishabh Thakur*, Naresh Kumar Rangra

Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India-174103
Email: rishabh1008.mpharmchem25@chitkarauniversity.edu.in

Introduction: Breast cancer is the most prevalent diagnosed cancer among women and remains a primary cause of morbidity and mortality globally. The MCF-7 cell line serves as a key candidate model for investigating estrogen receptor (ER)-positive breast cancers. Rhodamine dyes and xanthene-based derivatives have attracted significant interest due to their tuneable fluorescence, high photostability, ease of functionalization, and inherent mitochondrial-targeting capabilities.

Aim and Objectives: To synthesize, characterize, and evaluate the in vitro anti-proliferative and cytotoxic potential of substituted "amino-alkyl-rhodamine" derivatives (compounds 1–5 and 7–9) and an anthracene derivative (6) against the MCF-7 human breast cancer cell line.

The objective was to synthesize and characterize a series of substituted "amino-alkyl-rhodamine" derivatives and evaluate their in vitro anti-proliferative activity against the MCF-7 human breast cancer cell line, using Adriamycin as the standard. The study further aims to establish a structure–activity correlation to identify promising rhodamine-based candidates for breast cancer therapy.

Methods: Rhodamine derivatives (1–5, 7–9) and an anthracene derivative (6) were synthesized and structurally characterized using 1H NME, 13C NMR, and ESI-MS spectroscopic techniques. In vitro cytotoxicity against MCF-7 cells was tested at concentrations ranging from 10 to 80 µg/mL, using Adriamycin (ADR) as a positive reference control. Anti-cancer efficacy was quantified in terms of percentage control growth, 50% growth inhibition (GI50) total growth inhibition (TGI), and 50% lethal concentration (LC50) values.

Results: 13C NMR spectra confirmed that the rhodamine derivatives exist in their spiro-cyclic closed-ring conformation, as indicated by a characteristic quaternary carbon peak at ~65 ppm. Among all tested substances, compound 8 (a bis-(aminoethyl)-piperazinyl appended rhodamine derivative) displayed the highest activity against MCF-7 cells, exhibiting -42.1% control growth at 10 µg/mL—outperforming ADR at all tested concentrations. Compounds 2, 4, 5, 6, and 7 exhibited potent anti-proliferative activity with (GI50) < 10 µg/mL, comparable to ADR. Out of all studied compounds, compound 6 achieved both (GI50) and TGI < 10 µg/mL, demonstrating the highest overall anticancer potency. The combined lipophilic and cationic nature of these spiro-cyclic rhodamine structures enhances cellular penetration across the phospholipid bilayer and promotes selective uptake into mitochondria to induce cell death.

Summary and Conclusion: Amine-based rhodamine derivatives incorporating amino-piperazine or nitro-aromatic substituents demonstrate strong potential as anticancer agents against MCF-7 cells. Compound 8 demonstrated superior growth inhibition and cell reduction. These spiro-cyclic rhodamine derivatives are promising candidates for further exploration as chemotherapeutic agents, diagnostic bio-imaging probes, and adjuvant cancer treatments.

Keywords: *Mammalian breast cancer; Rhodamine derivatives; Anti-proliferative activity; In-vitro studies; MCF-7 cell line.*

P-06/F/008 POSTER · OFFLINE

Cyclodextrin-Drug Inclusion Complexes: How Molecular Structure Influences Drug Solubility

Ansh Raj[1]*, Jasleen Kaur[2]

[1]*Department of Pharmaceutical Sciences, ISF College of Pharmacy and Research, Moga-142001, Punjab, India*
[2]*Department of Pharmaceutical Chemistry, ISF College of Pharmacy and Research, Moga-142001, Punjab, India*
Email: ansh70539@gmail.com

Introduction: Drug development is still severely restricted by poor water solubility, which results in inadequate dissolution and variable bioavailability. Cyclodextrin (CDs) can encapsulate poorly soluble medicinal molecules and improve their apparent aqueous solubility through their hydrophilic surface and hydrophobic internal cavity.

Aim & Objective: To determine how inclusion-complex formation, stability and solubility enhancement are regulated by the molecular configurations of cyclodextrins and drug molecules.

Methods: A comparative evaluation was carried out of published data about α-, β-, and γ-cyclodextrins and their chemically modified derivatives. To identify key structure-solubility correlations, outcomes from phase-solubility analysis, spectroscopic methodologies, thermal analysis, X-ray diffraction, molecular docking and molecular dynamics analysis were synthesized.

Result: Molecular interactions and drug-cavity size compatibility influenced solubility. For small, medium aromatic and large molecules, respectively, α-, β-, and γ-cyclodextrins were adequate. Although excessive binding can reduce drug availability and prolong release, modified β-cyclodextrins enhanced solubility and complexation.

Summary: Complementary cavity-guest dimensions and balanced hydrophobic, electrostatic and hydrogen-bonding interactions are essential to cyclodextrin mediated solubilization.

Conclusion: The rational development of highly soluble and bioavailable medicinal products can be facilitated by structure-guided cyclodextrin selection, which can improve formulation performance while reducing empirical screening.

Keywords: *Cyclodextrins, inclusion complexes, molecular structure, bioavailability, drug solubility.*

P-06/F/009 POSTER · OFFLINE

Discovery of C-5-Arylidene-N-Benzyl Thiazolidine-2,4-Dione Derivatives as Potent Aldose Reductase Inhibitors: In Vitro, In Vivo, and Molecular Modeling Investigations

Faiz Anwar*, Rajiv Patel, Sant Kumar Verma

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: fa2031088@gmail.com

Aldose reductase (AR) is a key enzyme of the polyol pathway and has been implicated in the development of diabetes-associated complications, making it an attractive target for therapeutic intervention. In the present study, a novel series of twelve C-5-arylidene-N-benzyl thiazolidine-2,4-dione derivatives (9a–l) was designed, synthesized, structurally characterized, and evaluated for their potential as AR inhibitors. The synthesized compounds were characterized using physicochemical and spectroscopic techniques, including melting-point determination, thin-layer chromatography, FT-IR, ^1H NMR, and ^13C NMR. Their inhibitory potential against AR was assessed in vitro using epalrestat as the reference inhibitor. Among the synthesized derivatives, compound 9h exhibited the highest inhibitory potency with an IC50 value of 0.98 ± 0.06 μM, followed by 9a (1.05 ± 0.11 μM), 9l (1.36 ± 0.07 μM), and 9i (2.47 ± 0.07 μM), compared with 1.20 ± 0.09 μM for epalrestat. The four most active compounds were further investigated for antihyperglycemic activity in streptozotocin–nicotinamide-induced diabetic mice, where all significantly reduced blood glucose levels. Molecular docking demonstrated favorable binding of the active compounds within the AR binding pocket, with binding affinities ranging from −10.797 to −10.971 kcal/mol, superior to epalrestat (−8.157 kcal/mol). Furthermore, a 500-ns molecular dynamics simulation of the 9h–AR complex indicated a stable protein–ligand interaction, supported by persistent hydrogen-bonding and hydrophobic contacts. In silico ADME and toxicity analyses further indicated acceptable drug-likeness and a favorable preliminary safety profile. Overall, these findings identify C-5-arylidene-N-benzyl thiazolidine-2,4-dione derivatives, particularly 9h, as promising lead structures for further development as AR-targeted agents against diabetic complications.

Keywords: *Aldose reductase; Polyol pathway; Diabetes-associated complications; Molecular docking*

P-06/F/010 POSTER · OFFLINE

Recent Drug Development and Medicinal Chemistry Approaches for SARS-COV-2 Infection: Role of Cyclodextrin in antiviral drugs delivery

Diya, Monika, Pooja Chawla

University Institute of Pharmaceutical and Research Sciences, Sadiq-road, Faridkot, 151203, Punjab, India
Email: dhingradiya18@gmail.com

The COVID-19 pandemic caused by SARS-CoV-2 infection was spreading at alarming rate and created health emergency around the globe. There was no effective vaccines or approved drug treatment against COVID-19. Pharmaceutical chemists paid attention to the variety of small organic molecule medicines on COVID-19 infection. Combined use of newly authorised COVID-19 medicines including Molnupiravir, Nirmatrelvir and Remdesivir had been actively pursued. Mechanically, Nirmatrelvir inhibits SARS-COV-2 replication by targeting viral main protease. Meanwhile, Molnupiravir and Remdesivir inhibits SARS-COV-2 replication by targeting RNA-dependent RNA-polymerase which was responsible for genome replication. By genome replication several important targets for drug development were identified. This review focuses on the medicinal chemistry approaches involved in the development of small molecule antiviral drugs and also discuss the role of cyclodextrins in improving the solubility, stability and delivery of antiviral drugs. This review also highlights the potential of cyclodextrin-based drug delivery approach in the development of effective treatment against SARS-COV-2 infection.

Keywords: *SARS-COV-2, COVID-1S, Medicinal chemistry, Antiviral drugs, Nirmatrelvir, Cyclodextrin*

P-06/F/011 POSTER · OFFLINE

Understanding Prodrug: Prodrug in Modern Drug Delivery, Targeted Activation & Reduced Toxicity and Prodrug Cyclodextrin Combination

Sunarika Rani*, Pooja A Chawla

University Institute of Pharmaceuticals Sciences and Research, BFUHS, Sadiq Road, Society, Faridkot, Punjab-151203, India
Email: sunarika.buke@gmail.com

Prodrugs are biologically inactive (or significantly less active) compounds that undergo a chemical or enzymatic transformation within the body to convert into an active, pharmacologically effective drug. Instead of administering the active drug directly, a prodrug acts as a "carrier" or "precursor" that gets converted into its active form once inside the system. Pharmaceutical scientists design prodrugs to overcome various chemical, physical, and biological barriers that limit the effectiveness of an active drug: Improving Absorption and Bioavailability, Solubility, Targeted Delivery (Reducing Side Effects). Some examples of prodrugs are Aspirin (Acetylsalicylic acid), L-DOPA (Levodopa), etc. The key difference comes down to activity at administration: conventional drugs are active from the moment you take them, while prodrugs are inactive "precursors" that require chemical or enzymatic activation inside your body. The objective of this Commentary is to help clarify and illustrate what prodrugs are, what they are not, which benefits they can offer, and what their limits are. To this end, a number of criteria of classification and evaluation are presented. It is estimated that about 10% of the drugs approved worldwide can be classified as prodrugs. Prodrugs, which have no or poor biological activity, are chemically modified versions of a pharmacologically active agent, which must undergo transformation in vivo to release the active drug. In case of cyclodextrins (CDs)—ring-shaped sugar molecules—are combined with prodrugs, they improve drug solubility, stability, absorption, and targeted delivery. These combinations are formed in two ways: Covalent Cyclodextrin-Prodrug Conjugates: The drug is chemically bound to the cyclodextrin ring through a cleavable linkage.

Keywords: *Bioavailability; Cyclodextrin; Drug delivery; Prodrug; Solubility; Targeted delivery.*

P-06/F/013 POSTER · OFFLINE

Biochemistry and Medicinal Chemistry of Blood-Stage Malaria Infection

Sahilpreet Kaur*, Pooja A Chawla, Ramanpreet Kaur

University Institute of Pharmaceutical Sciences and Research, Sadiq Road, Faridkot, Punjab 151203, India
Email: sahilsahota8387@gmail.com

Malaria is a pandemic vector-borne parasitic disease caused by protozoan parasite of the genus Plasmodium. Plasmodium has 200 species, but Plasmodium falciparum, Plasmodium vivax, Plasmodium malariae, Plasmodium ovale, and Plasmodium knowlesi are the five known species of Plasmodium that cause malaria in humans. It has grave morbidity and a high mortality rate. The higher incidence of deaths occurs in 61% of children under 5 years, and 125 million pregnant females are at risk of malaria infections (according to a WHO report). In this disease plasmodium parasite invades red blood cells, undergoes multiplication, utilises host haemoglobin, and produces toxic heme as a by-product. It also involves increased removal of circulating erythrocytes as well as decreased production of erythrocytes in the bone marrow. Recognition of biochemical indices potentiates diagnosis of malaria. This project focuses on understanding the biochemical pathways of blood-stage Plasmodium infection and exploring medicinal-chemistry strategies for identifying potential antimalarial compounds like Chloroquine and Artemisinin.

Keywords: *Malaria, Plasmodium, Blood stage, Heme, Medicinal chemistry.*

P-06/F/014 POSTER · OFFLINE

The Green Solvent: An Important Consideration

Abdul Qayoom War*, Riya, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India
Email: warqayoom99@gmail.com

Green solvents have gained significant attention as an important component of green chemistry due to their potential to reduce the harmful effects of conventional solvents on human health and the environment. Traditional organic solvents are widely used in pharmaceutical, chemical, and industrial processes; however, many of them are volatile, toxic, flammable, and difficult to dispose of safely. Green solvents are selected based on their safety, low toxicity, biodegradability, renewability, and reduced environmental impact. Common examples include water, ethanol, ethyl lactate, glycerol, and certain bio-based solvents. In pharmaceutical research, green solvents are particularly important in drug synthesis, extraction, purification, and formulation development. They can also support sustainable manufacturing by reducing solvent-related risks and promoting efficient use of resources. However, the selection of a suitable green solvent requires careful consideration of its chemical properties, solubilising ability, cost, availability, and compatibility with the intended process. Some alternative solvents may also have limitations related to toxicity, recovery, or environmental persistence, highlighting the need for proper assessment before use. Therefore, solvent selection should consider the complete life cycle of the solvent rather than relying only on its renewable origin or natural source. Continued research and innovation can further expand their applications and support the transition towards cleaner and more sustainable chemical processes.

Keywords: *Green chemistry, Green solvents, Purification, Formulation development*

P-06/F/015 POSTER · OFFLINE

Amr – A Growing Threat: One Health, AI and Infection Prevention for a Safer Tomorrow

Prabhsimar Kaur*

Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab – 142001, India
Email: kaurprabhsimar96@gmail.com

Antimicrobial Resistance (AMR) is an escalating global health threat in which microorganisms develop resistance to antimicrobial medicines, making infections increasingly difficult to treat. The inappropriate and excessive use of antibiotics, inadequate infection-control practices, self-medication, and environmental contamination are major contributors to the emergence and spread of resistant microorganisms. This poster highlights the importance of a One Health approach, recognizing the interconnected health of humans, animals, and the environment in controlling AMR. Effective infection-prevention strategies, including hand hygiene, appropriate use of personal protective equipment, sterilization, disinfection, vaccination, antimicrobial stewardship, and rational prescribing, play a vital role in reducing the transmission of resistant pathogens. Furthermore, Artificial Intelligence (AI) offers promising opportunities for AMR surveillance, early detection of resistant infections, prediction of resistance patterns, clinical decision support, and optimized antimicrobial selection. Integrating AI-driven technologies with strong infection-prevention measures and responsible antimicrobial use can strengthen healthcare systems and reduce the burden of resistant infections. A coordinated One Health strategy involving healthcare professionals, patients, veterinarians, policymakers, and environmental sectors is essential for sustainable AMR control. Collective action, awareness, surveillance, and responsible antimicrobial practices are crucial to safeguarding the effectiveness of existing and future antimicrobial therapies.

Keywords: *Antimicrobial Resistance, One Health, Artificial Intelligence, Infection Prevention, Antimicrobial Stewardship, AMR Surveillance, Rational Antibiotic Use.*

P-06/F/016 POSTER · OFFLINE

The Role of 2,4-Thiazolidinediones in Enhancing Insulin Sensitivity for Type 2 Diabetes

Abhay Grover*, Riya, Monika

University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridko-151203, Punjab, India
Email: abhaygrover98@gmail.com

Diabetes mellitus is a chronic metabolic disorder characterized by high blood glucose levels due to either insufficient insulin production or poor cellular response to insulin. The condition has become a global health concern due to its increasing prevalence, which is largely driven by lifestyle factors such as poor diet, physical inactivity and obesity. Thiazolidinediones (TZDs), also called “glitazones, in managing type 2 diabetes can help with glycemic control and insulin resistance. There are 2 TZDs, rosiglitazone and pioglitazone, currently approved by FDA as monotherapy or combined with metformin or sulfonylureas to manage type 2 diabetes mellitus. TZDs is mainly used to improve insulin sensitivity and glucose homeostasis by targeting peroxisome proliferator-activated receptors (PPARs), specifically PPAR-γ. Here, we have tried to highlight the molecular mechanism underlying the efficacy of TZDs in diabetes management, their impact on insulin resistance, and their potential benefits in reducing cardiovascular risk factors commonly associated with diabetes. In addition to their function in glycemic control and improvement of insulin resistance, TZDs potentially have anti-inflammatory and anti-cancer properties. Research has shown additional beneficial effects on endothelial function, fibrinolysis and ovarian steroidogenesis. Some studies demonstrated that activation of PPAR-gamma receptors could induce cancer cell apoptosis. However, these mechanisms are still under investigation due to conflicting studies and possible confounders.

Keywords: *Diabetes, 2,4-Thiazolidinediones, PPAR-γ, Pioglitazone, Rosiglitazone.*

P-06/F/017 POSTER · OFFLINE

Climate change and the future of medicinal plant research

Aditya Sethi*, Raman, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India.
Email: as6853639@gmail.com

Medicinal plants are globally valuable and vital for human livelihoods, with India's medicinal plant wealth being unique and globally rich. Climate change is affecting life cycles and plant species distribution, but the effects on secondary chemical production in plants are unclear. This article emphasizes the need for research to improve our understanding of these effects on medicinal plants, focusing on the Indian perspective. This review investigates the impact of climate change on medicinal plants, a crucial part of traditional medicine practices and economic value. It examines the diversity of medicinal plant species in current climate scenarios and assesses the implications of climate change on their distribution in future scenarios. Climate change significantly impacts the distribution and life cycles of all vegetation, including medicinal plants. Factors such as increased carbon dioxide and ozone levels, low temperatures, climate warming, drought, threats, and phenological changes affect the productivity and quality of medicinal plants. The complexity of climate change's effects on medicinal plants is evident, and future researchers should carefully examine the interactions of direct and indirect causes and their corresponding effects. The complexity of climate change's effects on medicinal plants underscores the need for careful research on the interactions of various direct and indirect causes for human survival

Keywords: *Secondary metabolites, Climate change, medicinal plants, Phenology*

P-06/F/018 POSTER · OFFLINE

The 30° Cis-to-trans Shift from & Atherosclerosis

Afsha Grover*, Monika

University Institute of Pharmaceutical Sciences and Research, Baba Farid University of Health Sciences, Faridkot 151203, Punjab, India
Email: afshagrover@gmail.com

Atherosclerosis is a cardiovascular disorder involving plaque formation within arterial walls. Dietary fats are essential components of normal metabolism but a small differences in their molecular structure can lead to different biological effects. This abstract focuses on the cis-to-trans isomerization of fatty acids. OLEIC ACID is a natural fat, with a bent in its structure at C9-C10. Presence of this bent, prevents crystalline packing and maintains the liquidity at body temperature. ELAIDIC ACID is the artificially hydrogenated variant of oleic acid, with straight carbon chain. This straight chain structure enables intermolecular stacking and an increased melting point, causing the molecule to be solid at body temperature. Trans fatty acid consumption can cause fats to accumulate in the arteries, promote foam-cell formation, and gradually lead to plaque buildup and narrowing of the blood vessels, increasing the risk of heart disease. This cis-to-trans change is a clear example of how molecular shape can influence it's pathophysiological effect. This example shows the link between organic chemistry and cardiovascular health, it highlights the importance of configuration in nutrition and cardiovascular health.

Keywords: *Isomerism, trans fatty acids, Atherosclerosis, Cardiovascular risk, Molecular geometry.*

P-06/F/019 POSTER · OFFLINE

Green Chemistry: Innovating Pharmaceutical Science for a Sustainable Future

Anmol*, Arshpreet kaur, Monika
University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India
Email: anmolraheja68@gmail.com

Green chemistry is an emerging approach that aims to reduce or eliminate the production and use of hazardous substances during chemical processes. In pharmaceutical chemistry, its implementation can minimize solvent consumption, chemical waste, energy requirements, and environmental burden while maintaining product quality and process efficiency and safety. The present work aims to explore the principles of green chemistry and their applications in pharmaceutical drug discovery, synthesis, formulation, analysis, and manufacturing, with emphasis on sustainable and environmentally responsible approaches. Relevant scientific literature was reviewed to identify recent advances in green pharmaceutical chemistry, including green solvents, catalysis, biocatalysis, microwave-assisted synthesis, continuous-flow processing, solvent-free reactions, and green analytical techniques, ultrasound assisted synthesis. Green chemistry metrics used for evaluating pharmaceutical processes were also considered. The studied approaches demonstrate potential for improving atom economy, reducing waste and hazardous reagents, lowering energy consumption, and improving process efficiency. Biocatalysis, safer solvents, one-pot synthesis, and continuous manufacturing provide promising strategies for developing more sustainable pharmaceutical processes. Overall, integration of green chemistry throughout the pharmaceutical development pathway can contribute to cleaner and more resource-efficient drug manufacturing. Green chemistry therefore provides a practical framework for achieving sustainable pharmaceutical development while balancing environmental responsibility, process efficiency, and product quality.

Keywords: *Green chemistry, Sustainable Pharmaceuticals, Green Synthesis, Green Solvents, Catalysis, Waste Minimization, Sustainable Manufacturing.*

P-06/F/020 POSTER · OFFLINE

4-Thiazolidinone: A Versatile Scaffold for Anti-Cancer Scaffold for Drug Design

Ansh*, Arshpreet Kaur, Monika, Pooja Chawla
University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, India
Email: aansh8588@gmail.com

Cancer is a disease caused when cells divide uncontrollably and spread into surrounding tissues. It occurs when genetic mutation disrupts normal cell regulation, leading to tumor formation. Heterocyclic compounds play a crucial role in modern drug discovery due to their structural diversity, and ability to interact with various biological targets. 4-Thiazolidinone is a sulphur containing heterocyclic compound that has been significant anticancer properties including anti-inflammatory effects, Inhibition of drug resistance etc. Various derivatives of 4-Thiazolidinone are present which gives anticancer mechanism such as a) By PPAR-γ activation TZDs act as agonists of peroxisome proliferator – activated receptor Gama, leading to cell cycle arrest and differentiation in cancer cells. B) Induction of apoptosis by activate pro-apoptotic pathways. C) Suppression of angiogenesis by reduce the expression VEGF limiting tumour blood supply and growth. 4-Thiazolidinones are a promising class of anticancer compounds due to their ability to interfere with multiple cancer pathways, including apoptosis, angiogenesis, and cell cycle regulation. Their anticancer activity largely depends on substitutions at the C-2 and C-5 positions, as well as modifications to the core thiazolidine-4-one ring. The keto (-CO) group at C-4 is essential for hydrogen bonding with enzymes and receptors involved in cancer pathways. Electron-withdrawing groups (-NO_2, -Cl,) at C-2 enhance activity by increasing binding to enzymes like topoisomerase and kinases. Carboxyl at C-5 improve interactions with cancer-related enzymes. Here we have tried to provide brief overview of role of 4-Thiazolidinones in targeting cancer with improved therapeutic profiles with the help of Structural activity relationship (SAR).

Keywords: *Anticancer, 4-Thiazolidinones, PPAR-γ, Apoptosis, SAR, Drug resistance*

P-06/F/021 POSTER · OFFLINE

Advancing 4-Thiazolidinone Synthesis through Green Chemistry: Recent Advances, Challenges and Future Perspectives

Arshpreet Kaur*, Monika, Viney Chawla, Pooja A Chawla

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, India
Email: arshkaur182013@gmail.com

The growing demand for sustainable and environmentally responsible chemical processes has encouraged the development of greener approaches for the synthesis of biologically important heterocyclic compounds. 4-Thiazolidinone is an important sulfur- and nitrogen-containing heterocyclic scaffold that has attracted considerable interest because of its diverse pharmacological activities, including anticancer, antimicrobial, anti-inflammatory, antidiabetic, and anticonvulsant effects. Conventional methods for the preparation of 4-thiazolidinone derivatives often involve toxic solvents, hazardous reagents, prolonged reaction times, high energy consumption, and considerable waste generation, which limit their environmental and practical suitability. Green synthesis of 4-thiazolidinone provides an alternative strategy by incorporating principles of green chemistry into heterocyclic drug synthesis. Recent approaches have employed environmentally benign solvents, water, ethanol, deep eutectic solvents, recyclable catalysts, microwave irradiation, ultrasound, multicomponent reactions, and catalyst-free conditions to improve reaction efficiency while reducing environmental impact. These methods can offer shorter reaction times, improved yields, reduced solvent and reagent requirements, simpler work-up, and better atom economy compared with conventional procedures. In particular, microwave-assisted and multicomponent strategies have demonstrated significant potential for rapid synthesis with reduced energy consumption, whereas deep eutectic solvents and aqueous media provide safer and more sustainable reaction environments. The present review focuses on recent green synthetic strategies for the preparation of 4-thiazolidinone and its derivatives, with emphasis on reaction conditions, catalysts, solvents, reaction time, yield, energy efficiency, and adherence to the principles of green chemistry. Overall, the integration of green chemistry with 4-thiazolidinone synthesis offers a promising route toward safer, efficient, and more sustainable production of pharmacologically valuable heterocyclic compounds.

Keywords: *Conventional vs green methods, Catalysts, Water/DES, Microwave, Ultrasound, Multicomponent reactions, green solvents, Future directions.*

P-06/F/022 POSTER · OFFLINE

Molecular Editing: A Late-Stage Functionalization Approach in Pharmaceutical Synthesis

Gagandeep kaur*, Vikas Gupta, Monika

University institute of pharmaceutical science and research, BFUHS, Faridkot-151203, Punjab, India
Email: amritpreet7655@gmail.com

Molecular editing is an emerging approach in organic and medicinal chemistry that focuses on making precise changes to existing drug molecules without rebuilding their entire molecular framework. One important application of this concept is late-stage functionalization, in which selected functional groups or molecular sites are modified at an advanced stage of synthesis. Such modifications can facilitate the preparation of drug analogues with altered physicochemical properties, biological activity, selectivity, or metabolic behaviour. Conventional synthetic approaches may require multiple steps when a structural change is introduced into a complex molecule, whereas late-stage functionalization can provide a more direct route to structural diversification. Examples of such transformations include late-stage C–H functionalization, halogenation, hydroxylation, amination, methylation, and other selective modifications of complex organic molecules. These reactions allow chemists to explore structural changes while retaining much of the original molecular framework. Molecular editing therefore provides a useful strategy for generating and studying pharmaceutical analogues and for investigating relationships between molecular structure and biological activity. By combining selective organic transformations with principles of medicinal chemistry, molecular editing offers a practical approach to the modification and optimization of drug molecules.

Keywords: *Molecular editing; Late-stage functionalization; Drug analogues; C-H functionalizations; Medicinal chemistry.*

P-06/F/023 POSTER · OFFLINE

Exploring Heterocyclic Scaffolds: A Strategic Approach to Drug Discovery

***Gurnoor Kaur[1], Monika[1]**

University Institute of Pharmaceutical Sciences and Research, Faridkot
Email: gurnoorkaur8901@gmail.com

Heterocyclic compounds constitute a diverse and pharmacologically significant class of organic molecules characterized by the presence of one or more heteroatoms, such as nitrogen, oxygen, or sulfur, within their ring systems. These structural motifs are widely encountered in pharmaceutical agents and contribute substantially to their molecular recognition, physicochemical properties, and biological activity. Several clinically important drugs, including antifungal, antibacterial, anticancer, anti-inflammatory, and cardiovascular agents, incorporate heterocyclic scaffolds such as pyridine, pyrimidine, imidazole, indole, quinoline, furan, and thiazole. Despite their therapeutic potential, many heterocyclic drug molecules exhibit formulation-related challenges, including poor aqueous solubility, limited dissolution, chemical instability, and inadequate bioavailability. These limitations can significantly influence their therapeutic performance and may necessitate advanced drug-delivery approaches. Cyclodextrins, cyclic oligosaccharides possessing a hydrophilic exterior and relatively hydrophobic internal cavity, have emerged as versatile pharmaceutical excipients for addressing such challenges. Through the formation of non-covalent inclusion complexes, cyclodextrins can encapsulate suitable hydrophobic or partially hydrophobic regions of heterocyclic molecules, potentially enhancing aqueous solubility, dissolution characteristics, stability, and bioavailability. The integration of heterocyclic drug scaffolds with cyclodextrin-based formulation strategies represents a promising approach toward improving the pharmaceutical performance of therapeutically relevant molecules. This abstract highlights the structural and pharmacological significance of heterocyclic compounds and discusses the potential of cyclodextrin-mediated inclusion complexation as a contemporary strategy for overcoming formulation barriers. Such approaches may contribute to the development of more effective, stable, and patient-oriented drug-delivery systems.

Keywords: *Heterocyclic compounds; Modern drug discovery; Medicinal chemistry; Heterocyclic scaffolds; Cyclodextrin inclusion complexation;*

P-06/F/024 POSTER · OFFLINE

Enzymes in Metabolism: The Key Regulators of Biochemical Reactions

Hare Krishna*, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India
Email: @k93795165@gmail.com

Enzymes are essential biological catalysts that regulate numerous biochemical reactions occurring within the human body. Metabolism is a continuous and highly coordinated process through which nutrients such as carbohydrates, proteins, and lipids are converted into energy and other molecules required for growth, cellular repair, and normal physiological functions. For example, enzymes involved in glycolysis contribute to the breakdown of glucose and the production of adenosine triphosphate (ATP), while enzymes associated with lipid metabolism participate in the breakdown and utilization of fatty acids. Similarly, various enzymes regulate the synthesis and degradation of proteins and amino acids. Enzyme activity is influenced by several factors, including temperature, pH, substrate concentration, and inhibitors, allowing metabolic reactions to respond to the changing requirements of the body. Disturbances in enzyme activity may interfere with normal metabolic pathways and can contribute to the development of metabolic disorders. Such abnormalities may arise from enzyme deficiency, altered enzyme production, or impaired catalytic function. Beyond their physiological role, enzymes are also highly significant in medical and pharmaceutical sciences. Certain enzymes can serve as biomarkers for disease diagnosis, while others act as important targets for therapeutic drug development. Understanding the role, regulation, and dysfunction of enzymes provides valuable insight into metabolic processes and disease mechanisms.

Keywords: *Enzymes, Metabolic reactions, Carbohydrates, Lipids, Proteins.*

P-06/F/025 POSTER · OFFLINE

Formylation of Electron-Rich Heterocycles: Evaluating the Limitations of the Gattermann-Koch and Strategic Alternatives

Jaskaran Singh*, Riya, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India
Email: jassramgarhia2812@gmail.com

The Gattermann–Koch reaction, named after the German chemists Ludwig Gattermann and Julius Arnold Koch, is a classical method for introducing an aldehyde group into aromatic compounds using carbon monoxide, hydrogen chloride, and a Lewis acid catalyst, typically aluminium chloride ($AlCl_3$), with cuprous chloride (CuCl) serving as a promoter. The reaction proceeds through the generation of a highly reactive formylating species under strongly acidic conditions. However, its application to phenols, phenol ethers, and sensitive heterocyclic substrates is limited because coordination of $AlCl_3$ with heteroatom lone pairs can deactivate the aromatic ring and promote decomposition or polymerisation. In addition, the strongly acidic HCl medium may cause degradation or ring cleavage of acid-sensitive heterocycles. These limitations have encouraged the development of milder and more selective formylation strategies. In this study, the traditional Gattermann–Koch reaction is compared with alternative approaches, particularly the Vilsmeier–Haack reaction using dimethylformamide (DMF) and phosphorus oxychloride ($POCl_3$), and the hydrogen cyanide-based Gattermann formylation. Among these methods, the Vilsmeier–Haack reaction offers broad applicability and efficient formylation of electron-rich aromatic and heterocyclic systems under comparatively mild conditions, for example, compounds like pyrrole, thiophene, indole, etc. Thus, modern formylation methods provide reliable and chemo-selective routes for synthesising structurally diverse aromatic and heterocyclic aldehydes.

Keywords: *Gattermann-Koch reaction, Metal Catalyst, Heterocycles, Furan, HCN.*

P-06/F/026 POSTER · OFFLINE

Green Chemistry in Pharmaceutical Synthesis: Strategies for Sustainable Drug Development

***Krishvi Gupta[1], Monika[1]**

University Institute of Pharmaceutical Sciences and Research, Faridkot 151203, Punjab, India
Email: krishvigupta0425@gmail.com

Green chemistry is an approach to chemical research and manufacturing that aims to design chemical processes and products that reduce or eliminate the use and generation of hazardous substances. In pharmaceutical synthesis, green chemistry plays an important role in developing safer, more efficient, and environmentally sustainable methods for drug production. The application of green chemistry principles, including waste prevention, atom economy, safer solvents, catalysis, energy efficiency, use of renewable feedstocks, and reduction of unnecessary synthetic steps, can help minimize these concerns. An important aspect of sustainable pharmaceutical synthesis is the reduction or replacement of hazardous and potentially carcinogenic chemicals. Carcinogens are substances capable of causing or promoting cancer, and exposure to certain carcinogenic reagents, solvents, intermediates, or by-products can pose risks to laboratory personnel, manufacturing workers, and the environment. Therefore, selecting safer alternatives and designing processes that minimize the formation of hazardous substances are important objectives of green chemistry. Modern green pharmaceutical synthesis uses catalysis, biocatalysis, continuous-flow chemistry, and safer solvent systems to improve reaction efficiency and reduce hazardous waste. Green metrics such as Process Mass Intensity (PMI) and E-factor help evaluate the environmental impact of synthetic routes. Replacing carcinogenic solvents and hazardous reagents with safer alternatives, along with reducing energy use and unnecessary synthetic steps, supports cleaner and more sustainable drug manufacturing while maintaining product quality.

Keywords: *Green Chemistry; Pharmaceutical Synthesis; Sustainable Drug Development; Carcinogens; Green Synthesis; Safer Solvents.*

P-06/F/027 POSTER · OFFLINE

Chirality and Its Therapeutic Significance: Enantiomers in Drug Action and Delivery

***Palak, Monika**

University Institute of Pharmaceutical Sciences and Research, BFUHS, Sadiq Road, Faridkot 151203, Punjab, India
Email: garg9a1ak@gmail.com

Chirality is a property of an object or molecule that cannot be superimposed on its mirror image. Enantiomers, also known as optical isomers, have the same molecular formula and similar chemical and physical properties in an achiral environment, but differ in their spatial arrangement and optical rotation. They can be classified as levorotatory or dextrorotatory depending on whether they rotate plane-polarised light to the left (-) or right (+), respectively. Due to their different spatial arrangements, one enantiomer may bind better to a particular target, while the other may show lower activity or interact with other targets. This review discusses the biomedical importance of chirality, with particular focus on enantiomeric drug action and drug delivery. Relevant scientific literature was reviewed to understand the effect of chirality on drug activity, receptor interactions, pharmacokinetics and therapeutic effects. For example: Ibuprofen demonstrates stereoselective pharmacological activity, where the S-enantiomer exhibits greater cyclooxygenase inhibitory activity while the R- enantiomer can undergo metabolic conversion to the S-enantiomer. Cyclodextrin has also attracted pharmaceutical interest as drug-delivery carriers through formation of inclusion complexes with drug molecules, which can improve the solubility and stability of certain drug molecules. Chirality significantly influences drug activity, therapeutic efficacy, pharmacokinetics and pharmaceutical drug delivery.

Keywords: *Chirality, Enantiomers, Stereochemistry, Chiral Drugs, Drug Delivery*

P-06/F/028 POSTER · OFFLINE

Synthesis and Evaluation of Some Benzimidazole Derivatives as Antimycobacterial and Antibacterial Agents

Riya*, Harjinder, Vikas Gupta, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India
Email: riyariya95599@gmail.com

Benzimidazole is an important heterocyclic scaffold in medicinal chemistry due to its diverse pharmacological properties and potential to serve as a basis for the development of new antimicrobial agents. The increasing prevalence of bacterial infections and the emergence of antimicrobial resistance have created a need for the discovery of new compounds with improved antimicrobial potential. The present study aims to synthesize and evaluate a series of benzimidazole derivatives for their antimycobacterial and antibacterial activities. The target compounds will be synthesized through suitable chemical reactions and characterized using appropriate analytical and spectroscopic techniques to confirm their structures. The synthesized derivatives will be assessed for their inhibitory effects against selected mycobacterial and bacterial strains using suitable in vitro antimicrobial methods. Their activity will be evaluated by determining the minimum inhibitory concentration (MIC), wherever applicable, and comparing the results with those of standard antimicrobial agents. The relationship between the chemical structures of the synthesized derivatives and their biological activities will also be examined to identify structural features that may contribute to antimicrobial efficacy. The findings of this study are expected to provide useful insights into the potential of benzimidazole-based compounds as antimicrobial candidates. This research may further support the development of novel heterocyclic molecules for addressing bacterial infections and drug-resistant mycobacterial diseases.

Keywords: *Benzimidazole, heterocyclic compounds, synthesis, antimycobacterial activity, antibacterial activity, minimum inhibitory concentration.*

P-06/F/029 POSTER · OFFLINE

Design, Synthesis and Antiplasmodial Evaluation of Quinoline–Furanone Hybrids as Potential *Pf*LDH Inhibitors

Sonu Singh[1], Naresh Kumar Rangra[1*]

[1]Chitkara University School of Pharmacy, Chitkara University, Himachal Pradesh, India174103
Email: sonu1010.mpharmchem25@chitkarauniversity.edu.in

Introduction: Malaria remains a massive global health burden, and resistance to chloroquine (CQ) largely due to drug efflux from parasite cells-keeps undermining treatment. Researchers have long turned to quinoline hybrids as a way to outsmart resistance, since bulkier molecules are harder for the parasite to pump out.

Aim and Objectives: This study aimed to design and evaluate new quinoline–furanone hybrid molecules as antimalarial agents, targeting P. falciparum lactate dehydrogenase (PfLDH) an enzyme structurally distinct from the human version, making it an attractive, parasite-specific drug target.

Material and Methods: The team designed 24 hybrid compounds, screened them virtually for drug-likeness and toxicity (QikProp, TOPKAT), then docked the best candidates against PfLDH using Molegro Virtual Docker. The 11 top hits were synthesized via Friedel-Crafts acylation, oxime formation, and Vilsmeier-Haack reactions, then tested using Schizont Maturation Inhibition and pLDH inhibition assays against chloroquine-resistant (K1) parasite strains.

Results: Two compounds, 5g (IC50 = 2.083 µg/mL) and 6e (IC50 = 2.168 µg/mL), worked almost as well as CQ (IC50 = 1.953 µg/mL). 5g was even better than CQ at blocking the PfLDH enzyme (2.314 vs 2.873 µg/mL). Compounds 5e, 5f, 6a, 6f, 7a, and 7f also worked well, with IC50 values under 5. But 6c (23.792) and 6h (16.837) barely worked at all. Adding chlorine or bromine to the molecules made them stronger; adding -NO2 or -OH made them weaker.

Summary and conclusion: These new bulky molecules turned out to be both safe and effective at fighting resistant malaria. They seem to block the same enzyme spot as CQ does, which means they could become a new starting point for better malaria drugs in the future.

Keywords: *Quinoline-furanone hybrids, antimalarial, Plasmodium falciparum, molecular docking, PfLDH, drug resistance.*

P-06/F/030 POSTER · OFFLINE

Prodrug Design: A Strategy for Improving Drug Delivery

Uzma gulzar*, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot-151203, Punjab,India
Email: uzmagulzar2007@gmail.com

The Prodrug design is a versatile method that can be applied to a wide range of parent drug molecules, administration routes and formulations. Prodrugs are bioreversible derivatives of drug molecules that undergo an enzymatic or chemical transformation in VIVO to release the active parent drug, which can then exert the desired pharmacological effect. Earlier, prodrugs were considered a last option but today they are often explore early in drug development. Optimal prodrug needs to have effective absorption, distribution, metabolism, and elimination (ADME) features to be chemically stable, to be selective towards the particular-site in the body, and to have appropriate safety. Lipidic prodrugs are made by attaching a lipid to a drug. This makes the drug more fat-soluble and can improve its absorption, stability, circulation time, distribution, and bioavailability. They can also help the drug reach specific sites, such as brain. Functional-group modifications is an important part of this strategy; where groups such as carboxvlic acid, hydroxyl, amine and phosphate-containing groups can be temporarily modified according to the limitation of the parent drug. Eg; levodopa(prodrug) is converted to dopamine by removal of its(-COOH) group, enabling dopamine delivery to the brain, poor water solubility of phenytoin is addressed by introducing a phosphate-containing group to form fosphenytoin, improving its aqueous solubility.

Keywords: *Drug delivery, Functional-group modification, Bioavailability Solubility, Medicinal chemistry Prodrug.*

P-06/F/031 POSTER · OFFLINE

Quercetin as a Bio-Based Alternative to Synthetic Sunscreens

Roushan Kumar*, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot -151203, Punjab, India
Email: roushan28292@gmail.com

Commonly used UV filters in sunscreens are Avobenzone and Octinoxate but there are some concerns about their photostability, skin sensitivity, and environmental effects have highlighted the need for natural alternatives. This leads to increased interest in plant-derived compounds with both UV-absorbing and antioxidant properties. Quercetin (3,3',4',5,7-pentahydroxyflavone), a naturally occurring flavonoid, as a plant-based photoprotective compound. This abstract focuses on Quercetin's molecular structure and its ability to interact with UV radiation. Quercetin has a conjugated structure across it's A, B, and C rings, which help in absorption of UV radiation and reduces the HOMO-LUMO energy gap. It mainly absorbs Ultraviolet light around 280–315 nm (ultraviolet band B) and 315–400 nm (Ultraviolet band A). These absorption properties are closely related to the arrangement of double bonds, carbonyl groups, and hydroxyl groups within the molecule. Quercetin also has antioxidant properties because of the hydroxyl groups present. UV radiation exposure can generate Reactive Oxygen Species (ROS) that leads to oxidative stress and skin damage. Quercetin neutralizes these ROS by donating hydrogen atoms. Its ability to absorb UV light and neutralize ROS makes Quercetin a good natural option for photoprotection. Its molecular properties highlight its ability to be an eco-friendly UV protection.

Keywords: *UV filters, Photoprotection, UV Radiation, Antioxidant Activity, HOMO-LUMO Gap, Reactive Oxygen Species.*

P-06/F/032 POSTER · OFFLINE

Aspirin For Cardiovascular Disease Prevention: Mechanism and Therapeutic Potential

Palma Devi*, Pooja Chawla, Ramanpreet Kaur

University Institute of Pharmaceutical Sciences and Research, Sadiq Road, Faridkot, Punjab – 151203, India
Email: devipalma63@gmail.com

Aspirin, chemically known as acetylsalicylic acid (IUPAC named 2-acetoxybenzoic acid), is a classic non-steroidal anti-inflammatory drug (NSAID) and widely studied antiplatelet agent. It is synthesized by acetylation of salicylic acid using acetic anhydride in the presence of an acid catalyst. Aspirin plays an important role in the prevention of thrombotic cardiovascular events by reducing arterial blood clot formation, thereby lowering the risk of myocardial infarction and ischemic stroke. Its therapeutic action is mainly mediated through irreversible inhibition of cyclooxygenase-1 (COX-1) in platelets, resulting in reduced thromboxane A production and inhibition of platelet aggregation. This mechanism limits platelet-mediated thrombus formation, making aspirin an established agent for the secondary prevention of cardiovascular events. In addition to its anti-inflammatory properties, aspirin was also observed to increase bleeding time, and later studies demonstrated the utility of aspirin as an antithrombotic agent. Cardiovascular diseases (CVDs) are a major global health concern and include myocardial infarction, ischemic stroke, and other thrombotic disorders. Atherosclerosis, characterized by plaque accumulation within arterial walls, can progressively narrow or obstruct blood vessels and impair blood supply to vital organs. Consequently, CVDs contribute substantially to disability, reduced quality of life, and premature mortality. Therefore, effective pharmacological preventive strategies, alongside lifestyle modification and risk-factor management, are important in reducing cardiovascular risk. By inhibiting platelet aggregation and preventing blood cell clumping within arteries, aspirin helps reduce thrombus formation and consequently lowers the risk of heart attacks and strokes.

Keywords: *Aspirin, Arterial thrombosis, Cardiovascular disease, Cyclooxygenase-1 (COX-1), Stroke.*

P-06/F/033 POSTER · OFFLINE

Design, synthesis of 2-(2-hydroxyphenyl)-1H benzo[d]imidazol-5-carboxylic acid derivatives as a novel class of anti-breast cancer agents

Nitin Gautam[1]*

ISF College of Pharmacy, Moga, Punjab
Email: nitinpharma016@gmail.com

Chemotherapeutic resistance in breast cancer highlights the need for new anticancer agents with improved therapeutic activity. Benzimidazole derivatives represent a versatile scaffold for developing compounds that interfere with microtubule function. This study aimed to design, synthesize, and evaluate substituted benzimidazole derivatives as potential anti-breast cancer agents. Molecular design was guided by methyl 2-(5-fluoro-2-hydroxyphenyl)-1H-benzo[d]imidazole-5-carboxylate (MBIC), a microtubule-targeting compound reported to exhibit preferential cytotoxicity toward breast cancer cells. Structurally related benzimidazole-5-carboxylate derivatives were designed to improve target-binding affinity and anticancer potency. Molecular docking at the colchicine-binding site of tubulin (PDB ID: 1SA0) predicted hydrogen bonding with Cys241 and additional interactions involving Lys252, Ala316, Ala317, Met259, and Val315. Guided by these findings, the designed compounds were synthesized and characterized using infrared spectroscopy, nuclear magnetic resonance spectroscopy, and mass spectrometry. Compounds NG20-02 and NG20-03 were evaluated for in vitro cytotoxicity against breast adenocarcinoma (MDA-MB-231, MCF-7). Both compounds exhibited growth-inhibitory activity against MDA-MB-231 triple-negative breast cancer cells. Together, the docking predictions and cytotoxicity findings support further investigation of these substituted benzimidazole derivatives as potential leads for breast cancer drug development. Further optimization and experimental validation of the proposed tubulin-targeting mechanism are warranted to establish their therapeutic potential.

Keywords: *Benzimidazole, Breast cancer, Molecular docking, Tubulin.*

P-06/F/034 POSTER · OFFLINE

Nucleophilic Addition Reactions: Chemistry Behind Drug Discovery

***Asmi, Monika**

University Institute of Pharmaceutical Sciences and Research, BFUHS, Sadiq Road, Faridkot-151203, Punjab, India
Email: asmi15sharma6@gmail.com

A nucleophilic addition reaction is an addition reaction where a chemical compound with an electrophilic double or triple bond reacts with a nucleophile, such that the double or triple bond is broken. Nucleophiles attack the electrophilic carbonyl carbon. Stereoselective nucleophilic addition can help control the three-dimensional structure of drug molecules. Nucleophilic addition reactions can provide efficient routes for constructing and modifying drug-like molecular scaffolds. Unsaturated carbohydrate derivatives undergo stereoselective nucleophilic additions. For example, studies of 2,3-unsaturated pyranosides have examined additions involving nitrogen, carbon and sulfur nucleophiles, with the stereochemical outcome depending on the substrate and nucleophile. It has applications in medicinal and bioorganic chemistry. The main aim of studying nucleophilic addition reactions in medicinal organic chemistry in pharmacy is to understand how to design, synthesise, and modify functional groups on drug molecules- especially carbonyl compounds- to optimise their pharmacological activity, stability, and target binding. Beta Cyclodextrin catalyzes nucleophilic addition of trimethylsilyl cyanide to imines and gives alpha-aminonitriles. Nucleophiles open the epoxide/ anhydro ring, producing regioselectively modified beta cyclodextrin derivatives. Hence, Nucleophilic addition reactions demonstrate cyclodextrin as a biomimetic and recyclable catalyst for selective pharmaceutical synthesis. These reactions provide useful approaches for drug synthesis and cyclodextrin- based drug- delivery systems.

Keywords: *Nucleophilic addition reactions, Medicinal Organic chemistry, Cyclodextrin, Drug synthesis, Drug delivery system.*

P-06/F/035 POSTER · OFFLINE

In-Silico Molecular Docking and Machine Learning Approaches for Predicting Host–Guest Binding Affinities of Cyclodextrin Complexes

Gaurish*, Amit Chaudhary, Rajnish Shrivastava, Nitin Verma

Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: gaurish1026.bpharm25@chitkarauniversity.edu.in

Aim & Objectives: This investigation delineates an integrated in-silico protocol combining semi-flexible molecular docking with supervised machine-learning algorithms to quantitatively model and rationalize the association thermodynamics of diversified cyclodextrin–guest systems.

Methods: Molecular docking was implemented to elucidate inclusion geometries, spatial cavity occupancies, and preliminary empirical binding energies. These topological features were subsequently harmonized with physicochemical descriptors of both host and guest moieties to train predictive regressors, encompassing Random Forest, Gradient Boosting, Support Vector Regression, and Gaussian Process architectures. Model generalizability was validated via stratified cross-validation and benchmarked using root-mean-square error (RMSE) alongside the coefficient of determination (R^2).

Results: Docking-derived structural coordinates synergized seamlessly with statistical learning models, yielding cross-validated predictive accuracy characterized by R^2 values approaching 0.80 and residual variances within 1–2 kJ/mol. Feature-importance decomposition identified guest lipophilicity, hydrogen-bonding capacity, and steric aspect ratio as the primary determinants governing supramolecular stability.

Summary & Conclusion: The amalgamation of mechanistic docking simulations with predictive algorithmic modelling circumvents protracted trial-and-error experimentation. This hybrid strategy establishes an expeditious computational pipeline for the rational, targeted engineering of cyclodextrin-based supramolecular carriers in pharmaceutical formulation science.

Keywords: *Cyclodextrin; Molecular Docking; Machine Learning; Host–Guest Interactions; Binding Affinity; Quantitative Structure–Affinity Relationship (QSAR).*

O-06/N/001 ORAL · ONLINE

In-silico Design and Evaluation of Thienopyridine Derivatives as Promising CHK1 Inhibitors Against Cancer

Dinki Sharma*, Vivek Asati

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga[142001], Punjab, India,
Email: dinkisharma22832@gmail.com

Checkpoint kinase 1 (CHK1) is a desirable target for cancer treatment because of its crucial involvement in cell cycle regulation and the DNA damage response. Nevertheless, drug resistance mechanisms, dose-limiting toxicities, and selectivity problems have hindered the clinical translation of CHK1 inhibitors, necessitating the development of new inhibitors with improved therapeutic characteristics. To identify CHK1 inhibitors, we developed an integrated computational-experimental process. Structure-based virtual screening included pharmacophore modeling, molecular docking (Schrödinger's Glide), and 200 ns molecular dynamics simulations using MM-GBSA calculations. The potential lead compounds were evaluated for their ADME properties and synthetic accessibility. The two potent compounds exhibited positive CHK1 binding characteristics. R1 formed stable contacts with the active amino acid residues CYS87, GLU85, GLU91, GLU134, and ASP148, emerging as the potential lead compound with a promising docking score of -13.8543 kcal/mol. Molecular dynamics simulations verified the stability of the complex systems. This chemical analog could be a viable potential lead candidate as CHK1 inhibitor. For oncology drug discovery, the workflow offers a more generalized framework in which traditional methods encounter clinical difficulties.

Keywords: *Checkpoint kinase 1 (CHK1), Pharmacophore modelling, 3D-QSAR, Molecular docking, 3PA3, Virtual screening, MD simulation.*

O-06/N/002 ORAL · ONLINE

An MTDL Approach for NLRP3 Inflammasome in Alzheimer's Disease

Abhay Rajput*, Sangamdeep Singh, Thakur Gurjeet Singh, Diksha Choudhary, Rajwinder Kaur

Chitkara College of Pharmacy, Chitkara University, Rajpura -140401, Punjab, India

Email: abhay1301.ccp25@chitkara.edu.in

Alzheimer's disease (AD) is a multifactorial pathology resulting from the interaction of amyloid-β (Aβ), tau hyperphosphorylation, cholinergic depletion, and persistent neuroinflammation. Current drug discovery research primarily focuses on two approaches lowering Aβ plaques or restoring decreased levels of acetylcholine; however, neither approach has yielded significant results because they have targeted only a single aspect of a complex, multifactorial disease. This has led to the study of nucleotide-binding polymerization domain, leucine-rich repeat (NOD-LRR) and pyrin domain (PYD) containing protein 3 (NLRP3) inflammasome, a multiprotein complex assembled in immune cells, such as microglia, as an alarm mechanism that senses danger and produces inflammation. A multidomain protein comprises NOD (enabling protein dimerization), LRR (domain sensitive to danger stimuli including Aβ and cellular stress) and the PYD binding adapter proteins to form the whole complex. This complex helps to recruit Apoptosis-associated Speck-like protein containing a CARD (ASC), where CARD refers to Caspase Activation and Recruitment Domain, to form the platform and activate caspase-1. This causes the secretion of interleukin-1β (IL-1β) and interleukin-18 (IL-18), thereby further worsening Aβ and tau pathology and reactivating NLRP3, maintaining an inflammatory loop that amplifies itself. As an intersection point between aggregation, inflammation, and neurodegeneration, NLRP3 appears to be a novel drug target. Thus, contemporary research emphasizes the development of multi-target directed ligands (MTDLs) with inhibitory activity towards NLRP3, acetylcholinesterase (AChE), and butyrylcholinesterase (BChE), restoring cholinergic tone, neutralizing the oxidative stress by NLRP3, and reducing Aβ through anti-aggregation peptides. The current study focuses on the need for research on brain-penetrant NLRP3 inhibitors as promising alternatives to mono-therapeutics in preclinical trials.

Keywords: *NLRP3 inflammasome; MTDL; Alzheimer's disease (AD); neuroinflammation; acetylcholinesterase (AChE); amyloid-β.*

O-06/N/003 ORAL · ONLINE

TREM2 in Alzheimer's Disease: Current Advances, Therapeutic Potential and Future Perspectives

Tina Thakur*, Rajwinder Kaur, Thakur Gurjeet Singh, Somdutt Mujwar

Chitkara College of Pharmacy, Chitkara University, Rajpura – 140401, Punjab

Email: tina1316.ccp25@chitkara.edu.in

Alzheimer's disease (AD) continues to be the global leading cause of dementia, resulting in a tremendous burden on the existing healthcare system. Thus, there is an urgent need for developing disease-modifying treatments to counter AD. Recently, one of the biomolecules, Triggering Receptor Expressed on Myeloid Cells 2 (TREM2), has gained significant attention for its role in regulating neuro-immunity. The present review provides an overview of the existing information on TREM2 biology, its etiological involvement in AD, and its theranostic potential based on a critical analysis of the most recent scientific articles. In addition, TREM2 plays a significant role in lipid metabolism. It interacts with downstream signaling molecules like DNAX activating protein of 12 kDa (DAP12) to impact the transcriptional profile of microglia during disease progression. The receptor shedding of TREM2 results in the generation of its soluble form sTREM2. It is a prominent biomarker of microglial activation in cerebrospinal fluid (CSF) observed across various stages of AD. Therapeutically, agonistic monoclonal antibodies, small-molecule inhibitors, and gene-targeting strategies were explored to stimulate protective microglial functioning via TREM2 signaling. However, several issues remain unresolved about TREM2 signaling, including limited knowledge of its mechanisms, variant-specific roles, and the translation of the preclinical results into clinical practice, which need to be resolved to get fruitful therapeutic outcomes.

Keywords: *Alzheimer's disease; neuroinflammation; microglia; amyloid-β; sTREM2*

O-06/N/004 ORAL · ONLINE

AI-Enabled Computer-Aided Drug Design: Emerging Computational Strategies for Modern Drug Discovery

Swati Pal[1],*, Ravinder Sharma[2], Shailesh Sharma[3]

[1]Research Scholar, IKG Punjab Technical University, Kapurthala, Punjab, India
[2]Faculty of Pharmaceutical Sciences, The ICFAI University, Himachal Pradesh, India
[3]Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, BELA
Email: swatipl16@gmail.com

Introduction: Drug discovery is a difficult, costly, time-consuming process with high failure rate, especially when it comes to developing new therapies for infectious and neglected tropical diseases like leishmaniasis. A promising computational approach to improve the efficiency of early drug discovery is computer-aided drug design (CADD).

Aim & Objective: To demonstrate how CADD and AI-enabled computational techniques improves lead identification, lead optimization and the selection of potential drug candidates.

Method: Virtual screening, molecular docking, pharmacophore modeling, quantitative structure-activity relationship (QSAR) analysis and de novo drug design including the structure-based and ligand-based drug design approaches were utilized. Chemoinformatic resources were combined with genomes and proteomics datasets for computational target identification. To assess drug-likeness, in silico prediction of absorption, distribution, metabolism, excretion and toxicity (ADMET) properties was carried out.

Results: Rapid screening of large chemical libraries, enhanced improved prediction of ligand-target interactions and effective lead optimization were all made possible by CADD. These methods improved the quality of selected lead candidates while lowering development expenses and experimental efforts.

Summary: Combining AI-assisted computational tools with CADD facilitates rational therapeutic design, improves drug development and improve decision-making.

Conclusions: By enabling the rapid, cost-effective and reliable identification of novel drug candidates, CADD has revolutionized pharmaceutical research and offers enormous potential for the development of anti-infective drugs and future drug discovery.

Keywords: *ADMET, QSAR, Computer-Aided Drug Design, Virtual Screening, Molecular Docking, Artificial Intelligence.*

O-06/N/005 ORAL · ONLINE

Pyrazoline Scaffolds in Modern Drug Discovery: Recent Advances in Design, Synthesis, Biological Evaluation and Therapeutic Applications

Amandeep Kaur*, Rahul Kumar Sharma, Monika Gupta

Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Ropar-140111
IK Gujral Punjab Technical University, Jalandhar
Email: kauraman9929@gmail.com

Pyrazoline is a versatile five-membered nitrogen-containing heterocyclic scaffold that has gained considerable attention in medicinal chemistry because of its structural diversity and broad pharmacological potential. The unique chemical properties of the pyrazoline nucleus enable extensive structural modification and incorporation of diverse substituents, making it an attractive pharmacophore for the development of biologically active molecules. Recent advances have demonstrated that pyrazoline derivatives exhibit promising anticancer, anti-inflammatory, antimicrobial, antioxidant, analgesic and other pharmacological activities. In cancer research, pyrazoline-based compounds have received particular interest because of their ability to influence important cellular pathways, including apoptosis, oxidative stress, angiogenesis, kinase signaling and cell-cycle regulation. Contemporary synthetic methodologies have significantly expanded the chemical diversity of pyrazoline derivatives through conventional cyclization, one-pot reactions, microwave- and ultrasound-assisted synthesis and green synthetic strategies. Structure–activity relationship studies further demonstrate that substitution at different positions of the pyrazoline nucleus, electronic effects, steric factors, linker modification, and pharmacophore hybridization can strongly influence biological activity and selectivity. Pyrazoline-based hybrids incorporating chalcone, piperazine other pharmacologically relevant moieties represent promising strategies for molecular optimization and multitarget drug discovery. Overall, pyrazoline remains a promising scaffold for the discovery and development of novel therapeutic candidates.

Keywords: *Pyrazoline; Synthetic strategies; Structural diversity; SAR; Anticancer activity.*

O-06/N/006 ORAL · ONLINE

In- silico Evaluation of Pyrrolopyrimidine Derivatives as Novel Bruton's Tyrosine Kinase (BTK) Inhibitors for B- Cell Malignancies

Ryena Dhir*, Vivek Asati

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga - 142001, Punjab, India
Email: ryena5720@gmail.com

Aberrant expression of Bruton's tyrosine kinase (BTK) plays a major role in the progression of B-cell malignancies and autoimmune disorders, highlighting the need for effective and selective BTK inhibitors. A series of 45 pyrrolopyrimidine derivatives were selected for in-silico study from the literature. A 3D-QSAR and pharmacophore model was utilized to design novel compounds; they were subsequently generated through R-group enumeration based on the QSAR data and further evaluated through molecular docking and virtual screening. The model AADHR_1 was chosen as the best pharmacophore model. The 3D-QSAR analysis yielded statistically robust models. The atom-based model exhibited an excellent correlation coefficient (R2 = 0.8831) and cross-validation coefficient (Q2 = 0.8675), while the field-based model demonstrated a correlation coefficient of R2 = 0.8498 and Q2 = 0.855. A total of 1752 compounds were generated through R-group enumeration for the production of new compounds. Among them, R1 demonstrated the best binding affinity (−7.87 kcal/mol, PDB ID: 5P9J) with key binding interactions at TYR551, GLN412 and LYS430. Molecular dynamics (MD) simulations further confirmed the stability of these interactions under dynamic conditions. Furthermore, ADME and physiochemical properties confirmed drug likeness, bioavailability and a favorable pharmacokinetic profile of the designed compounds. Among the designed compounds, R1 exhibited the highest binding affinity, superior interaction stability in MD simulations and balanced ADME characteristics, making it the most potent. Overall, this study provides considerable insights into the rational computational design of pyrrolopyrimidine-based BTK inhibitors for advancing these candidates into experimental validation and clinical advancement.

Keywords: *BTK inhibitors; pyrrolopyrimidine; 3D-QSAR; molecular dynamics.*

O-06/N/007 ORAL · ONLINE

In silico Design and Evaluation of Novel Indole Derivatives as Potential BACE1 Inhibitors for Alzheimer's Disease

Pitam Ghosh*, Vivek Asati

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India
Email: ghoshpitam712611@gmail.com

Alzheimer's disease (AD) is a progressive neurodegenerative disorder affecting 47 million people worldwide, with prevalence projected to reach 75 million by 2030 and triple by mid-century. Dysregulation of BACE 1, the initiating enzyme in the amyloidogenic cascade, plays a pivotal role in AD pathogenesis. Conventional anticholinesterase inhibitors can only provide symptomatic relief but are ineffective in stopping disease progression. This study employed an integrated computational approach to rationally design novel indole-based BACE1 inhibitors through pharmacophore modeling, 3D-QSAR analysis, ligand-protein docking, pharmacophore-guided virtual screening, MD simulation, and ADME studies. DDHRR_1 was identified as the best pharmacophore hypothesis (DDHRR_1) with a survival score of 5.7767. Statistically significant 3D-QSAR models were obtained, wherein the atom-based model demonstrated high predictive reliability (R^2=0.9386, Q^2=0.9753), while the field-based model exhibited acceptable predictive ability (R^2=0.8492, Q^2=0.6644). Among the dataset compounds, compound B38 (3i) showed the highest binding affinity (-6.567 kcal/mol; PDB ID: 4DJU), with key interactions at GLY95, TYR132, and PHE169. R-group enumeration generated 5880 derivatives, among which R1 exhibited strong binding affinities (-10.339 kcal/mol), stable interactions in MD simulations, and favorable ADME properties. Comparative analysis of the referenced ligand, the two best-performing ZINC-derived compounds (ZINC43707325, ZINC03628223), and the two top-ranked R-group compounds (R1, R2) revealed that R1 served as the most promising lead compound. These results provide valuable insights into the structure-based design of novel BACE1 antagonists and establish a reliable in silico framework to facilitate their progression toward experimental validation and clinical development.

Keywords: *Alzheimer's disease, BACE1, 3D-QSAR, Molecular dynamics, ADME, ZINC.*

O-06/N/008 ORAL · ONLINE

Design and Synthesis of Thiazolidine-2,4-dione Derivatives as Antidiabetic Agents

Saurabh Jain*, Nasir Vadia

Faculty of Pharmacy, Marwadi University, Rajkot- 360003, Gujarat, India
Email: saurabhcdsco08@gmail.com

A novel series of oxazole-linked thiazolidine-2,4-dione derivatives (4a-4l) was rationally designed, synthesised and evaluated for antidiabetic potential with emphasis on structure-activity relationships and molecular interactions. The structure of the synthesized compounds was confirmed by FT-IR, ^{1}H NMR, ^{13}C NMR and mass spectrometry. In vitro PPAR-γ transactivation studies revealed that compounds 4d, 4k, and 4h exhibited considerable agonistic activity, with EC_{50} values comparable to those of the reference drug, pioglitazone. In vivo evaluation in streptozotocin–nicotinamide-induced diabetic mice showed significant antihyperglycemic activity, improved oral glucose tolerance, and normalisation of the lipid profile. Compound 4d in the series exhibited the highest pharmacological activity. Moreover, some derivatives showed antioxidant activity by decreasing lipid peroxidation and increasing endogenous antioxidant enzymes, such as glutathione and catalase. Molecular docking studies against the PPAR-γ receptor (PDB ID: 5Y2O) revealed that compounds 4d, 4h, 4c and 4k exhibited strong binding affinities with docking scores ranging from −7.655 to −8.099 kcal/mol. Key interactions with residues Cys285, Arg288 and Tyr327 support stable ligand-receptor complex formation and correlate with biological activity. These results demonstrate that introducing oxazole functionality into the thiazolidinedione scaffold yields promising dual-acting molecules with improved antidiabetic and antioxidant properties, providing valuable leads for further optimisation.

Keywords: *Thiazolidine-2,4-dione derivatives; Diabetes mellitus; PPAR-γ agonists; Antioxidant activity; Molecular docking*

O-06/N/009 ORAL · ONLINE

Amino Acid-Functionalized TPA–Zn(II): A Carbonic Anhydrase Mimic

Ramkrishna Mandala, Alexandre Martinezb, Yoann Cotelleb, and Cédric Colombanb

aJharkhand Rai University, Raja, Namkum, Ulatu, Ranchi, Jharkhand, 834010, India
bAix Marseille University, CNRS, Centrale Méd., iSm², UMR 7313, 13013 Marseille, France
Email: ramkrishna.mandal@jru.edu.in

Bioinspired catalysis aims to translate the efficiency and selectivity of natural enzymes into simpler, robust artificial systems. A central challenge is to replicate not only the metal-based active site but also the surrounding molecular environment, which governs substrate recognition and reactivity. Carbonic anhydrase (CA) is a metalloenzyme that catalyzes the reversible hydration of CO2 to bicarbonate. Its active site contains a Zn (II) metal center coordinated by three histidine residues and a water molecule. Activity arises from more than the first coordination sphere. A hydrophobic cavity directs CO2 toward the metal center, while the second coordination sphere organizes hydrogen-bonding interactions that position the substrate and stabilize reactive species. This process helps regenerate the active Zn–OH form for CO2 transformation. Building on these principles, our work explores a CA-inspired catalyst that combines a tripodal tris(2-pyridylmethyl) amine (TPA)–Zn (II) center with an amino-acid-functionalized, arm-decorated molecular cavity. The TPA unit models the histidine-rich first coordination sphere, while the amino-acid arms provide a tunable hydrophobic and hydrogen-bonding second sphere (Figure 1). The complexes were characterized spectroscopically and evaluated using CA-related model reactions under buffered conditions. This approach provides a minimal platform for examining how molecular confinement and amino acid functionality regulate zinc-mediated reactivity.

Keywords: *Bioinspired catalysis; Carbonic anhydrase; TPA–Zn(II); Second coordination sphere; Molecular cavity.*

O-06/N/010 ORAL · ONLINE

Screening of Novel 1,2,4-triazine Clubbed 1,2,3-Triazole Derivatives as Alpha-Glucosidase Inhibitors: In Silico Study

***Neha Chaturvedi**

Department of Pharmaceutical Chemistry, SR College of Pharmaceutical Sciences, Jhansi, Uttar Pradesh – 284003
Email: ch.nehass@gmail.com

Type 2 diabetes mellitus (T2DM) is a rapidly increasing metabolic disorder that necessitates the development of safer and more effective α-glucosidase inhibitors for the management of postprandial hyperglycemia. In the present study, a series of novel benzimidazole–triazole hybrids (5a–5k) was rationally designed using an integrated computer-aided drug design (CADD) approach incorporating pharmacophore modeling, virtual screening, molecular docking, molecular dynamics simulation, and ADME prediction. A validated six-feature pharmacophore model (DHRRR_1; ROC-AUC = 0.96) was employed to identify potential lead compounds. The selected derivatives were synthesized via a three-step synthetic route involving copper(I)-catalyzed azide–alkyne cycloaddition (CuAAC) and were structurally characterized using FTIR, 1H NMR, 13C NMR, and LC–MS analyses. The synthesized compounds were evaluated for in vitro α-glucosidase inhibitory activity, followed by in vivo antidiabetic assessment of the most active derivatives in streptozotocin–nicotinamide-induced diabetic Swiss albino mice. Among the tested compounds, derivative 5b exhibited the highest α-glucosidase inhibitory activity with an IC50 value of 8.10 ± 0.12 µM, surpassing the standard drug acarbose (IC50 = 12.8 ± 0.64 µM). Compounds 5i and 5g also demonstrated notable inhibitory activity. Molecular docking studies revealed strong binding affinities for compounds 5b, 5i, and 5g, with docking scores of −7.839, −7.682, and −7.623 kcal/mol, respectively, supported by favorable interactions with key catalytic residues of the α-glucosidase active site. Furthermore, in vivo studies demonstrated significant reductions in blood glucose levels, improved oral glucose tolerance, restoration of body weight, and amelioration of dyslipidemia in diabetic mice. Collectively, these findings identify compound 5b as the most promising lead candidate and demonstrate that benzimidazole–triazole hybrids represent attractive scaffolds for the development of novel α-glucosidase inhibitors for the treatment of T2DM.

Keywords: *Benzimidazole–triazole hybrids; α-glucosidase inhibitor; Type 2 diabetes mellitus; Computer-aided drug design; Molecular docking; Click chemistry; Structure–activity relationship.*

O-06/N/011 ORAL · ONLINE

Design, Green Microwave-Assisted Synthesis, and Biological Evaluation of Polyhydroxy Piperidine Derivatives as Potential Antidiabetic Agents

Anju Dahariaa*, Alok Singh Thakurb

aDepartment of Pharmaceutical Chemistry, Kamla Institute of Pharmaceutical Sciences, Bhilai-490020, Chhattisgarh, India
b Department of Pharmaceutical Chemistry, Shri Shankaracharya Institute of Pharmaceutical Sciences and Research, Bhilai - 490020, Chhattisgarh, India
Email: anjudaharia055@gmail.com

A series of piperidines with polyhydroxy conjugations was designed and synthesized using the proposed green synthetic approach to evaluate their inhibitory activity against α-glucosidase. The structures of the target molecules were established using standard spectroscopic techniques. The enzyme-inhibitory activity of the enzyme α-glucosidase was measured in vitro, and the values of IC50 were calculated. Synthetic analogues revealed compound 4f with the para-isopropyl as the most potent inhibitor (IC50 = 47.65 ± 0.88 µM) compared with the reference compound, rutin (IC50 = 72.66 ± 1.45 µM). Compounds 4e and 4d also showed good bioactivity (IC50 = 57.33 ± 1.76 µM and 62.67 ± 0.88 µM, respectively). Structure-activity relationship (SAR) studies showed that p-substitution with an electron-donating group is tolerated and improves inhibitory activity, likely by increasing electronic density and interaction between enzyme and ligand, while that of an electron-withdrawing group decreases activity. The molecular docking results showed that compound 4f has a favorable binding conformation to α-glycosidase (PDB ID: 3A4A) with a strong binding affinity (-207.035 kcal/mol) and stable interactions within the catalytic pocket. One-way ANOVA statistically validated the significance of the inhibition observed ($p<0.05$). Overall, these results confirm the viability of the polyhydroxy-conjugated piperidine scaffolds as useful insights to pursue further optimization for a new class of antidiabetic agents targeting α-glucosidase.

Keywords: *Polyhydroxy piperidine, Green synthesis, α-Glucosidase inhibition, Structure-activity relationship, Molecular docking study, ADMET.*

O-06/N/012 ORAL · ONLINE

Design and synthesis of newer 1,3,4-oxadiazole and 1,2,4-triazole based Topsentin analogues as anti-proliferative agent targeting tubulin

***Fatima Naaz, Faiz Ahmad, Bilal Ahmad Lone, Yuba Raj Pokharel, Neeraj Kumar Fuloria, Shivkanya Fuloria, Manickam Ravichandran, Lalitha Pattabhiraman, Syed Shaff, M. Shahar Yar**

**Department of Pharmaceutical Chemistry, School of Pharmaceutical Education and Research, Jamia Hamdard, New Delhi-11062, India.*
Email: Drfatimanaaz@jamiahamdard.ac.in

Introduction: Topsentin is a bis-indole alkaloids found in several Mediterranean shallow-water Sponges. It has a broad spectrum of biological activities with antiproliferative (IC50 = 6-20 µg/mL) activity. Inspired by reported anti-proliferative activity of topsentin and its similarities with the structural template designed to develop the molecules that occupies the colchicines binding site.

Aim & Objective: A set of two series of 1,3,4-oxadiazole and 1,2,4-Triazole based topsentin analogues were prepared and evaluated as antiproliferative activity.

Method: 1,3,4-oxadiazole (11a-n) and 1,2,4-Triazole (12a, c, e, g, h, j-n) based topsentin analogues were synthesised by replacing imidazole moiety of topsentin through a multistep synthesis starting from indole. All the compounds synthesized were submitted for single dose (10 µM) screening against an NCI panel of 60-human cancer cell lines. Among all cancer cell lines, colon (HCC-2998) and Breast (MCF-7, T-47D) cancer cell lines were found to be more susceptible for this class of compounds.

Results: Compounds 11d, 12e and 12h demonstrated better activity with IC50 2.42 µM, 3.06 µM, and 3.30 µM respectively against MCF-7 human cancer cell line than that of the standard drug doxorubicin IC50 6.31 µM. Furthermore, 11d induced cell cycle arrest at G0/G1 phase and also disrupted mitochondrial membrane potential with reducing cell migration potential of MCF-7 cells in dose dependent manner. In vitro microtubule polymerization assays found that compound 11d disrupt tubulin dynamics by inhibiting tubulin polymerization with IC50 3.89 µM compared with standard nocodazole (IC50 2.49 µM). In silico docking studies represented that 11d was binding at colchicine binding site of β-tubulin.

Conclusion: Compound 11d emerged as lead molecule from the library of compounds tested and this may serve as a template for further drug discovery.

Keywords: *1,3,4-oxadiazole; 1,2,4-Triazole; Topsentin, Anti-proliferation; Colchicine; Tubulin; Cancer cell line*

O-06/N/013 ORAL · ONLINE

Computational Screening of Indole–Piperazine Derivatives: Pharmacokinetics, ADME, and Toxicity Analysis

Pandurang Shivraj Vijapure [1]*, Girish Kumar Vyas [1], Atul A. Barawkar[2]

[1]Department of Pharmaceutical Chemistry, School of Health & Allied Sciences, Career Point University, Kota 324005, Rajasthan, India
[2]Department of Pharmaceutical Chemistry, ADT School of Pharmacy and Research Centre, Baramati 413115, Dist. Pune, Maharashtra, India
Email: pvijapure2010@gmail.com

The present study investigated the in silico drug-likeness, physicochemical, pharmacokinetic, ADME and toxicity profiles of ten novel indole–piperazine hybrid derivatives (C1–C10) to identify promising candidates for further drug-development research. Computational evaluation was performed using molecular descriptors associated with Lipinski's Rule of Five, including molecular weight, hydrogen-bond donor and acceptor counts, and predicted octanol/water partition coefficient (QPlogPo/w). Additional physicochemical and ADME parameters, including water-accessible polar surface area (WPSA), predicted aqueous solubility (QPlogS), molecular globularity (Glob), predicted hERG liability (QPlogHERG), Caco-2 permeability (QPPCaco), blood–brain barrier distribution (QPlogBB), MDCK permeability (QPPMDCK), human serum albumin binding (QPlogKhsa) and predicted human oral absorption (%HOA), were comparatively analyzed. Toxicological assessment included predicted hepatotoxicity, developmental toxicity and mutagenicity. The compounds demonstrated considerable variation in molecular weight (383.49–482.52 Da), lipophilicity and polarity, reflecting the influence of structural modifications on their predicted pharmacokinetic behavior. C5 and C10 displayed comparatively greater polarity and improved predicted aqueous solubility, whereas C3 and C7 exhibited higher predicted membrane permeability and BBB distribution. C1, C4 and C9 demonstrated a favorable balance between lipophilicity, permeability and predicted oral absorption. Importantly, all ten compounds were predicted to be non-hepatotoxic, non-developmentally toxicant and non-mutagenic within the applied computational models. Overall, the integrated computational profiling identified distinct structure–property relationships across the series and highlighted compounds with comparatively balanced ADME characteristics. These findings support the use of computational profiling as an early-stage strategy for prioritizing indole–piperazine hybrids for subsequent experimental validation and lead optimization.

Keywords: *Indole–piperazine hybrids; In silico drug discovery; Lipinski's Rule of Five; ADME profiling; Pharmacokinetic prediction; Toxicity prediction*

O-06/N/014 ORAL · ONLINE

Synthesis, Characterization and Biological Evaluation of Some Thiadiazole-Conjugated Imidazole Derivatives

Rahul Ahirwar*, Deepak Kumar, Hamid Khan

Department of Pharmaceutical Chemistry, Smt. Vidyavati College of Pharmacy, Goramachhiya, Kanpur Road, Jhansi-284121, Uttar Pradesh, India
Email: rahulahirwar26370@gmail.com

In the presented research paper, a series of thiadiazole-conjugated imidazole derivatives were synthesized and evaluated for antibacterial activity against Escherichia coli (Gram-negative) and Staphylococcus aureus (Gram-positive). The synthesis of derivatives was carried out by the preparation of substituted imidazoles followed by conjugation with thiadiazole. The structural studies of derivatives were carried out by FTIR, 1HNMR, and Mass Spectrometry. Antibacterial activity was analysed by using disc diffusion method. All the synthesized compounds showed the promising anti-bacterial activity with inhibition zones up to 26 mm. The compounds provided the useful information for further development of new antimicrobial agents.

Keywords: *Thiadiazole-Conjugated Imidazole, Derivatives, Anti-microbial Agents, Synthesis, Characterization, Spectral Study.*

O-06/N/015 ORAL · ONLINE

Synthesis, Characterization, and Biological Evaluation of Some Novel Benzothiazole Derivatives

Raj Sharma* Deepak Kumar, Hamid Khan

Department of Pharmaceutical Chemistry, Smt. Vidyavati College of Pharmacy, Goramachhiya, Kanpur Road, Jhansi-284121, Uttar Pradesh, India
Email: sharmaraj66798@gmail.com

In the recent years the incidences of microbial resistance have been increased and observed in the treatment of various diseases based on the antibiotic therapy. This problem ultimately led to researchers to think the development of novel antimicrobial agents. In the presented study, a series of benzothiazole derivatives containing chalcone moieties were synthesized via systematic reaction steps. The obtained benzothiazole derivatives were characterized by spectral studies using IR, 1HNMR, and Mass spectrometry. The compounds (7a–7e) were evaluated for antibacterial activity against Escherichia coli and Staphylococcus aureus using the disc diffusion method. Among all the obtained derivatives, the compound 7d (bromo-substituted) exhibited the highest activity with inhibition zones comparable to ciprofloxacin at 100 µg/mL, while hydroxyl-substituted derivative (7c) showed poor activity. The presented work summarizes, the synthesis, spectral and biological evaluation of benzothiazole–chalcone derivatives. The derived benzothiazole compounds were provided useful information for the antimicrobial drug development.

Keywords: *Benzothiazole, Derivatives, Anti-microbial agents, Synthesis, Characterization, Spectral Studies*

O-06/N/016 ORAL · ONLINE

In silico Studies and In vitro Evaluation of Novel Guanyl Thiourea Derivatives as Antimicrobial Agents

Vaibhav Handa*

Department of Pharmaceutical Chemistry, GHG Khalsa College of pharmacy, Gurusar Sadhar
Email: vaibhavhanda2003@gmail.com

The present study aimed to design, synthesize, characterize, and evaluate novel guanyl thiourea derivatives (37a–e) as potential antimicrobial agents through in silico and in vitro approaches. Molecular docking studies were performed against DNA gyrase (PDB ID: 6RKS), and five promising compounds were selected for synthesis. The synthesized compounds were characterized by melting point, TLC, FTIR, ^{1}H NMR, and ^{13}C NMR. Their antibacterial activity was evaluated against Staphylococcus aureus and Escherichia coli, while antifungal activity was tested against Candida albicans. Among the synthesized derivatives, compounds 37c and 37e showed the most favorable docking scores and the strongest antimicrobial activity. Compound 37c demonstrated the best overall correlation between molecular docking and experimental antimicrobial results. The study suggests that guanyl thiourea derivatives are promising antimicrobial lead compounds and require further investigation through MIC, cytotoxicity, and mechanistic studies.

Keywords: *Guanyl thiourea derivatives, DNA gyrase, Molecular docking, Antibacterial activity, Antifungal activity.*

O-06/N/017 ORAL · ONLINE

Synthesis and Characterization of Schiff Base Derivative of 4-Aminoantipyrine

Monika Pandey[1]*, Arvind Kumar[1], Pratiksha Tyagi[2], Bhuwanendra Singh[2]

[1]*Department of Pharmaceutical Chemistry SD College of Pharmacy & Vocational Studies*
[2]*Department of Pharmacognosy, SD College of Pharmacy & Vocational Studies*
Email: monaharimishra1326@gmail.com

Schiff bases establish a vital class of nitrogen-containing complexes that have fascinated significant attention because of their multipurpose chemical properties and vide range of pharmacological applications. For medicinal and pharmaceutical research, the existence of an azomethine (–C=N–) functional group offers Schiff base novel compounds with individual structural and coordination characteristics. The on-going study lays emphasis on the synthesis and characterization of a Schiff base derivative of 4-aminoantipyrine. The target complex was prepared via condensation reaction including the amino group of 4-aminoantipyrine and a suitable carbonyl-containing compound under opposite reaction conditions. The derived form of new compound was isolated and exposed to physicochemical and spectroscopic characterization to create its formation and structural features. Primary characterization involves assessment of melting behaviour, percentage yield, physical appearance & solubility. Structural validation was additionally maintained by spectroscopic techniques, chiefly Fourier-transform infrared (FT-IR) spectroscopy, with emphasis on the distinctive azomethine (C=N) absorption and additional applicable functional groups. Supplementary spectroscopic analysis, where appropriate, can deliver further evidence regarding the molecular structure of the synthesized derivative. The formation of the Schiff base is predictable to outcome from replacement of the amino hydrogen atoms by condensation with the carbonyl group, convoyed by abolition of water. The synthesized complex signifies a structurally stimulating derivative of 4-aminoantipyrine and may aid as a possible lead for further biological and medicinal chemistry research. In general, the study establishes a forthright method for the synthesis of a novel 4-aminoantipyrine-based Schiff base and its primary structural classification.

Keywords: *4-Aminoantipyrine, Schiff base, Condensation reaction, FT-IR spectroscopy, Structural characterization.*

O-06/N/018 ORAL · ONLINE

The Core Correlation between Organic Chemistry and Medicinal Chemistry

Sarika Manohar Jadhav*

Department of Chemistry, Siddharth Arts, Commerce and Science College Jafrabad, District Jalna 431206, Maharashtra, India
Email: sarikaj402@gmail.com

Medicinal Chemistry is also called as Pharmaceutical Chemistry, it is branch of Chemistry which deals with synthesis, development of new drug. Also, it includes development of existing drugs. Organic Chemistry is the Chemistry of Carbon. Organic Chemistry is backbone of Medicinal Chemistry. In organic chemistry we study reaction's structure, connectivity to synthesis new molecule in medicinal chemistry we relay the activity of these organic compounds against biological activity. It also studies how the drugs are working. Medicinal chemistry and organic chemistry work together in design, synthesis and study of molecules. Organic chemistry studies the stereochemistry which shows connectivity of molecules. Various techniques like UV, IR, NMR, Raman spectroscopy, Mass Spectroscopy are useful in the drug structure analysis. Also, for testing of blood, urine, swab these spectroscopic techniques are very useful. In this research article we explain the core correlation between the Organic Chemistry and Medicinal Chemistry. Organic Chemistry is the key engine of drug discovery. In Medicinal Chemistry everything is depends on the structure activity relationship that is (SAR). The working of Medicinal Chemistry depends upon the Organic Chemistry. These Organic Chemistry and medicinal Chemistry both works together on synthesis and development on personalized medication.

Keywords: *Organic Chemistry, Medicinal Chemistry, Analytical Techniques, Correlation.*

O-06/N/019 ORAL · ONLINE

Benzothiazole-Based Schiff Base and Its Metal Complexes: Synthesis, Characterization and Biological Evaluation

Jeaniya Rani*

G.H.G. Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana, Punjab, India
Email: jeaniyagarg755@gmail.com

Benzothiazole and thiophene scaffolds are associated with diverse biological activities. Their incorporation into Schiff bases, alongside metal coordination, offers a promising strategy to modify bioactivity. This work reviews the synthesis, characterization, and biological evaluation of N-(thiophen-2-ylmethylene) benzo[d]thiazol-2-amine (L)-a Schiff base derived from 2-aminobenzothiazole and 2-thiophenecarboxaldehyde and its Cu (II), Fe (III), Ni (II), and Zn (II) complexes. Characterization was achieved using elemental analysis, IR, mass spectrometry, ^{1}H-NMR, UV-Vis, thermal analysis, and magnetic susceptibility measurements. Spectral data indicated bidentate ligand coordination. Octahedral geometries were proposed for Cu (II) and Fe (III) complexes, whereas tetrahedral geometries were assigned to Ni (II) and Zn (II) complexes. The Schiff base displayed antimicrobial activity, which enhanced significantly upon metal complexation. Additionally, the ligand and its complexes demonstrated in vitro cytotoxic activity against five human tumor cell lines. Overall, metal coordination alters the biological profile of benzothiazole-based Schiff bases, supporting their investigation as bioactive agents.

Keywords: *Schiff base; Benzothiazole; Thiophene; Metal complexes; Antimicrobial activity; Cytotoxicity*

O-06/N/020 ORAL · ONLINE

Synergistic Computational Techniques for Discovery of Novel Benzylidene-2,4-Thiazolidinedione Derivatives as PTP1B Inhibitors

Abhishek Pathak[1*], Naveen Gupta[1], Vivek Asati[2]

[1]*Department of Pharmacy, Madhyanchal Professional University Bhopal, MP, India*
[2]*Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India*
Email: abhipathak09@gmail.com

Protein tyrosine phosphatase 1B (PTP1B) acts as a negative regulator of insulin and leptin signaling pathways by dephosphorylating insulin receptor substrates. In recent years, it has emerged as a promising therapeutic target for the treatment of type 2 diabetes. A total of 48 benzylidene-2,4-thiazolidinedione derivatives were selected for *in-silico* study from the literature. Following the design of novel compounds, the dataset was utilised to develop 3D-QSAR and pharmacophore models; novel compounds were subsequently generated through R-group enumeration based on QSAR data and further evaluated using molecular docking and virtual screening. Among the generated pharmacophore and 3D-QSAR models, further validation identified the most predictive and statistically significant ones. The model AAANR_1 has been chosen as the best pharmacophore model. The 3D-QSAR study yielded the most successful statistical models, with the atom-based model's correlation coefficient (r^2 = 0.7741) and cross-validated correlation (q^2 = 0.8229), and the field-based model's correlation coefficient (r^2 = 0.7652) and q^2 = 0.6212. A total of 11000 compounds were generated using the R-group enumeration study for the production of new compounds. The newly designed compounds were subjected to virtual screening, among which compounds a1, a2, and a3 demonstrated binding interactions with key amino acid residues ALA217 and ARG221 of the target protein (PDB ID: 1C83), similar to those of the co-crystallized ligand, with a docking score of −10.95 kcal/mol. In the molecular dynamics study, compound a3 indicates a much more rigid structure compared to a1 and a2. These molecules may also be utilised in the development of possible PTP1B inhibitors.

Keywords: *PTP1B inhibitors; thiazolidinedione; type2 diabetes; obesity; 3D-QSAR.*

O-06/N/022 ORAL · ONLINE

Topical Administration of *Carica papaya* Extract for Hair Regrowth and Antiandrogenic Activity

Ramsaneh Raghuwanshi*

Sage Institute of Research & Technology-Pharmacy, Sanjeev Agrwal Global Educational University, Bhopal, Madhya Pradesh
Email: ramsanehraghuwanshi@gmail.com

Background: Androgenic alopecia is primarily driven by dihydrotestosterone (DHT) binding to androgen receptors, mediated through testosterone 5α-reductase activity. Natural products with inhibitory effects on this enzyme are considered promising therapeutic agents for hair regrowth.

Objective: To evaluate the hair growth–promoting and antiandrogenic activity of *Carica papaya* seed extract (CPS-ext) in testosterone-induced alopecia models and to identify its active constituent.

Method: Animal were administered CPS-ext (2 mg/day/rat) topically. Hair regrowth was assessed in testosterone-treated rats and in shaved dorsal areas. Inhibition of testosterone 5α-reductase was measured at concentrations of 200 and 500 mg/ml. Activity-guided fractionation was performed to identify active compounds. LNCaP prostate cancer cells were treated with CPS-ext and isolated compounds to evaluate androgen-dependent proliferation.

Results: CPS-ext improved hair regrowth in testosterone-treated rats and promoted regrowth in shaved dorsal areas. CPS-ext inhibited 5α-reductase activity by 82.4% (200 mg/mL) and 94.6% (500 mg/mL). 12-methoxycarnosic acid was identified as the active constituent responsible for enzyme inhibition. CPS-ext and 12-methoxycarnosic acid inhibited androgen-dependent proliferation of LNCaP cells by 64.5% (5 mg/mL) and 66.7% (5 mM), respectively. Both agents likely act by preventing DHT binding to androgen receptors.

Conclusion: CPS-ext demonstrates significant antiandrogenic activity through inhibition of 5α-reductase and suppression of androgen receptor binding. It is a promising crude drug candidate for hair growth stimulation and potential treatment of androgenic alopecia.

Keywords: *Carica papaya, CPS-ext, hair regrowth, androgenic alopecia, 5α-reductase inhibition, 12-methoxycarnosic acid, LNCaP cells, antiandrogenic activity*

O-06/N/023 ORAL · ONLINE

A Comprehensive Review on Therapeutic Applications of Ferulic Acid and its Novel Analogues: A Brief Literature

Ritchu Babbar, Kirti*

Chitkara College of Pharmacy, Chitkara University, Punjab, India
Email: kirti23054.ccp@chitkara.edu.in

Ferulic acid (FA), chemically known as 4-hydroxy-3-methoxycinnamic acid, is a naturally occurring phenolic compound extensively distributed in fruits, vegetables, cereals, grains, seeds, and other plant sources. Owing to its diverse biological properties, FA has gained considerable attention for its therapeutic potential. This review aims to summarize the pharmacological activities of FA and its novel analogues, along with their therapeutic applications and emerging formulation strategies. Relevant published literature was reviewed to evaluate the biological activities, therapeutic potential, physicochemical limitations, and recent advances associated with FA and its derivatives. FA exhibits prominent antioxidant and anti-inflammatory activities, in addition to antimicrobial, antiviral, anticarcinogenic, antiallergic, and hepatoprotective effects. It has demonstrated potential applications in diabetes, cancer, cardiovascular, and pulmonary disorders through modulation of oxidative stress, inflammatory processes, enzyme activity, and cellular signaling pathways. However, poor aqueous solubility, limited bioavailability, rapid metabolism, and physiological instability restrict its pharmaceutical utilization. Structural modification has consequently been explored for developing novel analogues with improved characteristics. Furthermore, polymeric and lipid-based nanocarriers have demonstrated potential to enhance FA solubility, stability, bioavailability, and controlled release, while surface engineering may facilitate targeted delivery. Collectively, the reviewed evidence highlights FA and its novel analogues as promising therapeutic candidates. Structural optimization and advanced delivery approaches may help overcome existing limitations and broaden their pharmaceutical applications.

Keywords: *Ferulic acid; Novel analogues; Therapeutic applications; Antioxidant; Bioavailability.*

P-06/N/001 POSTER · ONLINE

Structure-guided discovery of selective agonists targeting the exon-11 associated 6TM OPRM1 receptor through virtual screening, molecular dynamics simulation and free-energy analysis.

Bawanpreet Kaur, Arvinder Kaur, Anuja Chopra, Satvinder Kaur

Department of Pharmaceutical Chemistry, GHG Khalsa College of Pharmacy, Gurusar Sadhar, Tehsil Raikot, Ludhiana, Punjab -141104, India
Email: bawandeol02@gmail.com

The μ-opioid receptor (MOR), encoded by the OPRM1 gene, is a major target in pain management. However, conventional MOR agonists are associated with adverse effects including respiratory depression, tolerance, dependence. The exon-11-associated six-transmembrane (6TM) OPRM1 isoform represents a distinct receptor variant that may provide an opportunity for selective opioid modulation. The present study aims to identify potential selective agonists targeting the exon-11-associated 6TM OPRM1 receptor and to characterize their receptor interactions and selectivity. A structure-guided virtual screening strategy will be employed to identify structurally diverse compounds with favourable interactions within the predicted 6TM OPRM1 binding region. Ligands will be prioritized using molecular docking and binding-affinity-based analysis, followed by molecular dynamics simulations to evaluate the stability and persistence of receptor–ligand interactions under dynamic conditions. Binding free-energy analysis, together with drug-likeness and pharmacokinetic assessment, will be used to prioritize compounds with favourable properties. The computational workflow is expected to identify ligands showing favourable binding interactions and stable association with 6TM OPRM1, with comparative evaluation against the classical seven-transmembrane MOR. Overall, this integrated approach may provide structural insights into ligand recognition and receptor selectivity and establish a rational framework for identifying 6TM OPRM1-selective agonists. The prioritized candidates may used for experimental validation and optimization toward novel analgesic agents with improved receptor selectivity and a potentially safety profile.

Keywords: *6TM OPRM1, exon 11, μ-opioid receptor, virtual screening, molecular dynamics*

P-06/N/002 POSTER · ONLINE

Synthesis and Evaluation of Antibacterial Activity of Chalcone Based Heterocyclic Derivatives

Anuja Chopra, Navpreet Kaur, Sonia Singla

Department of Pharmaceutical Chemistry, G.H.G Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana, 141104 Punjab, India
Email: anujachopra139@gmail.com

Introduction: Chalcones, 1,3- diphenyl-2-propen-1-ones, are based on two aryl moieties bridged via an α,β-unsaturated carbonyl group. These molecules have a –C=O–CH=CH– ketoethylenic moiety in their structure. A significant part of medicinal chemistry research in the 21st century has been focused on both natural and synthetic chalcones because of their various pharmacological potential including activities and characteristics such as antibacterial, anti-inflammatory, analgesic, antidiabetic, immunomodulatory, aldosereductase inhibition, estrogenic, acetylcholinesterase inhibition, and as non-purine xanthine oxidase inhibitors.

Objectives: The objective of this research work is to design, synthesize, and evaluation of antimicrobial activity of some novel substituted Chalcone based heterocyclic derivatives.

Methods: In the present work, the chalcone based heterocyclic derivatives will be synthesized via treatment of acetophenone derivative and benzaldehyde derivative in equal amounts using ethyl alcohol in 40% NaOH solution at 10 °C and stirred for 1 h and then at RT for 4 h; the reaction proceeded via Claisen–Schmidt reactions.

Results: The formation of substituted chalcone based heterocyclic derivatives will be confirmed through their spectral analysis, that is, 1H-NMR, 13C-NMR, and Mass spectroscopy. The synthesized compounds were also evaluated in vitro for their antibacterial (against S. aureus, B. subtilis, P. aeruginosa, and E. coli bacterial strains). All the synthesized compounds exhibited moderate-to-potent antibacterial activities.

Conclusions: All the synthesized compounds may exhibit significant antibacterial and were confirmed to be potential antibacterial agents.

Keywords: *Antibacterial, Chalcone, Heterocyclic derivatives.*

P-06/N/003 POSTER · ONLINE

In Silico Virtual Screening of Diverse Chemical Libraries for the Discovery of Novel C5aR1 and C5aR2 Receptor Modulators

Kamalpreet Kaur, Anuja Chopra

Department of Pharmaceutical Chemistry, GHG Khalsa College of PharmacyGurusar Sadhar, Tehsil Raikot, Ludhiana, Punjab – 141104, India
Email: Kamalsaini9656@gmail.com

The complement anaphylatoxin C5a and its receptors, C5aR1 and C5aR2, are important modulators of innate immune responses and are implicated in severe inflammatory pathologies. The discovery of small-molecule modulators targeting these receptors may offer new therapeutic opportunities; however, exploring large chemical spaces remains challenging. This ongoing study aims to establish a high-throughput in silico virtual screening workflow to evaluate diverse chemical libraries for the discovery of novel small-molecule modulators targeting C5aR1 and C5aR2. Molecules from diverse chemical repositories, including ZINC, LOTUS and PubChem, will be subjected to a hierarchical computational screening workflow. Prepared C5aR1 and C5aR2 receptor structures will be used for molecular docking using AutoDock Vina. Compounds will be ranked based on predicted binding affinity, binding poses and key receptor–ligand interactions. The screening workflow is expected to prioritize a focused subset of promising candidate molecules showing favourable predicted binding scores and interaction profiles across one or both receptor targets. Currently at the literature review and protocol-design stage, this study establishes a structured computational pipeline for identifying structurally diverse plant-derived and synthetic lead compounds capable of modulating C5a-mediated signaling. The proposed workflow may provide a cost-effective foundation for subsequent in vitro validation and the discovery of novel anti-inflammatory therapeutic candidates.

Keywords: *C5aR1; C5aR2; Virtual Screening; Molecular Docking; AutoDock Vina; Inflammation*

P-06/N/004 POSTER · ONLINE

Imidazole-1,3,4-Thidiazole Hybrid Scaffolds: Synthetic Approaches, Structure–Activity Relationships and Emerging Biological Potential

Loveneet Kaur* and Monika Gupta

Department of Pharmaceutical Chemistry, Amar Shahed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy (An Autonomous College) Bela (Ropar) Punjab-140111, India.
Email: loveneetbela24@gmail.com

Imidazole and 1,3,4-thiadiazole are important nitrogen- and sulfur-containing heterocycles that possess broad pharmacological potential. Their molecular hybridization into a single scaffold offers an attractive strategy for generating compounds with improved biological activity and selectivity. This review aims to examine conventional synthetic approaches for imidazole–thiadiazole hybrids and to establish structure–activity relationship (SAR) patterns associated with their biological properties, with an emphasis on anticancer, antimicrobial, antitubercular, anti-inflammatory, antidiabetic, antioxidant, and antiparasitic activities. Relevant literature was systematically examined to compare reported synthetic routes, substituent effects, linker chemistry, physicochemical features, biological evaluation methods, and molecular-docking findings of imidazole–thiadiazole derivatives. The literature indicates that the hybridization of imidazole and 1,3,4-thiadiazole frequently produces biologically active molecules, while their activity is strongly influenced by the nature and position of substituents, electronic characteristics, lipophilicity, and linker architecture. Electron-withdrawing and electron-donating groups can markedly alter potency and selectivity depending on the biological target. Several derivatives demonstrated promising antimicrobial, anticancer, anti-inflammatory, and antioxidant profiles, and docking studies commonly supported favorable interactions with relevant target proteins. Collectively, the reviewed SAR trends demonstrate that rational modification of either heterocyclic ring and optimization of the connecting linker can provide valuable improvements in biological performance. Imidazole–thiadiazole hybrids represent a versatile platform for medicinal-chemistry research and future drug discovery. Further optimization supported by mechanistic studies, pharmacokinetic assessment, toxicity profiling, and in-vivo validation is required to translate promising lead structures into therapeutically relevant candidates.

Keywords: *Imidazole; 1,3,4-thiadiazole; structure–activity relationship; anticancer; antimicrobial; antitubercular; anti-inflammatory; molecular docking.*

P-06/N/005 POSTER · ONLINE

Review of Bradykinin B1 and B2 Receptors

Rajpreet Kaur*, Sonia Singla, Satwinder Kaur

Department of Pharmaceutical Chemistry, GHG Khalsa College of Pharmacy, Gurusar Sadhar, Tehsil Raikot, Ludhiana, Punjab-141104, India.
Email: puneetsokhal83@gmail.com

Bradykinin is an important vasoactive peptide of the kallikrein–kinin system that plays a major role in pain, inflammation, vasodilation, vascular permeability and tissue responses. Its biological effects are mainly mediated through two G-protein-coupled receptors, bradykinin B1 (B1R) and B2 (B2R) receptors. B2R is constitutively expressed in many tissues and is primarily activated by bradykinin, contributing mainly to acute pain and inflammatory responses. In contrast, B1R is expressed at very low levels under normal physiological conditions but is strongly induced during tissue injury, inflammation and chronic pathological conditions. B1R is therefore particularly associated with persistent inflammation and chronic pain. Activation of B1R and B2R triggers intracellular signalling pathways that promote inflammatory responses, pain sensitization and changes in vascular function. Due to their important role in inflammatory and pain-related disorders, both receptors have attracted considerable attention as potential therapeutic targets. B2 receptor antagonism has demonstrated clinical relevance, while B1 receptor antagonists are being explored for the treatment of chronic pain and inflammatory diseases. Recent advances in structural biology and computational drug-design approaches have improved the understanding of receptor–ligand interactions and provide opportunities for the identification of novel bradykinin receptor antagonists. Therefore, selective targeting of B1R and B2R represents a promising strategy for the development of new therapeutic agents for pain and inflammatory disorders.

Keywords: *Bradykinin, B1 receptor, B2 receptor, inflammation, pain, receptor antagonists, drug discovery, molecular docking.*

P-06/N/006 POSTER · ONLINE

Anti-Inflammatory Potential of Cedrus deodara Essential Oil

Riya*

Department of Pharmaceutical Chemistry, GHG Khalsa College of Pharmacy, Gurusar Sadhar, Tehsil Raikot, Ludhiana, Punjab-141104, India.
Email: riyaverdhan4@gmail.com

Inflammation is a natural protective response that, when prolonged, can contribute to various chronic diseases. Cedrus deodara (Roxb. ex D. Don), commonly known as Deodar, is a medicinal plant traditionally used for inflammatory and rheumatic conditions. Its essential oil contains several bioactive terpenoids, particularly himachalene derivatives, which may contribute to its pharmacological activity. Studies have reported that C. deodara essential oil exhibits significant anti-inflammatory effects by reducing inflammatory responses and modulating key inflammatory mediators. Its inhibitory effect on lipoxygenase further suggests a possible role in reducing the production of pro-inflammatory leukotrienes. These findings indicate that C. deodara essential oil is a promising natural source of anti-inflammatory compounds. Further research is required to establish its molecular mechanism, safety, and therapeutic potential.

Keywords: *Cedrus deodara, Essential oil, Anti-inflammatory activity, Himachalene, Terpenoids, Lipoxygenase, Inflammation.*

P-06/N/007 POSTER · ONLINE

In vitro Anthelmintic potential of three wild Indian medicinal plants

Sonia Singla* Anuja Chopra, Navpreet Kaur

Department of Pharmaceutical Chemistry, Guru Har Gobind Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana, Punjab-141104, India.
Email: soniaasingla786@gmail.com

Background: Parasitic infections pose a significant risk to both human and animal health, with helminthiasis being one of the most prevalent form. Although a variety of anthelmintic drugs have been employed to combat these infections, synthetic options often face challenges such as drug resistance. As a result, exploring medicinal plants presents a promising and cost-effective alternative for developing more effective anthelmintic treatments.

Materials and Methods: The three wild-growing plants selected in the study are Achyranthes aspera, Ficus benghalensis and Tephrosia purpurea, belonging to the family Amaranthaceae, Poaceae and Fabaceae respectively. Traditionally, all these plants are used as vermicides. The main goal of the study was to examine the anthelmintic activity of these three plants using earthworms (Eisenia fetida). 50% Hydroethanolic extracts of the three plants at different concentrations (20, 50, 80 mg/ml) showed dose-dependent anthelmintic response.

Results: At concentrations of 20, 50, 80 mg/ml, all three plant Achyranthes aspera, Bambusa vulgaris and Tephrosia purpurea extracts caused paralysis at 32.4 ±0.68, 22.1 ±1.17, 18.05 ±0.2; 7.07 ±0.34, 5.04 ±0.01, 3.02 ±0.15; 20.41 ±1.28, 15.2 ±0.35, 10.12 ±0.03 min. and death at 40±0.71, 29.2 ±1.24, 21.07 ±0.34; 13.02±0.33, 10.03 ±0.01, 5.04 ±0.01; 35.12±0.28, 26.15 ±0.31, 18.03 ±0.01 min. respectively. Albendazole was used as a reference standard at three different concentrations 20, 50, 80 mg/ml and caused paralysis at 40.37 ±1.46, 36.12 ±0.34, 24.44 ±0.62 min and death at 50.1±1.42, 39 ±0.44, 30.49 ±0.73 min.

Conclusion: After analysing results, it was concluded that the three plants possess effective anthelmintic activity when compared with standard drug Albendazole and Ficus benghalensis was found to be much more effective than all.

Keywords: *Achyranthes aspera, Ficus benghalensis, Tephrosia purpurea, Anthelmintic activity, Albendazole.*

P-06/N/008 POSTER · ONLINE

In-silico Design and Optimization of COX-2 Inhibitors as Anti-inflammatory Agents

Jasmeen*

G.H.G Khalsa College of Pharmacy, Gurusar Sadhar
Email: jasmeendoda3@gmail.com

Inflammation is a complex physiological response associated with several acute and chronic disorders, and cyclooxygenase-2 (COX-2) is an important molecular target involved in the biosynthesis of prostaglandins during inflammatory processes. Although selective COX-2 inhibitors can provide effective anti-inflammatory activity, the development of potent and selective compounds with favorable pharmacokinetic and safety profiles remains an important research objective. The present study proposes a computer-aided drug design (CADD) approach for the design and optimization of novel COX-2 inhibitors. A series of structurally diverse ligands will be designed and evaluated using molecular docking to investigate their binding interactions within the active site of COX-2. Key interactions with catalytically and structurally important amino-acid residues will be analyzed to identify promising lead molecules. The selected compounds will subsequently be assessed for drug-likeness and pharmacokinetic characteristics using in-silico ADMET prediction, while quantitative structure–activity relationship (QSAR) and/or pharmacophore studies may be employed to identify structural features responsible for activity. The most promising candidates can further be subjected to molecular dynamics simulations to evaluate the stability of protein–ligand complexes. This integrated computational strategy is expected to identify potential COX-2 inhibitor scaffolds and provide useful structure–activity insights for further synthesis and biological evaluation. The study may contribute to the rational discovery of safer and more effective anti-inflammatory agents while reducing the time and resources required during early-stage drug development.

Keywords: *COX-2, cyclooxygenase-2, CADD, molecular docking, anti-inflammatory agents, QSAR, pharmacophore, ADMET, molecular dynamics simulation.*

P-06/N/009 POSTER · ONLINE

Molecular Docking and ADMET Evaluation of Chalcone Heterocycle Hybrid analogues in Polycystic Ovarian Disease Management

Ketki A Doshi*

Savitribai Phule Pune University, Rasiklal M Dhariwal Institute of Pharmaceutical Education and Research, Chinchwad.
Email: ketkidoshi567@gmail.com

Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age. It is characterized by hormonal imbalance, irregular menstrual cycles, and impaired ovulation, often accompanied by increased androgen levels and polycystic ovaries. PCOS can affect reproductive, metabolic, and psychological health, leading to complications such as infertility, insulin resistance, obesity, and an increased risk of type 2 diabetes. Early diagnosis and appropriate management through lifestyle modification and medical treatment can help reduce symptoms and improve long-term health outcomes.

Keywords: *Polycystic Ovary Syndrome (PCOS), Hormonal Imbalance, Reproductive Health, Irregular Menstruation, Infertility, Insulin Resistance.*

P-06/N/010 POSTER · ONLINE

Benzimidazole Derivatives as Promising Tyrosinase Inhibitors: A Review of Design, Synthesis, Biological Evaluation, and Structure–Activity Relationships

Gurdeep Singh* and Monika Gupta

Department of Pharmaceutical Chemistry, Amar Shaheed Baba Ajit Singh Jhujar Singh Memorial College of Pharmacy (An Autonomous College) Bela (Ropar)-140111, Punjab, India

Email: gd8745175@gmail.com

Tyrosinase is a copper-containing enzyme that plays a crucial role in melanin biosynthesis by catalyzing the oxidation of tyrosine and L-DOPA, making it an important target for the management of hyperpigmentation and related cosmetic disorders. Benzimidazole is an important nitrogen-containing heterocyclic scaffold with diverse biological properties and has attracted considerable interest in the development of novel tyrosinase inhibitors. This review aims to provide an overview of benzimidazole derivatives investigated as tyrosine's inhibitors, with emphasis on their structural modifications, synthetic approaches, inhibitory activity, mechanism of action, and structure–activity relationships. Relevant research studies were reviewed to assess the influence of different substituents and structural modifications on the tyrosinase inhibitory potential of benzimidazole derivatives. Reported biological assays, enzyme kinetic studies, molecular docking, and other computational approaches were considered to understand compound–enzyme interactions. The reviewed findings demonstrate that structural modification of the benzimidazole nucleus can significantly influence tyrosinase inhibition. Appropriate substitution on the benzimidazole ring and attached aromatic groups may enhance hydrophobic interactions, hydrogen bonding, and binding within the enzyme active site. Several benzimidazole derivatives have shown promising inhibitory activity, with selected compounds exhibiting potency comparable to or greater than standard inhibitors such as kojic acid. Benzimidazole provides a versatile scaffold for the development of structurally diverse tyrosinase inhibitors. Rational modification and structure-based drug design of benzimidazole derivatives may facilitate the discovery of potent and selective tyrosinase inhibitors with potential applications in hyperpigmentation management and cosmetic research.

Keywords: *Benzimidazole; Tyrosinase; Tyrosinase inhibitors; Melanin; Melanogenesis; Hyperpigmentation; Heterocyclic compounds; Structure–activity relationship.*

P-06/N/011 POSTER · ONLINE

Design, Preparation and Evaluation of Curcumin, Piperine and Eugenol-Based Polyherbal Periodontal Film

Khushpreet Kaur*

G.H.G. Khalsa College of Pharmacy, Gurusar Sudhar

Email: randhawakhushpreetkaur@gmail.com

Periodontal diseases are chronic inflammatory disorders affecting the supporting structures of the teeth and are primarily associated with pathogenic microorganisms, dental plaque accumulation, inflammation, and progressive destruction of periodontal tissues. Conventional periodontal therapy may have certain limitations, including inadequate drug retention and short residence time at the periodontal site. Therefore, localized drug-delivery systems may offer an effective approach for maintaining therapeutic concentrations of active agents at the site of infection and inflammation. The present study aims to design, prepare, and evaluate a polyherbal periodontal film containing curcumin, piperine, and eugenol for localized delivery in the management of periodontal diseases. Curcumin possesses reported anti-inflammatory, antioxidant, and antimicrobial activities, whereas piperine exhibits antimicrobial and anti-inflammatory properties and has been investigated for its potential to enhance the bioavailability of curcumin. Eugenol possesses antimicrobial, analgesic, and anti-inflammatory activities and may contribute to the overall therapeutic potential of the formulation. The combination of these phytoconstituents is expected to provide complementary pharmacological effects against inflammation and periodontal pathogens. The periodontal film will be formulated using suitable biocompatible polymers by the solvent-casting technique. The prepared films will be evaluated for physical appearance, thickness, weight variation, folding endurance, surface pH, drug content, moisture content, tensile strength, swelling behavior, in-vitro drug release, antimicrobial activity, and stability. Drug–polymer compatibility will be investigated using Fourier-transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC). The antimicrobial activity of the optimized formulation will be evaluated against selected periodontal pathogens using an appropriate microbiological method. The developed polyherbal periodontal film is expected to provide localized and controlled release of curcumin, piperine, and eugenol, thereby potentially enhancing drug residence at the periodontal site and reducing microbial burden and inflammation. The study may provide a promising herbal localized drug-delivery approach for periodontal therapy.

Keywords: *Anti-inflammatory, Curcumin, Eugenol, localized drug-delivery, Periodontal Film.*

P-06/N/012 POSTER · ONLINE

The Strategic Role of Acetamide Linkers in Anticancer Drug Discovery: Insights into Molecular Design and Structure–Activity Relationships

Navdeep Kaur* and Monika Gupta

Department of Pharmaceutical Chemistry, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial, College of Pharmacy (An Autonomous College), Bela (Ropar)-140111 Punjab, India

Email: harjitghuman94@gmail.com

Cancer remains one of the major global health challenges, creating a continuous need for the discovery of novel and effective anticancer agents. In medicinal chemistry, the selection of an appropriate linker can significantly influence the biological activity, selectivity, stability, and pharmacokinetic properties of drug molecules. Among various linkers, the acetamide (acetamido) moiety has received considerable attention because of its ability to participate in important molecular interactions and modulate the physicochemical and biological properties of therapeutic compounds. The present review provides a comprehensive overview of the role of acetamide linkers in the design and discovery of anticancer agents. Published anticancer compounds incorporating acetamide linkers are systematically discussed with emphasis on their chemical structures, biological targets, mechanisms of action, and reported anticancer activities. Particular attention is given to structure activity relationship (SAR) studies to understand how modifications around the acetamide linker and associated pharmacophores influence potency and selectivity. The review also highlights the application of acetamide linkers across different molecular scaffolds and their contribution to interactions with important cancer-associated targets and cell lines. Comparative analysis of reported compounds provides insights into structural features associated with improved anticancer activity and assists in identifying promising molecular frameworks for further optimization. Overall, this review emphasizes the versatility of the acetamide linker as a valuable structural element in anticancer drug design and provides useful insights for the development of novel, potent, selective, and therapeutically relevant anticancer agents.

Keywords: *Acetamide linker; Anticancer agents; Drug design; Structure activity relationship; Molecular interactions; Cancer therapy.*

P-06/N/013 POSTER · ONLINE

Computational Design and Screening of 4,5-Dihydrofuran Derivatives Targeting Selective COX-2 and Carbonic Anhydrase for Osteoarthritis

Sapna Kumari*, Surinder

Department of Pharmaceutical Chemistry, JCDM College of Pharmacy, Sirsa-125055, Haryana, India

maliksapna403@gmail.com Osteoarthritis (OA) is a widely prevalent degenerative joint disorder in which cyclooxygenase-2 (COX-2) and carbonic anhydrase (CA) isoforms II, IX and XII act as interlinked contributors to chondrocyte breakdown. Prolonged use of non-selective NSAIDs and first-generation coxibs remains limited by gastrointestinal, renal and cardiovascular risks, creating interest in structurally novel, isoform-selective, dual-acting molecules. This work aims to design and computationally evaluate 4,5-dihydrofuran derivatives as dual COX-2/CA inhibitors for managing osteoarthritis. A structured in silico pipeline was applied, involving pharmacophore mapping of the COX-2 secondary-pocket and CA zinc-binding requirements onto the 4,5-dihydrofuran core, molecular docking against COX-2 and CA II/IX/XII structures, molecular dynamics with MM-GBSA/MM-PBSA free-energy estimation, ADMET prediction, and QSAR-guided optimisation of C2–C5 substituents. The dihydrofuran scaffold accommodated both pharmacophores together, with a C2 aryl-sulfonamide group satisfying COX-2 and CA requirements simultaneously. Comparative binding trends suggested the design could approach the potency of reported oxadiazole-sulfonamide and pyrazolopyrimidine dual inhibitors, with predicted ADMET parameters within acceptable drug-likeness limits. The 4,5-dihydrofuran ring is proposed as a synthetically accessible, structurally distinct scaffold capable of dual COX-2/CA engagement, offering a rational computational route toward novel anti-osteoarthritic leads ahead of synthesis and experimental validation.

Keywords: *4,5-Dihydrofuran; Cyclooxygenase-2; Carbonic anhydrase; Osteoarthritis; Molecular docking; Dual-target drug design.*

P-06/N/014 POSTER · ONLINE

Heteroaryl Coumarin Derivatives as Dual-Site AChE Inhibitors

Shivanshi *, Reeta sethi

Department of Pharmaceutical Chemistry, JCDM College of Pharmacy, Sirsa -125055, Haryana, India
Email: shivanimalik5380@gmail.com

Introduction: Alzheimer's disease (AD) is a multifactorial neurodegenerative disorder associated with progressive cognitive decline and impaired cholinergic neurotransmission. Acetylcholinesterase (AChE) inhibition remains an established symptomatic approach for managing AD. However, conventional AChE inhibitors generally target the catalytic anionic site (CAS), whereas simultaneous interaction with the peripheral anionic site (PAS) may provide a more effective strategy. Coumarin is a privileged scaffold with considerable structural versatility and potential for developing novel AChE inhibitors.

Aim & Objectives: To computationally design and evaluate heteroaryl coumarin derivatives as dual-site AChE inhibitors capable of interacting with both the CAS and PAS.

Methods: A structure-based computational approach was employed for the design and evaluation of heteroaryl coumarin derivatives. Molecular docking was used to investigate their binding modes and interactions with key residues located within the CAS and PAS of AChE. The designed compounds were further assessed using relevant in silico physicochemical and pharmacokinetic parameters.

Results: The designed heteroaryl coumarin derivatives showed promising predicted binding interactions within the active-site gorge of AChE, with potential interactions involving both CAS and PAS regions. The computational findings support the potential of the heteroaryl coumarin scaffold for developing dual-site AChE inhibitors.

Summary: The study provides a computational framework for exploring heteroaryl coumarin derivatives as potential dual-site AChE inhibitors.

Conclusion: Heteroaryl coumarin derivatives represent promising candidates for further investigation in the development of novel therapeutic agents for Alzheimer's disease.

Keywords: *Alzheimer's disease; Acetylcholinesterase; Coumarin; Heteroaryl derivatives; Molecular docking; Dual-site inhibition.*

P-06/N/015 POSTER · ONLINE

Hexadentate Coordination Chemistry in Toxicology: The Chelation Mechanics of $CaNa_2EDTA$in Lead Poisoning

Chahat*, Monika

University Institute of Pharmaceutical Sciences and Research, BFUHS, Faridkot 151203, Punjab, India
Email: chahatnarula445@gmail.com

Lead poisoning remains an important public health concern because lead can accumulate in the body and interfere with essential biological functions. Chelation therapy is used to reduce lead toxicity by binding the metal and promoting its removal from the body. Calcium disodium ethylenediaminetetraacetate ($CaNa_2EDTA$) is a well-developed chelating agent used in the treatment of significant lead poisoning. Its therapeutic action is based on the coordination chemistry of EDTA, which contains multiple donor atoms capable of forming a stable complex with lead ions. This abstract aims to explain the coordination chemistry and chelation mechanism of $CaNa_2EDTA$ in lead poisoning, with particular focus on the hexadentate binding ability of EDTA, its interaction with Pb^{2+}, and the stability and elimination of the resulting metal-chelate complex. A literature-based approach is used to study published research articles and relevant sources on coordination chemistry, EDTA structure, Pb^{2+}–EDTA complex formation, and the clinical application of $CaNa_2EDTA$. The studied evidence indicates that EDTA acts as a hexadentate ligand through two nitrogen and four oxygen donor atoms, allowing it to strongly coordinate with Pb^{2+}. In $CaNa_2EDTA$, calcium is initially associated with EDTA and can be displaced by lead because Pb^{2+} forms a more stable complex with the ligand. The resulting lead–EDTA complex is sufficiently stable to facilitate the renal elimination of lead. Overall, the studyhighlights how the molecular structure and coordination properties of EDTA contribute directly to the chelation and therapeutic removal of lead, demonstrating the important role of coordination chemistry in the treatment of metal poisoning.

Keywords: *Lead poisoning, Calcium disodium, EDTA, Metal-chelate complex, Hexadentate*

P-06/N/016 POSTER · ONLINE

Tetracycline–Calcium Chelation: The Molecular Basis of Reduced Antibiotic Absorption

Manav Bhambri*, Monika[1]

University Institute of Pharmaceutical Sciences and Research, BFUHS, Sadiq Road, Society, Faridkot, Punjab-151203, India
Email: manavbhambri0@gmail.com

Tetracyclines are a group of broad-spectrum antibiotics used to treat several bacterial infections, including acne and respiratory infections. An important problem with these antibiotics is that their absorption can be reduced when they are taken along with calcium-containing foods or medicines. This interaction can be explained using coordination chemistry. Tetracycline molecules contain several oxygen-containing groups that can bind with metal ions such as calcium (Ca^{2+}). When tetracycline is taken with milk, dairy products, calcium supplements or calcium-containing antacids, calcium can attach to the tetracycline molecule and form a stable tetracycline–calcium chelate. This complex is less soluble and is therefore absorbed poorly from the gastrointestinal tract. As a result, less antibiotic reaches the bloodstream, which may reduce the effectiveness of treatment. This is an important example of how basic chemistry can directly influence drug absorption and therapeutic action. Understanding this interaction is useful in pharmacy because pharmacists can identify potential drug–food and drug–mineral interactions and counsel patients about appropriate administration of tetracycline antibiotics. Patients may need to avoid taking certain tetracyclines at the same time as calcium-rich foods, supplements or antacids, depending on the specific drug. Therefore, knowledge of coordination chemistry helps pharmacists understand the molecular basis of this interaction and apply it to safe and effective antibiotic therapy.

Keywords: *Tetracyclines; Coordination chemistry; Calcium; Chelation; Drug–food interaction; Antibiotic absorption; Pharmacist counselling.*

P-06/N/017 POSTER · ONLINE

C–H Activation-Mediated Dimerization of N-Benzyl Isoquinolone Derivatives: An Approach Towards the Synthesis of Novel Isoquinolone-Based Dimers

Suneha Sharma

G.H.G. Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana
Email: sunehasharma223@gmail.com

Isoquinolone derivatives are important nitrogen-containing heterocycles with significant structural and synthetic interest. C–H activation provides an efficient approach for direct functionalization and construction of new carbon–carbon bonds. In the present work, the C–H activation-mediated dimerization of N-benzyl isoquinolone derivatives is being investigated to develop structurally complex isoquinolone-based dimers. The study focuses on the activation of C–H bonds followed by intermolecular C–C bond formation between isoquinolone molecules. Different reaction parameters, including catalyst, oxidant, solvent, and temperature, are being explored to achieve efficient dimerization. This approach provides a direct strategy for increasing molecular complexity from readily available N-benzyl isoquinolone substrates and may contribute to the development of new synthetic methodologies for heterocyclic compounds.

Keywords: *Isoquinolone, heterocycles, Dimerization.*


Inmac
INMAC
LABORATORIES
ISO 9001:2015 & GMP CERTIFIED
Quality You Can Trust.
Health You Can Count On.
Committed to manufacturing safe, effective and affordable medicines — made in India with uncompromising quality at every step.
PRECISION • PURITY • PERFORMANCE
GMP CERTIFIED
GMP Certified
Manufacturing facility compliant with Good Manufacturing Practices
ISO 9001:2015
ISO 9001:2015
Certified quality management system for consistent excellence
Made in India
Proudly manufactured at Bangsipura, Punjab
WARM WISHES
to ISF College of Pharmacy, Moga on hosting the
22nd International Cyclodextrin Symposium (ICS-22)
Inmac
Manufactured in India by :
Inmac Laboratories
(An ISO 9001:2015 & GMP certified Company)
Bangsipura-142 033 (Pb.)
Your Trusted Partner in Quality Healthcare
Bangsipura – 142 033, Punjab, India

CATEGORY 7 | 30 ABSTRACTS

Analytical Techniques & Sensor Technology

DRESSUPORT™

Premium Rolled Bandage

Reliable Support | Superior Quality | Everyday Care

Dressuport™ rolled bandage is a superior and premium quality rolled cloth for providing support to surgical dressings. Premium Rolled bandage available in different sizes like 5 cm, 7.5 cm, 10 cm and 12.5 cm and different length as required.

Dressuport premium gauze than available in 100 cm and 18 meter length.



Premium Quality Cloth

Soft & Comfortable

Reliable Support

Suitable for Surgical Dressings

AVAILABLE SIZES



5 cm 7.5 cm 10 cm 12.5 cm

Manufactured by

Prime Care Industries

Gaushala Road, Ropar- 140001, Punjab

9478039327, 9876026343

www.onlinecare.in

Registration Number: Prime-Rupna-PB/M/MD/000859

UDYAM-PB-18-0000183

Industry Registration ID: W20RPN780368

O-07/F/001 ORAL · OFFLINE

Analytical Techniques and Sensor Technology: Advancements, Applications and Future Perspectives

Shaiwal Shaswat Singh*

Department of Pharmacy, K.R. Mangalam University, Gurugram, Haryana, India
Email: shaiwalshaswat7@gmail.com

Introduction: Analytical techniques are essential for the identification, characterization, quantification, and quality assessment of chemical and biological substances. Recent developments in sensor technology have further enhanced analytical capabilities by enabling rapid, sensitive, selective, and portable detection.

Aim & Objectives: This presentation aims to provide an overview of major analytical techniques and modern sensor technologies, highlighting their principles, applications, advantages, limitations, and emerging developments.

Methods: A literature-based review was conducted covering conventional analytical techniques, including spectroscopy, chromatography, electroanalytical methods, thermal analysis, and mass spectrometry, along with electrochemical, optical, biosensor, semiconductor, and piezoelectric sensor technologies.

Results: The review demonstrates that techniques such as High-Performance Liquid Chromatography, Ultraviolet-Visible spectroscopy, Fourier Transform Infrared spectroscopy, Nuclear Magnetic Resonance, and mass spectrometry provide reliable qualitative and quantitative analysis. Sensor-based approaches offer rapid response, high sensitivity, selectivity, miniaturization, portability, and potential for real-time monitoring.

Summary: Integration of advanced analytical methods with sensor technology has expanded the scope of analytical measurements across pharmaceutical, biomedical, environmental, food, and industrial applications.

Conclusion: Continued development of sensitive, miniaturized, and cost-effective analytical and sensor platforms can improve the speed, reliability, and accessibility of analytical testing.

Keywords: *Analytical techniques, Sensors, Biosensors, Spectroscopy, Chromatography, Detection.*

O-07/F/002 ORAL · OFFLINE

Green Chemistry-Driven RP-HPLC Method for Diltiazem and Lidocaine Hydrochloride in Bulk and Gel Formulations Using AQbD

Airia*, Preeti Patel

ISF College of Pharmacy, Moga, Punjab
Email: airiarana23@gmail.com

In this work, a simple, specific, accurate, and precise Reverse-Phase High-Performance Liquid Chromatography (RP-HPLC) method for estimating lidocaine hydrochloride and diltiazem hydrochloride in bulk and pharmaceutical dosage forms is developed and validated. The method uses an isocratic RP-HPLC approach for the separation and quantification of these compounds. Chromatographic analysis was performed on a Waters HPLC system that was fitted with a Thermo Scientific C18 ODS column (250 mm × 4.6 mm, 5 µm). The mobile phase was supplied at a flow rate of 1.0 mL/min and consisted of methanol, acetonitrile, and buffer (orthophosphoric acid) in a 70:20:10 ratio. At 233 nm, a sharp, symmetrical peak, with retention periods of 2.5 and 4.4 min was obtained through drug detection. Samples, such as linearity, accuracy, precision, specificity, and robustness, were evaluated for the method's validation. The method showed linearity throughout a concentration range of 20–100 µg/mL, with correlation coefficients (r^2) of 0.999 and 0.998, respectively, and the recovery of diltiazem hydrochloride varied from 99 to 100 %. Method optimization was accomplished through the use of a Box–Behnken design with desirability functions, and the validation parameters satisfied the requirements specified in the ICH Q2 (R1) recommendations. The AGREE assessment of the proposed RP-HPLC technique resulted in a score of 0.68, indicating a good balance between analytical performance and environmental sustainability. This confirms its suitability as an eco-friendly analytical method.

Keywords: *Green chemistry, Diltiazem, Lidocaine hydrochlorides, Method validation, Reverse-phase chromatography, Box–Behnken design.*

O-07/F/003 ORAL · OFFLINE

Development and Validation of an LC-MS/MS Method for the Assessment of Isoxazole, a Bioactive Analogue of Curcumin in Rat Plasma: Application to a Pharmacokinetic Study

Anjali Maurya*, Nidhi Gupta
Department of Pharmaceutical Analysis, ISF College of Pharmacy, Moga, Punjab, India
Email: anjalimaurya.official@gmail.com

A novel Isoxazole (ISO) analogue of curcumin is synthesized from curcumin and described as having a better pharmacological activity than curcumin, such as anti-cancer, anti-malarial, anti-mycobacterial, and many more. The present research aims to develop a bio-analytical method with a simple, rapid, selective, sensitive, accurate, and precise quantification of ISO by (LC-MS/MS) in rat plasma matrix. The simple plasma protein precipitation method was used for ISO extraction. The ISO was eluted in isocratic mode on a Water symmetry C 18 column (75 × 4.6 mm, 3.5 µ m) at a 600 µL/min flow rate with a 0.1 % formic acid in water and methanol (20:80) as mobile phase. The MS/MS was used as a monitoring tool for the fragmentation of ISO as m/z = 366.1 → 145.1 and m/z =237.1 → 194.07 for carbamazepine (CBZ; internal standard). The ISO showed good co-relation as (r 2 =0.999) linear and covered a wide range with a lower limit of quantification of 1.0 ng/ml. Finally, the developed method was successfully utilized for oral and intravenous pharmacokinetics of ISO in rat plasma. The absolute bioavailability of ISO was found at about 17.6 % after oral administration.

Keywords: *Isoxazole, LC-MS/MS, Plasma, Bio-analytical method, Pharmacokinetics.*

O-07/F/004 ORAL · OFFLINE

Determination of Cadmium in Different Groundwater Samples by Complexometric Principle and Atomic Absorption Spectroscopy: A Comparative Study

Asima Kumar Muduli*, Vivek Asati
ISF College of Pharmacy, Moga, Punjab
Email: asimkumar123276@gmail.com

Introduction: Heavy metal contamination, particularly with cadmium (Cd^{2+}), is dangerous for environmental and human health. Conventional methods such as atomic absorption spectroscopy are reliable but require costly equipment and expertise. To address the need for rapid, cost-effective, and portable analysis, a novel microfluidic cloth-based analytical device (µCAD) based on the simple complexometric principle facilitates on-site detection of cadmium in water samples.

Materials and Methods: The µCAD uses wax-dipped cotton fabric treated with reagents; at pH 10, Cd^{2+} triggers a reddish-brown color, measured via ImageJ software.

Results: The µCAD system showed efficient cadmium detection in the range of 20-60ppm. The LoD & LoQ are 3.84 & 11.60 ppm, respectively. The results confirm device's reliability, which matched those obtained through atomic absorption spectroscopy.

Discussion: The application of the complexometric principle in the µCAD system platform made it possible to create a fast, reliable, and easy-to-interpret detection system for cadmium. The concentration of Cd^{2+} is indicated by reddish brown colour intensity. In comparison, the µCAD system offered a portable, low-cost alternative for field analysis with minimal technical expertise.

Conclusion: A new µCAD-based method was developed and validated for cadmium detection in water samples. The device showed excellent sensitivity, reproducibility, and accuracy in comparison with standard AAS results. The simplicity, portability, and rapid response make it a promising tool for monitoring (Cd^{2+}) contaminated water sources.

Keywords: *Heavy metal, AAS, microfluidic cloth-based device, complexometric principle, environmental monitoring, image analysis.*

O-07/F/005 ORAL · OFFLINE

α-Glucosidase and α-Amylase Inhibitory Constituent of Carex Baccans: Bio-Assay Guided Isolation and Quantification by Validated RP-HPLC–DAD

Jai Kishan Saikia*, Nidhi Gupta
ISF College of Pharmacy, Moga, Punjab
Email: saikiajaikishan@gmail.com

Carex baccans is used extensively as food additive for its medicinal and nutritional properties. Its extract demonstrated significant inhibition of α-glucosidase and α-amylase with IC50 43.32 ± 1.22 and 562.18 ± 5.98 lg/mL, respectively. A bio-assay guided approach was employed to identify the active constituent(s). Fractionation and purification of the extract led to the isolation of a potent inhibitor, (+)-α-viniferin, and of weak inhibitors smiglasides A and B. (+)-α-Viniferin was quantified in the extract and fractions using HPLC and the method was validated for linearity, limit of detection, limit of quantification, precision, and accuracy. The calibration curve showed good linearity (r2 > 0.999) in the range of 7.813–250 lg/mL. The identification of α-glucosidase and α-amylase inhibitory activity in C. baccans supports the possible use of the plant as functional food for the management of diabetes. The validated HPLC method for the study of plant extracts will be useful in future research.

Keywords: *Carex baccans, Cyperaceae, α-Glucosidase, α-Amylase, (+)-α-Viniferin, HPLC.*

O-07/F/006 ORAL · OFFLINE

Simultaneous Estimation of Pesticide Residue in Agricultural Products by RP-HPLC Using Metal Organic Framework-Based Extraction Technique

Pavittar Singh[1]*, Vivek Asati[2]
[1]*Assistant Professor, Department of Analysis, ISF College Pharmacy, Moga*
[2]*Associate Professor, Department of Chemistry, ISF College of Pharmacy, Moga*
Email: Singhpavittar710@gmail.com

The increasing use of pesticides during cultivation of rice has increased the concern over residual pesticide levels in food. This study presents a novel method for pesticide residue analysis in rice using reverse-phase high-performance liquid chromatography (RP-HPLC) combined with a metal-organic framework (MOF)-based extraction technique. The method aims to provide a sensitive, efficient, and environmentally friendly approach to detect pesticides such as chlorantraniliprole and lambda-cyhalothrin commonly used in Punjab rice cultivation. The synthesized MOFs were characterized and optimized for extraction parameters. The % recovery was found to be 98.4- 99.4% and the limit of detection was found to be 0.000046- 0.00009 µg/mL. This approach offers a reliable tool for ensuring food safety and monitoring pesticide residues in rice.

Keywords: *Analytical method development, Metal Organic Framework, Pesticide extraction, Chlorantraniliprole, Lambda-cyhalothrin.*

O-07/F/007 ORAL · OFFLINE

Simultaneous Estimation of Acrylamide, Nitrosamines and Polycyclic Aromatic Hydrocarbons in Thermally Processed Foods By RP-HPLC Using COF-Based Extraction Technique

Saurab Chandra Deb*, Preeti Patel
ISF College of Pharmacy, Moga, Punjab, 142001, India.
Email: debsaurab23@gmail.com

Simultaneous extraction and quantification of harmful residues in thermally processed foods remains an analytical challenge. This study developed a method combining Covalent Organic Framework (COF)-based extraction with reversed-phase HPLC (RP-HPLC) for the simultaneous estimation of acrylamide, N-nitrosodiethylamine (NDEA), and naphthalene (a PAH marker). A magnetic Fe_3O_4@PDA@TpPa-1 COF was synthesized via Schiff-base condensation (60°C, 60 min, microwave-assisted) and characterized by FTIR, TEM, BET, TGA, and XRD. Chromatographic separation used a Wakosil 5 C18 AR column (250 × 4.6 mm, 5 µm) with an isocratic mobile phase of water: methanol: acetonitrile: phosphate buffer (45:25:25:5 v/v) at 1.0 mL/min, detected at 226 nm. Baseline separation was achieved with retention times of 2.4, 4.4, and 9.2 min for acrylamide, NDEA, and naphthalene, respectively. The method was validated per ICH Q2(R2), showing strong linearity (4-20 µg/mL, $r^2 \geq 0.9966$), low LoD/LoQ, and intermediate precision (%RSD) within acceptable limits. Recovery ranged from 98.2-101.8% (spiked) and 95.6-100.2% (real samples). This COF-RP-HPLC platform offers a sensitive, precise, and robust approach for simultaneous quantification of toxic residues in complex food matrices.

Keywords: *Covalent Organic Framework (COF), Magnetic Solid-Phase Extraction, Acrylamide, N-Nitrosodiethylamine, Polycyclic Aromatic Hydrocarbons, RP-HPLC, Thermally Processed Foods.*

O-07/F/008 ORAL · OFFLINE

Simultaneous quantification of eight bioactive secondary metabolites from Codonopsis ovata by validated high-performance thin layer chromatography and their antioxidant profile

Sumit Kumar*, Nidhi Gupta
Department of Pharmaceutical Analysis, ISF College of Pharmacy, Moga, Punjab, India
Email: sumitbhatt2345@gmail.com

Chemical investigation of Codonopsis ovata resulted in the isolation and identification of-sitosterol-3-O-glycoside, luteolin, apigenin, gentiacaulein, swertiaperenine-sitosterol, taraxeryl-3-acetate, and3 -acetoxyoleanane-12-one. A rapid, precise, sensitive and validated HPTLC method for simultaneous quantification of these natural products (NPs) was developed on silica-gel 60F254 plate using ternary solvent system, n-hexane:ethyl acetate:formic acid (10.5:3.5:0.43, v/v/v). Markers were quantified after post chromatographic derivatization with cerric ammonium sulfate reagent. The method was validated for accuracy, precision, LOD, LOQ and all calibration curves showed a good linear relationship ($r > 0.9924$) within test range. Precision was evaluated by intra- and inter-day tests with RSDs <2.59%, accuracy validation recovery 92.43–99.50% with RSDs <1.00%. Apigenin was found major component (natural abundance: 1.103%) and -sitosterol the least (0.0263%). The NPs displayed antioxidant activity with luteolin exhibiting maximum effect at 1g/mL concentration (75.9% for DPPH and 43.7% for ABTS) and others at 10 and 25g/mL, suggesting thereby their apparent potential use for the prevention of free radical induced diseases or as an additive element to food and pharmaceutical industry.

Keywords: *Codonopsis ovate, Validation, HPTLC, Qualification, Antioxidant.*

O-07/F/009 ORAL · OFFLINE

Carbon Dots Functionalized Molecularly Imprinted polymer as an Efficient Sorbent for Simultaneous Determination of Bisphenol A and Carbazole in a water sample by RP-HPLC

Tavish Chauhan*, Vivek Asati

Department of Pharmaceutical Analysis, ISF College of Pharmacy, GT Road, Ghal Kalan-142001, Moga, Punjab, India.
Email: chauhantavish78@gmail.com

A carbon dot-based molecularly imprinted polymer (CD-MIP) was developed as a selective sorbent for the simultaneous extraction and determination of Bisphenol A (BPA) and Carbazole in water samples. Specific binding cavities within the CD-MIP matrix conferred high selectivity and strong adsorption capacity toward both target analytes. Key extraction parameters including pH, adsorbent dosage, extraction and desorption times, and ionic strength were systematically optimized to maximize recovery. A simultaneous HPLC method was developed and validated for quantifying BPA and Carbazole, demonstrating strong linearity (R^2 = 0.9971 and 0.9979, respectively), high accuracy (98–99% recovery), and good precision (%RSD = 0.33–0.44%). The method also achieved low detection and quantification limits, with LoD values of 0.0018 and 0.00019 and LoQ values of 0.0054 and 0.00058 for BPA and Carbazole, respectively. Adsorption kinetics followed the pseudo-second-order model (R^2 = 0.986–0.997), indicating that chemisorption governs the uptake mechanism. Comparative testing against the non-imprinted polymer (CD-NIP) confirmed that CD-MIP exhibited markedly superior adsorption performance, verifying the successful formation of analyte-specific recognition sites within the polymer network. Together, these findings establish the CD-MIP–HPLC platform as an effective, selective, and sensitive approach for extracting and quantifying BPA and Carbazole in environmental water samples.

Keywords: *Bisphenol A, CD-MIP, Carbazole, HPLC.*

O-07/F/010 ORAL · OFFLINE

AI-Engineered Molecularly Imprinted Electrochemical Nanosensors for Real-Time Therapeutic Drug Monitoring

Udbhav Sharma*

ISF College of Pharmacy, Moga, Punjab
Email: 2315800@isfcp.org

Therapeutic drug monitoring (TDM) is essential for optimizing pharmacotherapy, particularly for drugs with narrow therapeutic windows, substantial pharmacokinetic variability, and concentration-dependent efficacy or toxicity. Conventional analytical approaches, including high-performance liquid chromatography and mass spectrometry, provide high sensitivity and accuracy but are often limited by sophisticated instrumentation, sample-processing requirements, cost, and lack of real-time applicability. AI-engineered molecularly imprinted electrochemical nanosensors represent an emerging analytical paradigm capable of addressing these limitations through the integration of synthetic molecular recognition, nanotechnology, electrochemical transduction, and artificial intelligence. MIPs provide selective recognition cavities complementary to target drug molecules, while nanostructured electrode materials enhance electron transfer, surface area, signal amplification, and analytical sensitivity. Artificial intelligence and machine-learning algorithms can further improve sensor performance by optimizing imprinting parameters, identifying complex signal patterns, correcting matrix-related interference, predicting drug concentrations, and enabling multiplexed analysis. Integration with miniaturized and wearable electrochemical platforms could facilitate minimally invasive monitoring of therapeutic drugs in saliva, sweat, interstitial fluid, or other accessible biological matrice. Such systems may ultimately support individualized dosing and adaptive pharmacotherapy. However, challenges involving molecular selectivity, biofouling, sensor drift, calibration stability, biological-matrix variability, reproducibility, data standardization, algorithmic reliability, and clinical validation remain significant barriers to translation. This review explores recent advances in AI-assisted molecularly imprinted electrochemical nanosensors for TDM, emphasizing sensor design, nanomaterial engineering, molecular recognition, AI-enabled data interpretation, wearable integration, analytical validation, and regulatory considerations. The emerging convergence of these technologies could establish a new generation of intelligent, portable, and personalized analytical platforms for real-time therapeutic drug monitoring.

Keywords: *Artificial intelligence Electrochemical Nanosensors, Machine-learning TDM, Therapeutic Drug Monitoring.*

O-07/F/011 ORAL · OFFLINE

Smart Biosensing Systems for Agriculture: Real-Time Monitoring of Plant Physiology and Environmental Contaminants

Yashan Singla*, Lovekesh Singh
ISF College of Pharmacy, Ghal kalan, Moga, Punjab, 142001
Email: singlayashan239@gmail.com

This review aims to evaluate biosensor technologies for real-time monitoring of plant health and environmental pollutants. A systematic assessment of electrochemical, optical, and nanomaterial-based biosensors was conducted using peer-reviewed studies and emerging prototypes. Results show that biosensors enable rapid detection of nutrient deficiencies, pathogens, soil contaminants, and abiotic stress markers with high sensitivity and low latency. Integration with IoT platforms enhances data transmission, enabling remote diagnostics and automated decision-making. However, challenges including sensor durability, calibration complexity, and environmental interference limit field deployment. The review concludes that biosensor-enabled agriculture represents a critical advancement for precision farming, and innovations in sensor materials and wireless networking will drive broader adoption.

Keywords: *Biosensing, agriculture, plants, contaminants, pollutants, environment.*

O-07/F/012 ORAL · OFFLINE

Analytical Quality by Design (AQbD) Approaches for HPLC Method Development of Cholinesterase Inhibitors: Focus on Neostigmine

Ajay Dhull*, Jitender Singh, Bhupender Nehra
Department of Pharmaceutical Sciences, Lord Shiva College of Pharmacy, Sirsa-125055, Haryana, India
Email: ajaydhull121098@gmail.com

Analytical Quality by Design (AQbD) assists to develop robust and reliable analytical methods via integration of analytical target profiles, risk assessment and design of experiments. Further, HPLC remains a principal analytical platform for determination of cholinesterase inhibitors. However, conventional method development may require extensive experimentation and may inadequately address interactions among critical chromatographic variables. This review critically discusses the application of AQbD principles regarding HPLC method development for cholinesterase inhibitors, especially Neostigmine. Herein, key elements are assessed, including Analytical Target Profile, determination of critical method parameters, assessment of risk, and design of experiments. Also, influence of chromatographic parameters is highlighted like stationary phase, composition of mobile-phase, temperature of column, flow rate, pH, and detection wavelength on performance of method. Forced-degradation experiments, specificity, robustness, and validation need to verify reliability of technique are also covered in this review. Therefore, AQbD can promote robustness of procedure, deplete experimental load, and simplify lifecycle management by combining risk-based assessment with multivariate optimization.

Keywords: *Analytical Quality by Design; HPLC; Cholinesterase Inhibitors; Neostigmine; Method Validation.*

O-07/F/013 ORAL · OFFLINE

Analytical reversed-phase high-performance liquid chromatography method development for silodosin and solifenacin in bulk and marketed formulation using analytical quality by design approach

Soumyaranjan Mohapatra*, Vivek Asati

Department of Pharmaceutical Analysis, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India.
Email: soumyasrm1234@gmail.com

A reliable HPLC method for the simultaneous estimation of Silodosin and Solifenacin was developed using the quality by design approach. The study aimed to develop a dependable chromatographic system for satisfactory component separation with sharp peaks and a reasonable run time. Critical quality attributes were evaluated for risk assessment. The quantitative relationship between critical material attributes and critical quality attributes was established using the Box-Behnken design to develop an analytical design and control strategy. The optimized mobile phase was acetonitrile: methanol: buffer (50:20:30, v/v/v), with a pH of 4.5 and a flow rate of 1 mL/min. Potassium dihydrogen phosphate was used as the buffer. The retention times of Silodosin and Solifenacin were 3.626 and 5.754 min, respectively, at λmax 210 nm. The R^2 values for Silodosin and Solifenacin were 0.9994 and 0.9982, respectively. The relative standard deviation was less than 2%, indicating good reproducibility and recovery. The developed method demonstrated satisfactory chromatographic performance and was found suitable for routine quality control testing. Thus, a simple, precise, and repeatable RP-HPLC method was successfully developed for the simultaneous estimation of Silodosin and Solifenacin using a quality by design approach.

Keywords: *Silodosin; Solifenacin; RP-HPLC; Analytical Quality by Design (AQbD); Box–Behnken Design; Validation.*

P-07/F/001 POSTER · OFFLINE

Stability Indicating Method Development and Validation for Simultaneous Estimation of Empagliflozin and Benfotiamine in Bulk Drug by Using RP-HPLC

Abhay Thakur[1] Aditi Kaushik[1] Dhiraj Kumar[1], Kajal[1]*, Aryan Thakur[1], Akash[1], Amar Deep Ankalgi[1], Mahendra Singh Ashawat[2]

[1]Department of Pharmaceutical Analysis, Laureate Institute of Pharmacy, VPO Kathog-HP
[2]Department of Pharmaceutics, Laureate Institute of Pharmacy, VPO Kathog-HP
Email: kc3422026@gmail.com

Empagliflozin, a sodium-glucose co-transporter-2 (SGLT2) inhibitor, and benfotiamine, a lipid-soluble derivative of thiamine (vitamin B1) possessing antioxidant and neuroprotective properties, are therapeutically relevant in the management of type 2 diabetes mellitus and associated diabetic neuropathy. The present study aimed to develop and validate a simple, rapid, sensitive, precise, and stability-indicating reverse-phase high-performance liquid chromatographic (RP-HPLC) method for simultaneous estimation of empagliflozin and benfotiamine in bulk drug. The identity of both analytes was initially confirmed by Fourier-transform infrared (FTIR) spectroscopy. Chromatographic separation was achieved using a Shimadzu HPLC system equipped with a photodiode array detector and a Shim-pack C18 column (250 × 4.6 mm, 5 µm). Isocratic elution was performed using acetonitrile and ammonium acetate buffer (pH 6.1) in a 50:50 (v/v) ratio at a flow rate of 1.0 mL/min, with detection at 233 nm and an injection volume of 20 µL. Benfotiamine and empagliflozin exhibited well-resolved, symmetrical peaks at retention times of 2.239 and 4.020 min, respectively. The method demonstrated excellent linearity (R^2 = 0.9998), accuracy with mean recoveries of 99.66% and 99.55%, and satisfactory precision. The LOD/LOQ values were 0.48/1.45 µg/mL for benfotiamine and 1.67/5.05 µg/mL for empagliflozin. The method remained robust following deliberate variations in chromatographic conditions. Forced degradation under acidic, alkaline, oxidative, photolytic, and thermal conditions confirmed its stability-indicating capability without interference from degradation products at analyte retention times. The validated method is suitable for routine quality control, assay, and stability assessment of empagliflozin and benfotiamine in bulk pharmaceutical materials.

Keywords: *Empagliflozin; Benfotiamine; RP-HPLC; Method validation; Stability-indicating assay.*

P-07/F/002 POSTER · OFFLINE

Decoding Drug Metabolism In Vitro: Analytical Profiling of Drug Biotransformation Using Human and Rat Liver Microsomal Models

Sapna Devi*, Ayush, Amardeep Ankalgi, Ankit Sharma

Department of Pharmaceutical Analysis, Laureate Institute of Pharmacy, Kathog, Kangra, Himachal Pradesh
Email: sapurana2020@gmail.com

Drug metabolism is the key factor for pharmacokinetics, therapeutic efficacy, safety and risk of drug-drug interaction. In vitro models of hepatic biotransformation including human liver microsomes (HLM) and rat liver microsomes (RLM) are vital tools to study in vitro biotransformation, measure compound stability, and identify resultant metabolites. These microsomal incubation platforms allow researchers to evaluate Phase I and selective Phase II metabolic pathways, as well as to screen candidate molecules by monitoring parent drug depletion, calculating intrinsic clearance, and determining metabolic half-life. Quantification of metabolite formation, determination of molecular formulas, and tracking substrate disappearance are heavily dependent on advanced analytical techniques including high-performance liquid chromatography (HPLC), liquid chromatography-tandem mass spectrometry (LC-MS/MS), and high-resolution mass spectrometry (HRMS). One of the central uses for these systems is the comparison between HLM and RLM across species. Cytochrome P450 (CYP) enzymatic pathways, metabolite ratios, and overall metabolic profiles frequently differ between species, thus comparative profiling closes the translational gap between rodent preclinical trials and human clinical outcomes. The combination of liver microsomal systems with high resolution chromatographic and mass spectrometric assays allows for a comprehensive assessment of drug safety, potential for adverse reactions, and overall pharmacokinetic feasibility. In the long run, the integration of dual-species metabolic profiling into the early drug discovery process optimizes candidate selection and alleviates late-stage translational failures.

Keywords: *HLM (Human Liver Microsomes), RLM (Rat Liver Microsomes), Cytochrome P450 (CYP), Metabolism / Drug biotransformation, Pharmacokinetics (PK), Metabolite profiling.*

P-07/F/003 POSTER · OFFLINE

A Green and QbD-Optimized RP-HPLC Method for Simultaneous Estimation of Linagliptin and Dapagliflozin

Chetan Kumar*, Preeti Patel

ISF College of Pharmacy, Moga, Punjab
Email: chetankumark75@gmail.com

The present study focuses on the development and optimization of a robust reversed-phase high-performance liquid chromatography (RP-HPLC) method for the simultaneous estimation of linagliptin and dapagliflozin in bulk and tablet dosage forms. A Quality by Design (QbD) approach was employed using the Box-Behnken design to systematically optimize critical chromatographic parameters, ensuring efficient separation with high sensitivity and reproducibility. The optimized conditions utilized a mobile phase of methanol: acetonitrile: buffer: triethylamine (80:10:10:0.1 v/v/v/v), with a pH adjusted to 5.0 using orthophosphoric acid and a flow rate of 1.0 mL/min. The method demonstrated excellent linearity (r^2 > 0.998), precision (%RSD < 2), and accuracy (98.9%–100.5%), complying with ICH guidelines. Additionally, a greenness evaluation was conducted using the AGREE analytical greenness metric tool, giving a score of 0.68, indicating an environmentally sustainable analytical approach. The developed method is rapid, reliable, and suitable for routine quality control analysis of linagliptin and dapagliflozin in pharmaceutical formulations.

Keywords: *Analytical Validation | Box-Behnken Design | Dapagliflozin | Greenness Evaluation | Linagliptin | Quality by Design | RP-HPLC.*

P-07/F/004 POSTER · OFFLINE

Exploring the Synergistic Application of Plasmonic Nanoparticles and Cyclodextrins in SERS

Gianfranco Terrones-Morey*, Alex Fragoso, Nicolás Pazos Pérez, Luca Guerrini

Departament d'Enginyeria Química, Universitat Rovira i Virgili, Avda. Països Catalans 26, 43007 Tarragona, Spain
Email: gianfranco.terrones@urv.cat

The combination of plasmonic gold nanoparticles and cyclodextrins (CDs) offers a promising strategy for the development of selective surface-enhanced Raman scattering (SERS) platforms. Thiolated α-, β-, and γ-cyclodextrins were synthesized as bifunctional molecules to enable nanoparticle functionalization through Au–S bonds while preserving their host–guest recognition properties. Dry functionalization approach was evaluated to optimize cyclodextrin immobilization on 40 nm gold nanoparticles and promote efficient analyte interaction. The resulting nanostructures were investigated for the detection of aromatic chlorophenoxy herbicides, measurable spectral changes were observed upon analyte binding, indicating that the combination of plasmonic enhancement and cyclodextrin molecular recognition improves analyte localization at the nanoparticle surface. These findings demonstrate the potential of integrating plasmonic nanomaterials and cyclodextrin chemistry for the development of selective SERS sensors with applications in environmental monitoring and food safety.

Keywords: *Cyclodextrins; Plasmonic nanoparticles; SERS; Herbicides.*

P-07/F/005 POSTER · OFFLINE

Unveiling Nitrosamine Impurities: Detection, Profiling and Health Hazards

Khushi[1], Aarushi[1], Anchal Thakur[1], Amar Deep Ankalgi[1], Ankit Sharma[1], Aditi Kaushik[1], Mahendra Singh Ashawat[2]

[1]Department of Pharmaceutical Analysis, Laureate Institute of Pharmacy, VPO-Kathog-HP
[2]Department of Pharmaceutics, Laureate Institute of Pharmacy, VPO-Kathog-HP
Email: khushinegi1306@gmail.com

The emergence of N-nitrosamine impurities (NAIs) in pharmaceutical products has become a significant global concern due to their potent carcinogenic, genotoxic, and potentially mutagenic properties. The detection of nitrosamines such as N-nitrosodimethylamine (NDMA) and N-nitrosodiethylamine (NDEA) in widely used medicines, including valsartan, ranitidine, and metformin, has resulted in product recalls, regulatory interventions, and stringent quality-control requirements. NAIs may originate from active pharmaceutical ingredients, excipients, manufacturing processes, degradation reactions, and contaminated raw materials, making their formation and control complex. Their analysis presents considerable analytical challenges because of their occurrence at trace levels and the diverse physicochemical characteristics of individual nitrosamine compounds. This review provides a comprehensive overview of the sources, formation pathways, toxicological implications, regulatory requirements, and recent advances in the analytical determination of NAIs in pharmaceutical products. Particular emphasis is placed on advanced analytical platforms, including liquid chromatography–mass spectrometry (LC–MS/MS), gas chromatography–mass spectrometry (GC–MS/MS), and high-resolution mass spectrometry (HRMS), together with contemporary sample-preparation strategies and method-validation approaches. The review highlights current analytical trends, methodological limitations, validation challenges, and emerging approaches for sensitive, selective, and reliable trace-level quantification. Overall, systematic nitrosamine risk assessment combined with robust analytical methodologies is essential for strengthening pharmaceutical quality assurance, regulatory compliance, and patient safety.

Keywords: *Nitrosamine impurities; NDMA; LC–MS/MS; HRMS; Pharmaceutical quality control.*

P-07/F/006 POSTER · OFFLINE

Advances in Estimation, Forced Degradation Studies and Stability-Indicating HPLC Methods for Topical Antibiotics: Focus on Fusidic Acid

Mukul Bansal*, Jitender Singh, Bhupender Nehra

Department of Pharmaceutical Sciences, Lord Shiva College of Pharmacy, Sirsa-125055, Haryana, India
Email: mukulbansal768@gmail.com

Reliable analytical techniques are required for precise estimation of drug, evaluation of degradation behavior, and assurance of product stability due to growing usage of topical antibiotics. Hereby, development of analytical techniques for estimation and evaluation of stability in case of topical antibiotics, particularly fusidic acid (a steroidal antibacterial agent), is discussed in this paper. Further, principles, chromatographic conditions, method-development methodologies, validation parameters, and applications of HPLC-based techniques reported for fusidic acid in topical and bulk medication formulations are all methodically covered. Furthermore, effectiveness of stability-indicating techniques to separate fusidic acid from excipients and degradation products of formulation is highlighted (i.e. forced degradation under acidic, alkaline, oxidative, thermal, hydrolytic, or photolytic conditions). To increase reliability of procedure and lifecycle performance, new strategies such as Analytical Quality by Design (AQbD), risk-based method development, statistical optimization, and determination of chromatographic robustness are critically assessed. Additionally, present review indicates potential to combine sophisticated chromatographic and hyphenated techniques for profiling of degradation-product and emphasizes present analytical shortcomings. As a result, current study provides specific basis to generate reliable, sensitive and legally acceptable stability-indicating HPLC techniques for fusidic acid and other topical antibiotics.

Keywords: *Fusidic acid; topical antibiotics; HPLC; stability-indicating method; forced degradation; AQbD.*

P-07/F/007 POSTER · OFFLINE

Smartphone-Based Sensors for Rapid Detection of Substandard and Falsified Medicines

Nikita Ray*, Mohammad Azahruddin

ISF College of Pharmacy and Research, Moga-142001 Punjab, India
Email: raynikita1018@gmail.com

Introduction: Substandard and falsified (SF) medicines represent a major health hazard due to the failures in treatment, undesirable events, and development of resistance to antimicrobial agents. Conventional approaches for the evaluation of medicines require specialized equipment, trained personnel, and laboratory infrastructure. The use of sensing technologies with smartphones provides the option of convenient, efficient and more affordable preliminary identification of suspect medications. The purpose of this work is to research the application of smartphone sensors for the quick detection of substandard and counterfeit medications.Methods: A literature-based review was conducted to assess smartphone-assisted sensing technologies such as imaging, colour detection, spectroscopy, barcode and QR code scanning, and the evaluation of different sensor-integrated applications in determining dosage form appearance, colour, packaging, composition, and authenticity.

Results: Smartphone-based systems provide opportunities for conducting screenings of SF drugs fast, in a non-invasive manner, and in the field. For instance, smart devices with cameras can perform colour analysis and sensor-based devices can identify abnormal products and packaging. The presence of cellular networks makes it possible to collect data and verify authenticity in real time. However, variations in light, devices, sample preparation, and the availability of standard databases can impact the accuracy of results.

Summary & Conclusion: Sensors incorporated into smartphones provide a useful means of fast and simple SF medicine identification, especially in remote areas. The combination of sensors with artificial intelligence and safe databases for medicines should help increase reliability and availability.

Keywords: *Smartphone sensors, falsified medicines, substandard medicines, rapid detection, artificial intelligence.*

P-07/F/008 POSTER · OFFLINE

Troubleshooting in Pesticide Residue Quantification of Bifenthrin and Cypermethrin in Apple Cider Vinegar, Using Gc-Ms/Ms

Priyanka Gour[1]* and Ravi Sethi[2]

[1] Research Scholar, Department of Chemistry, Pacific Academy of Higher Education and Research University, Pacific Hills, Pratapnagar Extn, Airport Road, Debari Udaipur-313024, (Rajasthan) India*

[1]Industry Adviser, Department of Chemistry, Pacific Academy of Higher Education and Research University, Pacific Hills, Pratapnagar Extn, Airport Road, Debari Udaipur-313024, (Rajasthan) India

Email: gourpihu78@gmail.com

Objective: This study aims to identify and resolve common troubleshooting issues encountered during GCMS/MS quantification of bifenthrin and cypermethrin in apple cider vinegar, including matrix effects, recovery problems, and chromatographic anomalies.

Methods: This study aims to identify and resolve common troubleshooting issues encountered when utilizing GC-MS/MS to quantify pesticide residues in complex food matrices. This article reviews key factors that affect method performance, including sample extraction and purification efficiency, matrix-induced effects, analyte stability, and instrument maintenance.

Results & Summary: Systematic troubleshooting revealed that poor recoveries and signal instability were almost all associated with inadequate clean-up procedures, source contamination, and column degradation. Implementation of optimized extraction protocols, frequent maintenance of the ion source, and proper calibration significantly enhanced accuracy and precision. This paper presents a comprehensive troubleshooting framework to guide analysts in diagnosing and correcting performance issues in GC-MS/MS pesticide residue analysis.

Conclusion: The GC-MS/MS method provides sensitive and reliable quantification of bifenthrin and cypermethrin in apple cider vinegar, with excellent linearity and stable retention times enabling accurate detection without matrix interference.

Keywords: *Pesticide residues, Troubleshooting, Bonus peak, Tailing peak, Split Peaks.*

P-07/F/009 POSTER · OFFLINE

Stability Indicating Method Development and Validation for the Simultaneous Estimation of Dapagliflozin and Saroglitazar in Bulk Drug by RP-HPLC

Rahul Kumar[1], Amar Deep Ankalgi[1], Nishant[1]*, Mrs. Ankita[1], Rahul Koundal[1], Ayush Kumar[1]

[1]Department of Pharmaceutical Analysis, Laureate Institute of Pharmacy
Kathog, Kangra. Himachal Pradesh, India
Email: nishantkapoor911@gmail.com

The present study was carried out to develop and validate a simple, precise, accurate, robust and stability indicating RP-HPLC method for simultaneous estimation of Dapagliflozin and Saroglitazar in bulk drug. FT-IR spectroscopy was used to analyze the both drugs and an RP-HPLC method was developed by optimizing different chromatographic conditions. The optimized method used C18 Shim-pack column, acetonitrile: Methanol: Buffer (50:30:20 % v/v) was used as the mobile phase with a flow rate of 1.0 mL/min. Detection was done at 266 nm and injection volume was 20 µL. The method showed good linearity with correlation coefficient (R2) of 0.998 and 0.9977 for Dapagliflozin and Saroglitazar respectively. The accuracy was found to be 99.9% and 99.5% respectively; precision and repeatability were within acceptable limits. The LOD and LOQ were discovered to be 3.59 and 5.88 µg/mL for Dapagliflozin and 4.38 and 5.62 µg/mL for Saroglitazar, respectively. Forced degradation studies were carried out under acidic, basic, oxidative, photolytic and thermal conditions to prove the stability indicating capability of the method. Hence, the developed RP-HPLC method is useful for reliable and routine simultaneous estimation of Dapagliflozin and Saroglitazar in bulk drug.

Keywords: *Dapagliflozin; Saroglitazar; RP-HPLC; Method Validation; Forced Degradation; Stability Indicating Method.*

P-07/F/010 POSTER · OFFLINE

Stability Indicating Method Development and Validation for the Simultaneous Estimation of Acelofenac and Leflunomide in Bulk Drug by RP-HPLC

Shifali Sharma[1], Aditi Kaushik[1], Nikhil kumar[1]*, Nikhil Sharma[2], Amar Deep Ankalgi[1], Rishav[1], Mukul Chauhan[1]

[1]*Department of Pharmaceutical Analysis, Laureate Institute of Pharmacy*
[2]*Department of Pharmaceutical Chemistry, Laureate Institute of Pharmacy*
Kathog, Kangra. Himachal Pradesh, India
Email: nikhil78766@gmail.com

In pharmaceutical research, the development of a reliable analytical method is needed, especially when many active pharmaceutical ingredients have to be evaluated at the same time. Leflunomide and Aceclofenac are important therapeutic drugs and their simultaneous analysis needs an analytical method which can give reliable separation and quantification within a reasonable time. The present study was carried out to develop and validate a simple and reproducible RP-HPLC method for simultaneous estimation of aceclofenac and leflunomide and study the degradation behaviour of these drugs under different stress conditions. The medicines were characterized first by infrared spectroscopy. The optimized method used C18 Shim-pack column, phosphate buffer, acetonitrile and methanol as mobile phase with detection at 283 nm. Leflunomide and Aceclofenac exhibited separate peaks at retention times of 5.635 and 6.295 min respectively. Studies on forced degradation in acidic, alkaline, oxidative, photolytic and thermal conditions provided useful information on the susceptibility of the drugs to degradation. Consequently, useful chromatographic method is developed which can be used in routine pharmaceutical quality control and stability indicating analytical studies. The accuracy was found to be 99.9% and 99.5% respectively.

Keywords: *Aceclofenac; Leflunomide; RP-HPLC; Simultaneous estimation; Method development; Stability-indicating method.*

P-07/F/011 POSTER · OFFLINE

Quantification of Ascorbic acid (Vitamin C) Through Paper Based Microfluidic Technique

Yashneet Kaur[1]*, Priyanka Rani[2], Dr. Rohit Bhatia[3], Aman[1]

[1]*ISF College of Pharmacy and Research, Moga, Punjab*
[2]*Department of Pharmaceutical Sciences, DAV University, Jalandhar*
[3]*Chitkara University, Rajpura, Punjab 140417*
Email: 240732427@isfcp.org

Ascorbic acid (Vitamin C) is an essential water-soluble vitamin with important physiological and antioxidant functions. Accurate and rapid quantification of ascorbic acid is important for the quality assessment of pharmaceutical formulations, dietary supplements, and food products. The present study describes the development of a simple, rapid, cost-effective, and portable paper-based microfluidic analytical device (μPAD) for the colorimetric quantification of ascorbic acid. The microfluidic device was fabricated using Whatman filter paper to generate defined hydrophilic reaction zones for controlled movement and reaction of the sample and reagents. Different concentrations of ascorbic acid were applied to the fabricated device, followed by the addition of ferric chloride and potassium ferricyanide, resulting in the formation of a characteristic Prussian blue coloured complex. The developed colour intensity was captured digitally and quantitatively analyzed using ImageJ software. A calibration curve was subsequently constructed by correlating colour intensity with the concentration of ascorbic acid, and the developed method was evaluated using appropriate analytical validation parameters. The limit of detection (LOD) and limit of quantification (LOQ) were also determined to assess the sensitivity of the proposed method. The developed paper-based microfluidic approach offers several advantages, including low reagent consumption, simplicity, portability, minimal instrumentation requirements, and reduced analytical cost. Therefore, the proposed method has potential as an economical and accessible analytical tool for the routine quantification of ascorbic acid in pharmaceutical, food, and other relevant samples.

Keywords: *Ascorbic acid (Vitamin C), limit of quantification, method validation, microfluidic analytical device.*

O-07/N/001 ORAL · ONLINE

Fluorescent Probes for Early Diagnosis of Alzheimer's Disease: Recent Developments and Future Perspectives

Sangamdeep Singh*, Abhay Rajput, Thakur Gurjeet Singh, Diksha Choudhary, and Rajwinder Kaur

Chitkara University, Punjab

Email: sangamdeep1314.ccp25@chitkara.edu.in

Alzheimer's disease (AD) remains challenging to diagnose in its early stages because the currently available standard techniques, including cerebrospinal fluid examination and PET scanning, are either invasive, costly, or difficult to use for routine screening purposes. Fluorescent small molecules are very promising for detecting key biomarkers of AD, including amyloid-β (Aβ) plaques, hyperphosphorylated tau, reactive oxygen species (ROS), metal ion imbalance, and changed acetylcholinesterase (AChE) and monoamine oxidase-B (MAO-B) activities. Near-infrared (NIR) donor-acceptor fluorophores have been reported to enable deep-tissue, high-contrast imaging of Aβ aggregates due to their large Stokes shift and improved blood-brain barrier permeability. Furthermore, aggregation-induced emission (AIE) systems overcome the problem of aggregation-induced quenching in traditional fluorophores, showing high sensitivity in viscous and aggregated microenvironments. Zinc chelation and phosphate-sensing probes differentiate phosphorylated tau from Aβ species selectively, and activatable ratiometric probes increase the specificity of detecting ROS and metal ions in the presence of biological interferences. Two-photon probes have also been developed for deeper brain imaging in in vivo studies. Despite these significant advantages, limitations remain regarding reproducible penetration of the blood-brain barrier, selectivity in vivo for overlapping biomarkers, and clinical application. This study highlights the need for future research focused on developing multifunctional, dual- or multi-targeting probes and non-invasive detection systems for pre-symptom diagnostics of AD and recent advances in fluorescent probes for AD reported between 2020 and 2026.

Keywords: *Alzheimer's disease; fluorescent probes; amyloid-β; aggregation-induced emission; near-infrared imaging; biomarkers.*

O-07/N/002 ORAL · ONLINE

Development and Validation of a Stability-Indicating RP-HPLC Method for the Estimation of Viloxazine HCL

Wagh Dipali S*

Department of Pharmaceutical Chemistry, Sinhgad Institute of Pharmacy, Narhe Pune

dipalithoke30@gmail.com

Introduction: High-Performance Liquid Chromatography (HPLC) plays a vital role in checking pharmaceutical purity. Developing a method that tracks a drug amidst its breakdown elements is essential for regulatory compliance.

Aim & Objectives: The objective of this study was to develop and validate a sensitive, stability-indicating Reverse-Phase High-Performance Liquid Chromatography (RP-HPLC) method for the estimation of Viloxazine HCL.

Methods: Chromatographic separation was achieved on a C8 column using a mobile phase of A B and phosphate buffer (pH 4.5) (55:45 v/v) at a flow rate of 1.0 mL/min with Ultraviolet (UV) detection at 272 nm. Forced degradation studies were conducted under acidic, alkaline, oxidative, thermal, and photolytic stress conditions to evaluate method specificity. The method was validated according to International Council for Harmonisation (ICH) guidelines.

Results: The drug peak eluted at 3.3minutes, showing excellent resolution from all degradation products. The method was linear over a concentration range of 50-150 µg/mL (R = 0.999). Accuracy and precision were within acceptable limits. Significant degradation occurred under alkaline and oxidative conditions, while the drug remained stable under thermal stress. Summary & Conclusion: In conclusion, a rapid, specific, and reproducible stability-indicating RP-HPLC method was successfully developed and validated for Viloxazine HCL drug. This method is highly suitable for routine quality control and stability testing in pharmaceutical industries.

Keywords: *RP-HPLC, Stability-indicating, Validation, Viloxazine HCL, Forced degradation, ICH guidelines.*

P-07/N/001 POSTER · ONLINE

QbD-Driven Green RP-HPLC Method Development & Validation

Jashanpreet kaur*, Reeta Sethi

Department of Pharmaceutical Chemistry, JCDM College of Pharmacy, Sirsa Affiliated by Pt. B.D. Sharma University of Health Sciences (Govt. Of Haryana) Rohtak, JCD Vidyapeeth Barnala Road, Sirsa-125055, Haryana, India
Email: dalipjosan989@gmail.com

Quality by Design (QbD) is a systematic and science-based approach that enhances the understanding, robustness, and reliability of analytical methods. The integration of QbD principles with green analytical chemistry has gained considerable attention in pharmaceutical research for the development of environmentally sustainable chromatographic methods. This review highlights the application of QbD in the development and validation of green RP-HPLC methods. The study discusses key QbD elements, including Analytical Target Profile (ATP), Critical Quality Attributes (CQAs), Critical Method Parameters (CMPs), risk assessment, and Design of Experiments (DoE) for method optimization. Special emphasis is placed on the selection of green solvents, reduction of solvent consumption, and minimization of analytical waste while maintaining method performance. Validation parameters such as specificity, linearity, accuracy, precision, robustness, LOD, and LOQ are reviewed in accordance with ICH guidelines. The reviewed literature demonstrates that QbD-based green RP-HPLC methods offer enhanced method robustness, improved analytical quality, and reduced environmental impact. Thus, the combination of QbD and green analytical chemistry provides an efficient, reliable, and sustainable strategy for pharmaceutical method development and validation.

Keywords: *Quality by Design (QbD), Green RP-HPLC, Method Development, Method Validation, Green Solvent.*

P-07/N/002 POSTER · ONLINE

Impurity Profiling of Resmetriom Tablets: A Sustainable RP-HPLC Framework

Kanchal Kamboj*, Pardeep Kamboj

Department of Pharmaceutical Chemistry, JCDM College of Pharmacy, JCD Vidyapeeth Barnala Road, Sirsa-125055, Haryana, India
Email: kanchalkamboj73622@gmail.com

Resmetirom is a selective thyroid hormone receptor-β (THR-β) agonist indicated for the treatment of metabolic dysfunction-associated steatohepatitis (MASH) with liver fibrosis. The development of reliable and sensitive analytical methods is essential for ensuring the quality, safety, and efficacy of Resmetirom pharmaceutical formulations. However, limited analytical methods are available for comprehensive impurity profiling of Resmetirom tablets, while most reported methods primarily focus on assay determination. The present study is proposed to develop and validate a rapid, accurate, precise, sensitive, and stability-indicating reversed-phase high-performance liquid chromatography (RP-HPLC) method for impurity profiling of Resmetirom tablets. The chromatographic method will be optimized by systematic evaluation of critical parameters, including column selection, mobile-phase composition, pH, flow rate, detection wavelength, temperature, and other chromatographic conditions to achieve satisfactory separation and resolution of Resmetirom and its related impurities. A C18 column with a suitable buffer and acetonitrile-based mobile phase and UV/PDA detection will be investigated for method development. The developed method will be validated for system suitability, specificity, linearity, accuracy, precision, robustness/ruggedness, and stability of analytical solutions. Limit of detection (LOD) and limit of quantification (LOQ) will also be evaluated. Forced degradation studies will be performed under acidic, basic, oxidative, thermal, and photolytic conditions to establish the stability-indicating capability of the proposed method. The developed RP-HPLC method is expected to provide reliable separation and quantification of Resmetirom and its related impurities and degradation products. The proposed method may serve as a useful analytical tool for impurity profiling and routine quality control of Resmetirom tablet formulations.

Keywords: *Resmetirom, RP-HPLC, Method Development, Method Validation, Impurity Profiling, Stability-Indicating Method.*

P-07/N/003 POSTER · ONLINE

Eco-Analytical Innovation: A Sustainable RP-HPLC Framework

Pawanpreet Kaur*, Reeta Sethi

Department of Pharmaceutical Chemistry, JCDM College of Pharmacy, Sirsa Affiliated by Pt. B.D. Sharma University of Health Sciences (Govt. Of Haryana) Rohtak, JCD Vidyapeeth Barnala Road, Sirsa-125055, Haryana, India

Email: pawansandhu2130@gmail.com

Reverse Phase High-Performance Liquid Chromatography (RP-HPLC) is one of the most widely used analytical techniques in pharmaceutical analysis for the qualitative and quantitative determination of drugs. However, conventional RP-HPLC methods often require large volumes of organic solvents, which can have adverse environmental and economic impacts. The concept of green analytical chemistry has emerged as an effective approach to minimize hazardous solvent consumption and reduce analytical waste. This review focuses on the development and validation of eco-friendly RP-HPLC methods by employing greener solvents, reducing solvent usage, and optimizing chromatographic conditions. Various aspects of method development, including selection of mobile phase, stationary phase, detection wavelength, flow rate, and system suitability parameters, are discussed. In addition, method validation parameters such as specificity, linearity, accuracy, precision, robustness, limit of detection (LOD), and limit of quantification (LOQ) according to ICH guidelines are reviewed. This review also highlights recent advances in green chromatographic technologies and various greenness assessment tools used for evaluating environmentally sustainable RP-HPLC methods. The findings indicate that eco-friendly RP-HPLC methods can provide reliable analytical performance while significantly reducing environmental impact. Therefore, green RP-HPLC represents a sustainable and efficient approach for modern pharmaceutical analysis.

Keywords: *Eco-friendly RP-HPLC, Green Solvent, Method Development, Method Validation, Pharmaceutical Analysis, Greenness Assessment Tools.*

P-07/N/004 POSTER · ONLINE

Green HPLC for Dissolution Profiling

Sahil[1]*, Reeta Sethi[1,2]

[1]Department of Pharmaceutical Chemistry, JCDM College of Pharmacy, Sirsa, Haryana, India

[2]Leichester, LE1 9BH, United Kingdom of Pharmacy, Health and Life Sciences, De Montfort University, The Gateway, Leichester, LE1 9BH, United Kingdom

Email: sahilpunia29029@gmail.com

The development of Green High-Performance Liquid Chromatography (Green HPLC) offers the prospect of an environmentally sustainable method of pharmaceutical analysis. Traditional HPLC techniques have been associated with the use of harmful organic solvents and production of large amounts of chemical waste, which have caused many environmental and health hazards. Green HPLC, on the other hand, involves minimal usage of solvents, use of environment-friendly solvents, low energy consumption, and efficient analytical technique. Dissolution profiling serves as an important quality assurance test which assesses the release characteristics of pharmaceutical formulations and their in vivo behaviour. The use of green HPLC in dissolution studies facilitates the development of Pharmaceuticals sustainably without compromising on accuracy, precision, and compliance to regulations.

Keywords: *Green HPLC; Dissolution Profiling; Pharmaceutical Analysis; Green Solvents; Sustainable Analytical Methods; Environmental Sustainability.*

CATEGORY 8 | 32 ABSTRACTS

Biotechnology & Life Sciences

DLF LABS™ Duggal Laboratory Furnisher

QUALITY | INNOVATION | TRUST

THE WAY TO MODERNIZE LABS

WWW.DLFLABS.COM

LABORATORY FURNITURE & INSTRUMENTS



CHEMISTRY LAB FURNITURE



Work tables with sinks, reagent racks and storage cupboards.

BIOLOGY LAB FURNITURE



Island work tables with sink, drawers and cupboards.

PHYSICS LAB FURNITURE



Work tables with electrical connections and ample space.



SINK

Polypropylene (PP)



TAPS

Two way & three way brass taps.



REAGENT RACK

Electro-Galvanized sheet with epoxy coating.

MATHEMATICS & GEOGRAPHY LAB



Instruments & apparatus with charts and portraits.

LANGUAGE LAB / RECORDING ROOMS



Digital language lab, AV systems, smart class.

CHEMICAL STORAGE CABINETS



Peg board, wall cupboard, eye washer, stools.

STEM/ROBOTICS/ATL LAB SETUP



Robotics kits and learning modules.

COMPUTER LAB FURNITURE



Premium quality furniture for computer labs.

LPG GAS FITTINGS



Safe and reliable gas fittings.

FUME HOOD



Safe working environment.

MICROBIOLOGY, BIOTECHNOLOGY & BIOCHEMISTRY LAB FURNITURE



Lab tables with wall cupboards and storage cabinets.

PHARMACY/ LAB / PHARMACEUTICAL LAB



Work tables with sink, tap, reagent rack and storage.

PHARMACY & PHARMACEUTICAL INSTRUMENTS | MATHEMATICS & GEOGRAPHY INSTRUMENTS | STEM/ROBOTICS/ATL LAB INSTRUMENTS | BIOLOGY INSTRUMENTS | CHEMISTRY INSTRUMENTS | PHYSICS INSTRUMENTS

QUALITY PRODUCTS | CUSTOMIZED SOLUTIONS | ON-TIME DELIVERY | AFTER SALES SUPPORT

CONTACT US

Factory: 350-A, HSIIDC, Industrial Estate, Saha, Ambala-133 104

E-mail: dlflabsambala@gmail.com

Website: www.dlflabs.com

SCO - 2,3, Opposite Ann Mary School, Near Tongi Bridge, Ambala Cantt-133 001

Mob: +91-94161 88084, +91-79883 44671

O-08/F/001 ORAL · OFFLINE

Cyclodextrin-based materials for the capture and quantification of marine toxins

Alex Fragoso*[1]

[1]*Departament d'Enginyeria Química, Universitat Rovirai Virgili, Avda. Països Catalans 26, 43007 Tarragona, Spain*
Email: alex.fragoso@urv.cat

Nowadays, human activity and industrial development associated with the generation of pollution and climate change have affected significantly the marine habitat. Harmful algal blooms are increasing in geographical expansion, frequency and severity. The increased production of toxins and, consequently, the risk associated to the consumption of marine products are some of the negative repercussions of marine environment disequilibrium. Monitoring programs mainly involve sampling of seawater and shellfish for analysis of marine toxins and phytoplankton identification and counting. Insoluble cyclodextrin polymers offer an interesting alternative as passive sampling materials for the extraction, preconcentration and purification of toxins present in marine environments. Here we present our results on the use of cyclic and linear maltodextrin polymers bearing spacers of different length and hydrophobicity in the capture of a wide variety of toxins such as okadaic acid, brevetoxin, ciguatoxins and palytoxins in both microalgae cultures and harbour waters of the Mediterranean area. We have found that some of the synthesized polymers show capture efficiencies comparable to commercial Dianion® resins and the role of the cyclodextrin moieties was demonstrated by comparison with linear analogue polymers and in experiments in the presence of competitive guests.

Keywords: *Neurological dysfunctions, Neurodegeneration, IGF-1, GLP-1, Neuroprotection.*

O-08/F/002 ORAL · OFFLINE

Pyrimidine-2,4-dione-Based DPP-4 Inhibitors: A Structure-Guided Multifaced 3D-QSAR and Molecular Dynamics Studies

Chavi Soni*, Rupali Kohal, Sant Kumar Verma

Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab 142 001, India
Email: chavisoni790@gmail.com

Dipeptidyl peptidase-4 (DPP-4) inhibitors are established therapeutic agents for the management of type 2 diabetes mellitus (T2DM). Pyrimidine-2,4-dione is a privileged nitrogen-containing scaffold present in the marketed DPP-4 inhibitor alogliptin and offers a suitable framework for the design of new DPP-4 inhibitors. This study aimed to identify structural and pharmacophoric features associated with DPP-4 inhibition and to evaluate the binding stability of a potent pyrimidine-2,4-dione derivative. A dataset of 103 pyrimidine-2,4-dione derivatives with reported DPP-4 inhibitory activity (IC50 = 0.8-17,000 nM) was subjected to molecular docking and structure-guided alignment-dependent Gaussian field-based and atom-based 3D-QSAR analyses. A five-point pharmacophore hypothesis was generated from the aligned compounds. Molecular dynamics (MD) simulations were performed for 100 ns for the potent compound 92 and the reference drug alogliptin, followed by binding-energy analysis using MM/PBSA. The Gaussian field-based and atom-based 3D-QSAR models showed satisfactory statistical performance, with R2 values of 0.858 and 0.904 and Q2 values of 0.664 and 0.638, respectively. Molecular docking identified compound 92 as a potent ligand with a MolDock score of -112.715 kcal/mol, compared with -97.324 kcal/mol for alogliptin. The optimal AADHHRR pharmacophore hypothesis comprised two hydrogen-bond acceptors, one hydrogen-bond donor, two hydrophobic interactions, and two aromatic rings. During 100 ns MD simulations, compound 92 maintained stable interactions within the DPP-4 binding pocket and showed favorable binding behaviour compared with alogliptin. The integrated docking, multifaceted 3D-QSAR, pharmacophore, and MD simulation analyses identified key structural features associated with DPP-4 inhibition. Compound 92 demonstrated favorable binding affinity and stability toward the DPP-4 binding site, supporting its potential as a lead structure for the design and development of novel DPP-4 inhibitors for T2DM management.

Keywords: *Atom-based 3D-QSAR, DPP-4 inhibitors, Gaussian field-based 3D-QSAR, molecular docking, molecular dynamics simulation, pyrimidine-2,4-dione.*

O-08/F/003 ORAL · OFFLINE

mRNA Vaccines & Therapeutics Beyond COVID - The Future of Medicine

Mohit Yadav*, Madhaw Dwivedi, Sourabh Kosey

Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: mohity9231603@gmail.com

Introduction: Messenger RNA (mRNA) technology has emerged as a transformative platform in modern medicine following the success of COVID-19 vaccines. Its applications are expanding into cancer immunotherapy, genetic disorders, cardiovascular diseases, and personalised medicine.

Methodology: A narrative review of scientific literature was conducted to explore the mechanisms, therapeutic applications, technological advancements, and challenges associated with mRNA-based vaccines and therapeutics.

Results: Advances in lipid nanoparticle delivery systems, mRNA stability, and molecular engineering have improved the therapeutic potential of mRNA technology. In oncology, mRNA-based cancer vaccines are being investigated to stimulate tumour-specific immune responses. Emerging applications include protein replacement for genetic disorders, metabolic disease management, and cardiovascular therapeutics. Despite promising developments, challenges related to targeted delivery, immune-related adverse effects, manufacturing costs, storage requirements, and accessibility remain significant barriers to clinical translation.

Summary and Conclusion: mRNA technology represents a versatile therapeutic platform extending beyond infectious disease prevention. Its potential applications in cancer treatment, genetic disorders, and personalised healthcare may contribute significantly to precision medicine. Continued technological innovation and rigorous clinical evaluation are essential to establish its long-term safety, efficacy, and accessibility.

Keywords: *mRNA therapeutics, mRNA vaccines, lipid nanoparticles, cancer immunotherapy, personalised medicine, precision medicine.*

P-08/F/001 POSTER · OFFLINE

From Gene to Drug: A Review on Biotechnology Driven Pharmaceutical Development

Bhumika Singla[1]*

[1]ISF College of Pharmacy, Moga Punjab-142001
Email: bs6744184@gmail.com

Biotechnology-based pharmaceuticals have greatly transformed modern healthcare by utilizing living organisms, cells, and molecular techniques to develop and improve therapeutic products. Biotechnology plays an important role in drug discovery, development, and delivery, particularly in the production of biologics, vaccines, recombinant products, and gene-based therapies. Recent scientific research has highlighted the applications of molecular cloning, recombinant DNA technology, protein engineering, and cell-culture techniques in pharmaceutical development. Advances in upstream and downstream bioprocessing, pharmacokinetic optimization, bioinformatics, and computational modeling have further improved the transition from genetic manipulation to the development and formulation of pharmaceutical products. Biotechnology has enabled the production of important therapeutic agents such as recombinant insulin, human growth hormone, enzymes, cytokines, monoclonal antibodies, and vaccines. Emerging technologies, including CRISPR-Cas genome editing, mRNA-based platforms, nanobiotechnology, artificial intelligence, and computational biology, have expanded the possibilities of modern drug discovery and personalized therapy. The integration of molecular biology, bioinformatics, and bioprocess engineering has accelerated the development of biologically derived medicines with improved efficacy, safety, and therapeutic precision. However, challenges such as stability, immunogenicity, manufacturing complexity, and ethical considerations still need to be addressed. Overall, biotechnology-driven pharmaceuticals represent a significant shift from conventional chemical-based drug development toward precision and patient-centered medicine. Continued advancements in genomics, nanotechnology, artificial intelligence, and related fields are expected to further improve the safety, effectiveness, and personalization of future therapies.

Keywords: *Biotechnology, Biopharmaceuticals, Drug Discovery, Recombinant DNA Technology, Biologics, Gene Therapy, Pharmaceutical Biotechnology.*

P-08/F/002 POSTER · OFFLINE

Smart Cyclodextrin: A Microbiome-Responsive Approach to More Selective Antibiotic Therapy

Gautam Bhardwaj[1], Aman Kumar[2]*

[1]Department of B. Pharm, ISF College of Pharmacy, Moga, Punjab, India
[2]Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India
Email: bhardwajgautam1216@gmail.com

Antibiotics are medicines that work against bacterial diseases, but they can also harm the useful bacteria that are already present in our gut. When these useful bacteria are disrupted, the microbiome system of our gut can also change. My study focuses on a key question: can we design antibiotic treatments that target pathogenic bacteria while sparing beneficial gut bacteria? To examine this idea, cyclodextrin can be used to deliver antibiotics that act more selectively on harmful bacteria. The goal is to create a system that releases antibiotics slowly or as needed under the right conditions. The free antibiotic and cyclodextrin-containing formulations can be compared to determine how much antibiotic is released, how much it affects harmful bacteria, and how much it affects useful gut bacteria. This study does not aim to create antibiotic resistance in useful gut bacteria. Instead, the aim is to reduce the unnecessary exposure of useful gut bacteria to the drug, while maintaining the drug's effectiveness against disease-causing bacteria. This concept combines biotechnology, drug delivery, and microbiology and may be a potential way to make antibiotic treatment more selective and reduce disturbance to the gut microbiome.

Keywords: *Cyclodextrin, Antibiotic Therapy, Gut Microbiome, Beneficial Bacteria, Pathogenic bacteria, Targeted Drug Delivery, Controlled Release.*

P-08/F/003 POSTER · OFFLINE

Artificial Intelligence in Biotechnology and Drug Discovery System

Gurpreet Gourav*

ISF College of Pharmacy & Research, Moga (Punjab)
Email: gurpreetgourav123@gmail.com

Artificial Intelligence (AI) has emerged as a valuable technology in biotechnology and pharmaceutical research, particularly in the discovery and development of new therapeutic agents. Conventional drug discovery is a complex and time-consuming process that requires extensive laboratory experiments, high financial investment, and several stages of validation. The integration of AI with biotechnology provides an opportunity to analyze large and complex biological and chemical datasets and support decision-making throughout the drug discovery process. Machine learning, deep learning, natural language processing, and generative approaches are increasingly being applied to target identification, protein structure prediction, virtual screening, molecular property prediction, lead identification, lead optimization, drug repurposing, and toxicity assessment. AI-assisted analysis can integrate genomic, proteomic, metabolomic, and chemical information to identify relationships between biological targets and potential therapeutic molecules. In medicinal chemistry, AI-based models can assist in predicting structure–activity relationships and selecting compounds with desirable physicochemical and pharmacological properties. These approaches may reduce unnecessary experimental screening and improve the prioritization of promising drug candidates. However, AI-based drug discovery also faces challenges related to data quality, dataset bias, model interpretability, reproducibility, computational requirements, intellectual property, and regulatory acceptance. Importantly, computational predictions require experimental and clinical validation before therapeutic application. Thus, AI should complement rather than replace conventional biotechnology, medicinal chemistry, pharmacology, and laboratory research. The integration of AI with multidisciplinary scientific approaches has considerable potential to accelerate drug discovery and contribute to the development of safer, more effective and innovative therapeutic candidates.

Keywords: *Artificial Intelligence, Biotechnology, Drug Discovery, Machine Learning, Deep Learning, Drug Repurposing, Target Identification.*

P-08/F/004 POSTER · OFFLINE

From Stem Cells to Smart Mini-Organs: Human Organoid-on-a-Chip Technology for Tissue functioning & Next-Generation Drug Discovery

Vandna*[1], Nandini[1]

[1]*ISF college of Pharmacy and Research, Moga, Punjab.*
Email: vandnaahuja47@gmail.com

Introduction: A developing biotechnology called "human organoids-on-a-chip" that simulates key aspects of human tissue shape and function by combining microfluidic technologies with three-dimensional human organoids. These models offer a medically appropriate and regulated setting for researching tissue behavior & drug responses.

Aim & Objective: Using human organoids-on-a-chip, the primary goal is to study tissue function. Assessing tissue viability, organization, maturation, cellular interactions, and physiological responses under controlled circumstances is the goal.

Methods: Organoids are created from human stem cells or tissue-derived cells, which are then incorporated onto microfluidic chips. To promote tissue growth and function, the systems offer controlled nutrient supply, oxygenation, fluid flow, and mechanical stimulation. Tissue morphology, vitality, and functional activity are evaluated using microscopy, biochemical tests, and molecular analyzes.

Results: When compared to traditional static cell cultures, organoids-on-a-chip show enhanced tissue organization, viability, maturation, and physiological activity. Under regulated settings, the microfluidic environment facilitates more precise portrayal of tissue functions and ongoing monitoring.

Conclusion: Human organoids-on-a-chip offer a viable platform for comprehending the in vitro functioning of human tissue. This method can promote tissue physiology research and boost applications in biotechnology and biomedical sciences by fusing microfluidic control with the biological complexity of organoids.

Keywords: *Tissue physiology, Stem cell, Microfluidics, 3D culture, Organoid Biotechnology.*

P-08/F/005 POSTER · OFFLINE

Beyond the ESCRT Paradigm: Cryo-ET Reveals the Hemifusome and Interacting Proteolipid as a Novel Pathway for Vesicle Biogenesis

Piyusha[1]*, Kumari Kajal[1]

[1]*ISF College of Pharmacy and Research, Moga PB-142001*
Email: piyushatakka@gmail.com

For several years, people have long treated Endosomal Sorting Complexes Required for Transport (ESCRT) as the main way to make inward membrane buds. In many cases, it is seen as the only way to form intraluminal vesicles (ILVs). These ILVs build up inside multivesicular bodies, known as MVBs. Vesicle fusion, membrane scission, and ILV formation are essential steps for intracellular trafficking, degradation and recycling yet direct in-situ visualization of the membrane-remodelling intermediates underlying these processes remained exclusive. Classical electron microscopy has extensively been used to map the changing, irregular form of endomembrane system, but sample preparation methods requiring chemical fixation and heavy-metal staining are inherently incompatible with preserving transient, native-state intermediates—raising the possibility that entire classes of short-lived structural intermediates have gone undetected. Here, using in-situ cryo electron tomography across four mammalian cell lines, identification of a previously undescribed vesicular organelle characterized by a distinctive membrane topology: heterotypic hemifused vesicles connected by an extended hemifusome diaphragm (HD) that consistently associates with a 42-nanometer proteolipid nanodroplet (PND) at its rim. This organelle was termed “hemifusomes.” Hemifusomes localize to the cell periphery and constitute approximately 10% of total vesicular organelle. Rather than adopting a single fixed conformation, hemifusomes display considerable morphological plasticity encompassing a range of shapes and bilayers. This structural heterogeneity is consistent with a stepwise progression towards intraluminal budding, suggesting hemifusomes function as structural intermediates in ILV formation. Researchers speculate that hemifusomes serve as foundational hubs for ILV biogenesis and MVB maturation, and help sort proteins and lipids, independent of ESCRT-mediated pathways.

Keywords: *Hemifusomes, PND (proteolipid nanodroplet), ESCRT, ILVs (intraluminal vesicles), MVBs (multivesicular bodies), Cryo-Electron Tomography.*

P-08/F/006 POSTER · OFFLINE

Regenerative and Stem Cell-Based Therapies for Arthritis: Harnessing Mesenchymal Stem Cells, Exosomes, and Bioengineered Scaffolds for Functional Joint Repair

Rahil Bartha*, Abhishek Sharma

[1]*Department Bachelor of Pharmacy, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India*
Email: 2501080@isfcp.org

Arthritis is a common joint disease that causes inflammation in joints and causes chronic pain, movement problems, and disability. There are 2 main types of arthritis: osteoarthritis (OA), in which your joints wear down and your cartilage breaks down, and rheumatoid arthritis (RA) which is an autoimmune disorder. Current pharmaceuticals and surgical treatments mostly help to relieve pain and symptoms but don't always fully repair damaged joint tissues. New advancements in regenerative medicine are providing new avenues to treat arthritis. Future treatments with promise for regeneration and repair of damaged joints include mesenchymal stem cell (MSC) therapy, exosome use, and bioengineered scaffolds.

MSCs can differentiate into multiple cell types, but they can also secrete factors that promote anti-inflammatory and cartilage repair. MSC-derived exosomes contain proteins, lipids, and microRNAs. These can provide many of the same benefits as stem cells, but without the use of live cells, potentially making treatments safer and easier to manage. Bioengineered scaffolds are made from either synthetic or natural materials, and they can help to support damaged tissues and encourage cell growth in the affected area. Yet, issues such as safety, uniform standards, production costs, and regulatory approval remain to be tackled. These treatments could also be enhanced by advanced technologies such as artificial intelligence, nanotechnology, and genetic editing. Regenerative medicine provides a hopeful approach to the treatment of arthritis in general, moving from symptomatic management to repairing damaged joint tissues.

Keywords: *Arthritis, OA, RA, Mesenchymal stem cells, Exosomes, Bioengineered scaffolds, Regenerative medicine.*

P-08/F/007 POSTER · OFFLINE

PCR Advance Techniques and Potential Approach in Therapeutic Applications: In-Depth and Current

Nitesh Kumar[1]*, Rahul Pal[2]

[1]*ISF College of Pharmacy, Moga PB-142001*
[2]*Faculty of Medical, Paramedical and Allied Health Sciences, Department of Pharmacy Jagannath University, Jaipur, Rajasthan, India.*
Email: palsrahul330@gmail.com

Background: Over the past decades, Polymerase chain reaction (PCR) has undergone remarkable technological advancements, resulting in enhanced sensitivity, specificity, and rapidity. Modern approaches such as quantitative PCR (qPCR), digital PCR (dPCR), loop-mediated isothermal amplification (LAMP), and CRISPR-based detection have extended PCR role beyond traditional diagnostics.

Objective: The objective of this study is to provide an in-depth evaluation of advanced PCR methodologies and their translational potential in therapeutic applications, highlighting both current progress and future perspectives. PCR has transformed molecular biology since its development, becoming an indispensable tool for nucleic acid amplification.

Methodology: A systematic review of peer-reviewed literature research studies published in past decades across major scientific databases. Research was analyzed focusing on the analytical sensitivity, specificity, clinical performance, and translational utility of advanced PCR technologies, including qPCR, dPCR, isothermal amplification platforms, and CRISPR-assisted assays.

Results: The findings indicate that dPCR allows absolute quantification and ultra-sensitive detection of minimal residual disease (MRD) and rare mutations, thereby supporting oncology-based therapeutic decisions, viral load monitoring, guiding antiviral therapy and patient management. Additionally, LAMP and CRISPR-Cas9 based assays demonstrate exceptional specificity and rapid turnaround, providing opportunities for point-of-care diagnostics and real-time therapy guidance.

Conclusion: Advanced PCR platforms and AI are revolutionizing the interface between diagnostics and therapeutics. Their integration with next-generation sequencing, microfluidics, and artificial intelligence holds promise for advancing personalized and precision medicine. Continued innovation in PCR methodologies is expected to further expand their role in clinical practice and therapeutic applications.

Keywords: *PCR, digital PCR, isothermal amplification, CRISPR diagnostics, therapeutic applications, precision medicine.*

P-08/F/008 POSTER · OFFLINE

Digital Twin for Smart Biomanufacturing: Challenges, Opportunities and Future Perspectives

Purvi Aggarwal*[1], Sania Grover[1]

[1]*ISF College of Pharmacy& Research, Rattian Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: purviaggarwal0908@gmail.com

The transition from laboratory-scale biotechnology to smart and sustainable biomanufacturing is growing at a fast pace by the emergence of Digital Twins (DTs). A Digital Twin is a virtual dynamic model of a bioprocess engineering that combines process models, real-time data, sensors, and computational technologies to support continuous monitoring, prediction and optimization. DTs have a great potential in biomanufacturing for further optimization of process efficiency, use of raw materials, and the profitability of the manufacturing process while reducing waste and energy consumption. However, it is difficult to implement, due to the high complexity, variability and lack of representation of the biological processes with traditional models. A gradual introduction of the more complex steady-state process models to the more advanced DTs can provide a framework to address these limitations. A key operation in biotechnology is fermentation, and this provides an important platform for this transition. Combining First Principles Models with Machine Learning creates a Hybrid Models that can capture process mechanisms and complex data-driven relationships. In conjunction with the progressive sensors and real-time data acquisition, these models can set up closed-loop systems that continuously control process conditions. These properties can optimize upstream and downstream operations, reduce the use of resources, and enable the control of the product properties. Reliable data, appropriate modelling strategies, human operator involvement and economic feasibility are other key factors for successful implementation. Therefore, moving from laboratory experiments to a Digital Twin for biotechnology is an important step toward prophetic, cost effective and environmentally friendly biomanufacturing.

Keywords: *Digital Twins, Sustainable Biotechnology, Bioprocessing, Machine Learning, Biomanufacturing.*

P-08/F/009 POSTER · OFFLINE

Non-Viral Vectors for mRNA Therapeutic

Muddassar Imtiyaz Baddi*[1]

[1]*Rasiklal Manikchand Dhariwals RMD college of pharmacy, Chinchwad.*
Email: mudassarbaddi02@gmail.com

Messenger RNA (mRNA) therapeutics have emerged as a transformative modality in modern medicine, enabling cells to produce therapeutic proteins directly from synthetic mRNA sequences. The success of COVID-19 vaccines has validated this approach, but efficient delivery remains a critical challenge due to the instability and immunogenicity of naked mRNA. Non-viral vectors, including lipid nanoparticles, liposomes, polymers, dendrimers, and inorganic nanoparticles, provide safer alternatives to viral vectors by protecting mRNA, facilitating cellular uptake, and enabling protein expression. This review explores the principles, types, components, and mechanisms of non-viral vector systems, highlighting their applications in vaccines, cancer therapy, gene therapy, and rare diseases. Advantages such as safety, scalability, and repeat dosing are balanced against limitations including stability, endosomal trapping, and targeting inefficiencies. Future innovations in targeted delivery, AI-designed nanoparticles, and personalized medicine promise to revolutionize the field.

Keywords: *Non-viral vectors, mRNA therapeutics, Lipid Nanoparticles, Drug Delivery, Personalized Medicine.*

P-08/F/010 POSTER · OFFLINE

Targeted Precision: Advances, Challenges, and Future Directions in Adoptive Cell Therapy

Divyansh Khajuria*, Aman[1]

Department of Pharmaceutical Sciences, ISF College of Pharmacy & Research, Rattian Road, Ghal Kalan, Punjab-142001, India
Email: divyanshkhajuria7@gmail.com

Background: Chimeric Antigen Receptor T-cell (CAR-T cell) therapy is a promising cancer treatment that has shown success in treating certain type of cancer. It has demonstrated remarkable efficacy, particularly in hematologic malignancies such as certain types of leukemia and lymphomas, offering hope for patients with limited options.

Aim and objective: The primary objective of this study is to target a rapid surge of hematologic malignancies using CAR- T cell therapy.

Methodology: CAR T cell therapy manufacturing begins with isolating target T cells from patient or donor blood, typically starting from a leukapheresis product, using isolation methods tailored to your downstream research or clinical goals.

Results and Discussion: The success of CAR-T treatment has led to treatment of B-cell acute lymphoblastic leukemia and B-cell lymphoma. CAR-T cells against CD19 have demonstrated promising results by preclinical and clinical studies for diseases such as systemic lupus erythematosus, antisynthetase syndrome and systemic sclerosis. The ability of this treatment to mobilization the immune system by the changing of the T cells to selectively attacks the malignant cells.

Conclusion: As the world of cancer treatment continues to change, CAR-T cell therapy is a beacon of hope for many patients and can allow for more targeted treatment of cancer.

Keywords: *Antisynthetase Syndrome, Lymphomas, Erythematosus, CD19, Systemic Sclerosis.*

P-08/F/011 POSTER · OFFLINE

CRISPR–Cyclodextrin Based Gene Delivery: An Emerging Approach in Biotechnology and Life Sciences

Kanwardeep Singh Sood[1]*, Sourab Kosey

Department of Pharmacy, ISF Collage of pharmacy, Moga, Punjab, India (142001)
Email: singhsoodk@gmail.com

Introduction: The combination of CRISPR technology and cyclodextrin-based carriers is an emerging approach for gene delivery. CRISPR-Cas systems allow precise genetic modification using guide RNA to identify a specific DNA sequence, while Cas9 cuts the DNA near a PAM sequence. This technology has potential applications in genetic diseases, cancer research, and gene therapy. However, delivering CRISPR components safely and efficiently into target cells remains a major challenge.

Methodology: A literature-based approach was used to study CRISPR-Cas systems, cyclodextrin properties, and their role in gene delivery. The potential of modified cyclodextrins as non-viral carriers for CRISPR components such as guide RNA, mRNA, plasmid DNA, and Cas proteins was reviewed.

Results: Cyclodextrins are ring-shaped sugar molecules with a hydrophilic outer surface and hydrophobic inner cavity, allowing them to carry and protect different molecules. Modified cyclodextrins can interact with nucleic acids and may improve cellular uptake and delivery of CRISPR components. However, challenges such as low delivery efficiency, toxicity, endosomal entrapment, tissue targeting, immune responses, and CRISPR off-target effects remain.

Conclusion: CRISPR–cyclodextrin systems combine genome editing with nanotechnology and may provide safer and more efficient gene delivery. Further research on improved cyclodextrin carriers, endosomal escape, targeted delivery, and high-fidelity CRISPR systems is needed to support future therapeutic applications.

Keywords: *CRISPR-Cas9, Cyclodextrin, Gene Delivery, Nanotechnology, Genome Editing, Gene Therapy.*

P-08/F/012 POSTER · OFFLINE

Xenobots: The Future of Living Therapeutics in Pharmaceutical Biotechnology

Ekampreet Singh[1]*, Kumari Kajal[1]
ISF College of Pharmacy and Research, Moga, Punjab
Email: ekampreetsingh262005@gmail.com

Introduction: Xenobots are living, programmable biological robots created from cells of Xenopus laevis embryos which is an african frog species. Their capability to move, self-heal, coordinate collectively, and carry out simple tasks has sparked interest in pharmaceutical biotechnology, especially for targeted drug delivery, regenerative medicine, and disease modelling etc.

Aim and Objectives: This summary intends to investigate the pharmaceutical significance of xenobots in biotechnology and life sciences. The goals are to evaluate their potential in precise drug transport, biocompatible therapeutic delivery, tissue repair, as well as future personalized treatment approaches.

Method: The research/review papers related to xenobot design, cellular engineering, AI-assisted morphology, and biomedical applications were examined. The Research involving stem-cell manipulation, microsurgery, computational modelling and in vitro behavioural observation was checked to assess pharmaceutical possibilities.

Result: Xenobots explains autonomous movement, self-healing, biodegradability, and programmable collective behaviour. These features indicate their potential use as living vectors designed to deliver medicinal drugs to targeted tissues while minimizing systemic exposure. Their cellular composition could also be useful regenerative methods and in vitro testing platforms. Nevertheless, Issues concerning control, scalability, immune system compatibility, reproducibility, and ethical oversight.

Summary: Xenobots has become a medium between synthetic biology, robotics, as well as pharmaceutical biotechnology applications.

Conclusion: While still in an experimental phase, xenobots still stand for advancing drug-delivery systems, precision medicine, and regenerative therapies if challenges related to safety, production, and regulation are effectively overcome.

Keywords: *Xenobots, Pharmaceutical Biotechnology, Drug Delivery, Synthetic Biology, Regenerative Medicine, Biocompatibility, Precision Medicine.*

P-08/F/013 POSTER · OFFLINE

Chemicals and Human Health: Benefits and Risks in Modern Lifestyles

Sachindra Rathore, Dr. Vijay Nigam,
Daksh Pharmacy College, Chhatarpur, Madhya Pradesh, India
Email: sachindrarathaur@gmail.com

Chemicals are indispensable to human structure, metabolism, signalling, nutrition, and disease treatment. However, modern lifestyles also involve repeated exposure to substances in processed foods, medicines, consumer products, polluted air, and agricultural environments. This narrative review examines the beneficial and adverse roles of endogenous chemicals and external chemical exposures, drawing on selected scientific publications and authoritative health resources. Essential nutrients and signalling molecules support health within physiological limits, whereas deficiency, excessive intake, inappropriate medicine use, and exposure to toxic substances can cause harm. Contemporary dietary patterns, physical inactivity, disrupted sleep, stimulant use, and self-medication influence both exposure and biological susceptibility. Evidence is well established for several risks, including tobacco exposure, lead toxicity, excessive sodium intake, and inappropriate medicine use. Uncertainties remain regarding the independent health effects of many food additives, complex chemical mixtures, and microplastics. Practical approaches should preserve the benefits of adequate nutrition, sanitation, and appropriate pharmacotherapy while reducing avoidable harmful exposures. Health education should emphasize substance identity, dose, route, exposure duration, and individual vulnerability rather than promote an unattainable “chemical-free” lifestyle. Coordinated efforts among consumers, pharmacists, clinicians, industry, and regulators are essential to support informed decisions and protect public health without creating unnecessary fear.

Keywords: *human biochemistry; chemical exposure; modern lifestyle; nutrition; toxicology; food additives; medicines; environmental health*

P-08/F/014 POSTER · OFFLINE

Formulation, Review of m-RNA – Based Vaccine Development, Challenges and Future Perspective

Nitin Vishwakarma, Dr. Vijay Nigam, Mr. Bhan Singh Yadav

Daksh Institute of Pharmaceutical Sciences, Chhatarpur, (M.P.), Pin: 471001, India
Email: nitinvishwashwakarma9329@gmail.com

mRNA-Based Vaccines Messenger RNA (mRNA) vaccines represent a novel vaccine platform that uses synthetic mRNA molecules to instruct host cells to produce specific antigens, thereby eliciting an immune response. Unlike traditional vaccines, mRNA vaccines do not contain live pathogens or protein antigens; instead, they deliver genetic instructions that enable cells to temporarily synthesize target proteins. The produced antigens are recognized by the immune system, stimulating both humoral and cellular immunity. mRNA vaccines offer several advantages, including rapid development, high efficacy, safety, and scalable manufacturing. Advances in lipid nanoparticle (LNP) delivery systems have significantly improved mRNA stability and cellular uptake, contributing to the successful deployment of mRNA vaccines against infectious diseases such as COVID-19. Current research is expanding their application to cancer immunotherapy and other infectious diseases, highlighting their potential as a versatile platform for future vaccine development.

Keywords: *m-RNA vaccine, messenger RNA, lipid nanoparticles, immunization, antigen expression, COVID-19, vaccine technology*

P-08/F/015 POSTER · OFFLINE

Engineered Probiotics: A Biotechnological Approach to Targeted Therapy

Md Modassir Alam*, Ms. Jasleen Kaur

ISF College of Pharmacy and Research, Moga- Punjab
Email: mdmodassirboss@gmail.com

The limitations of conventional drug delivery, including poor targeting, systemic side-effects, and inadequate therapeutic concentrations in disease sites, have inspired development of innovative biological delivery systems. Engineered probiotics represent a new paradigm where commensal microbes can be harnessed to recognize and respond to disease-associated cues by delivering therapeutics to specific sites. Advances in synthetic biology now enable creation of probiotic bacterial strains carrying genetic circuits, inducible promoters, biosensors, and therapeutic cargo, which can be programmed to behave like smart drugs. Such engineered microbes can recognize and respond to specific microenvironmental stimuli (e.g., pH, inflammatory cytokines, metabolites, pathogen-associated molecular patterns) and deliver customizable payloads of protein, peptides or other biomolecules. Their therapeutic limitations of conventional drug delivery, including poor targeting, systemic side-effects, and inadequate therapeutic concentrations in disease sites, have inspired development of innovative biological delivery systems. Engineered probiotics represent a new paradigm where commensal microbes can be harnessed to recognize and respond to disease-associated cues by delivering therapeutics to specific sites. Advances in synthetic biology now enable creation of probiotic bacterial strains carrying genetic circuits, inducible promoters, biosensors, and therapeutic cargo, which can be programmed to behave like smart drugs. Such engineered microbes can recognize and respond to specific microenvironmental stimuli (e.g., pH, inflammatory cytokines, metabolites, pathogen-associated molecular patterns) and deliver customizable payloads of protein, peptides or other biomolecules. potential is being explored for inflammatory bowel diseases, colorectal cancers, endocrine disorders, and other microbiome-associated diseases. Compared to conventional drug delivery approaches, engineered probiotics can potentially provide localized and sustained therapeutic effects while minimizing systemic exposure. However, critical challenges related to genetic stability, biosafety, containment, manufacturing, dosing, host-microbe interactions and regulatory approval, present major bottlenecks to clinical translation. Recent advancements in synthetic biology and microbial engineering are beginning to address these concerns, and engineered probiotics can represent a promising convergence of biotechnology, microbiology and pharmaceutical sciences for personalized and precision medicine.

Keywords: *Engineered probiotics; living therapeutics; synthetic biology; targeted drug delivery; microbial biosensors; personalized medicine.*

O-08/N/001 ORAL · ONLINE

Functional Foods and Nutraceuticals: Bridging Food and Pharmacy

Amit Kumar*

Department of Biotechnology and Food Processing, ASBASJSM College, Bela, Ropar (140111)
Email: amit.bvoc@gmail.com

Introduction: Functional foods and nutraceuticals have achieved significant attention because of their ability to provide health benefits beyond basic nutrition. They contain bioactive compounds that help prevent disease and promote overall health, creating a strong link between food science and pharmaceutical research.

Aim & Objectives: This review aims to highlight the role of functional foods and nutraceuticals, identify major bioactive components, food sources and discuss their health benefits, applications and current challenges.

Methods: A comprehensive review of recent scientific literature was conducted to summarize evidence on functional foods, nutraceuticals, bioactive compounds, food processing approaches and their therapeutic applications.

Results: Functional foods are rich in probiotics, dietary fibre, omega-3 fatty acids, vitamins, minerals, polyphenols, flavonoids and carotenoids. These compounds contribute to improved gut health, immunity, cardiovascular health, antioxidant activity and reduced inflammation. Advances in food processing and formulation have enhanced the stability, bioavailability, safety and effectiveness of these bioactive ingredients. However, issues related to scientific validation, dosage, regulation, quality assurance and consumer awareness remain important challenges.

Conclusion: Functional foods and nutraceuticals represent a promising approach to preventive healthcare by integrating nutrition with pharmaceutical science. Continued research and evidence-based product development can support the production of safe, effective and innovative health-promoting foods.

Keywords: *Functional Foods, Nutraceuticals, Bioactive Compounds, Probiotics, Polyphenols, Preventive Healthcare.*

O-08/N/002 ORAL · ONLINE

Phytochemical Potential of Ethnomedicinal Plants and Prospects of Cyclodextrin-Based Delivery: A Review

Mamta Arora[1]

Department of Biotechnology, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College, Bela, Ropar, Punjab, India
Email: aroramamta996@gmail.com

Introduction: Ethnomedicinal plants remain a rich, underexplored reservoir of bioactive phytoconstituents with proven antioxidant, antimicrobial, and therapeutic potential, yet many particularly rare and endangered species lack systematic phytochemical documentation. Furthermore, these phytoconstituents, especially flavonoids and phenolics, often show poor aqueous solubility, and cyclodextrin (CD)-based inclusion complexation is increasingly recognized as a means of overcoming this barrier.

Aim & Objectives: To review the phytochemical composition and pharmacological activity reported for select ethnomedicinal plant species, and to examine the prospects of cyclodextrin-based complexation, supported by AI-enabled modelling, for enhancing the solubility and bioavailability of their bioactive constituents.

Methods: A structured review of published literature was conducted, covering extraction and characterization techniques (Soxhlet extraction, HPTLC fingerprinting, GC-MS profiling), phytochemical screening, and in vitro antioxidant and antimicrobial assays across ethnomedicinal plant species, alongside literature on cyclodextrin inclusion complexation and AI/QSAR-based prediction of host–guest interactions.

Findings: Reviewed evidence links flavonoid and phenolic content to antioxidant and antimicrobial efficacy, reliably fingerprinted through HPTLC and GC-MS. Cyclodextrins, particularly β-cyclodextrin and its derivatives, are widely reported to improve the solubility, stability, and dissolution behaviour of such phytoconstituents through inclusion complexation, while AI-based modelling approaches show growing capability in predicting favourable CD–phytoconstituent combinations ahead of laboratory validation.

Conclusion: Integrating classical phytochemical evaluation with cyclodextrin-based complexation and AI-enabled predictive tools offers a rational pathway to convert underexplored ethnomedicinal plant constituents into deliverable, bioavailable formulations, supporting their translation into biotechnology-driven healthcare and nutraceutical applications.

Keywords: *Cyclodextrin, Phytochemical Analysis, Ethnomedicinal Plants, Bioavailability, HPTLC, AI Modelling.*

O-08/N/003 ORAL · ONLINE

Enhanced Camptothecin Production by Endophytic Fungi through Submerged Fermentation and Process Optimization

Gopal Patel[1], Nishi Jain, Surendra Kumar Jain[1]

[1]*Lakshmi Narain College of Pharmacy, Bhopal, Madhya Pradesh, India-462021*
Email: gopalp@lnct.ac.in

Camptothecin (CPT) is an important anticancer alkaloid with considerable pharmaceutical significance. This study investigated the production of CPT through submerged culture fermentation using the endophytic microfungi. Initial screening experiments were performed to identify suitable carbon sources, initial pH, agitation speed, and incubation temperature for maximizing CPT production. The concentrations of selected sugar alcohols, alcohol elicitors, and potential precursors were subsequently optimized using a one-factor-at-a-time approach. Enhanced CPT production was achieved through optimization of these influencing factors. To improve the economic feasibility of the process, cost-effective and nutrient-rich media alternatives such as whey were evaluated for CPT production. Furthermore, response surface methodology (RSM) was employed to model and optimize CPT production. Ultrasonic stimulation was investigated as an additional process-intensification strategy, considering ultrasound power, irradiation duration, treatment frequency, and duty cycle. The optimized ultrasonic strategy involved treating 3-day-old mycelial cultures at 80% power for 5 min, twice at a 12-h interval, using a fixed frequency of 40 kHz until the sixth day of fermentation. This treatment increased CPT productivity by 1.91-fold, reaching 1280 mg/L compared with 670 mg/L in the non-sonicated control. Increased pellet porosity following ultrasonic treatment likely enhanced nutrient and metabolite mass transfer. Overall, optimized medium composition, mixed fermentation, statistical modeling, and ultrasonic stimulation provide promising approaches for cost-effective and industrially feasible CPT production.

Keywords: *Camptothecin, Endophytic fungi, Process Optimization, Secondary Metabolites.*

O-08/N/004 ORAL · ONLINE

Bioinformatics-Guided Screening and Ranking of Microbial Cyclodextrin Glucanotransferases (CGTases) for Enhanced Cyclodextrin Production

Gurkirat Singh*[1]

[1]*Department of Biotechnology and Food Processing, Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College, Bela - 140111, Ropar, Punjab, India*
Email: aujlagurkirat08@gmail.com

Introduction: Cyclodextrins are cyclic oligosaccharides produced from starch by cyclodextrin glucanotransferase (CGTase) enzymes and have important applications in food, pharmaceutical, and biotechnology industries. The efficiency of cyclodextrin production is strongly influenced by the catalytic properties and substrate specificity of the CGTase employed.

Aim and Objectives: This study aims to develop a bioinformatics-based strategy for screening and ranking microbial CGTases to identify promising enzyme candidates for enhanced cyclodextrin production. The objectives include comparative sequence analysis, prediction of structural and functional characteristics, and prioritization of candidates based on relevant enzyme properties.

Methods: CGTase sequences from selected microbial sources will be retrieved from publicly available databases and analyzed using sequence alignment, phylogenetic analysis, conserved-domain identification, physicochemical profiling, and structural bioinformatics approaches. Candidate enzymes will subsequently be ranked using an integrated computational scoring framework considering catalytic-site conservation, predicted structural features, stability-related properties, and substrate-associated characteristics.

Results: The computational screening is expected to identify distinct CGTase candidates exhibiting favorable combinations of conserved catalytic residues, structural characteristics, and predicted functional properties associated with efficient cyclodextrin production.

Summary and Conclusion: This study provides a systematic and cost-effective approach for prioritizing microbial CGTases before experimental validation. The resulting ranking can guide future enzyme selection, optimization, and experimental studies for improved and potentially tailored cyclodextrin production.

Keywords: *Cyclodextrins, Cyclodextrin glucanotransferase, Bioinformatics, Enzyme screening, Sequence analysis, Structural bioinformatics.*

O-08/N/005 ORAL · ONLINE

Kinetic Modelling and QbD-Optimized Cyclodextrin-Functionalized Exosomes for Targeted Venetoclax Delivery in Acute Myeloid Leukaemia

Aditya Pathak[1]*, Manish Kumar[1]

[1]*KIET School of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh, India*
Email: pathakjiaditya@gmail.com

Background: Venetoclax, a potent BCL-2 inhibitor for the management acute myeloid leukaemia (AML), is limited by its highly crystalline nature and poor aqueous solubility. Extracellular vesicles (exosomes) offer unique biocompatibility for targeted delivery; however, conventional chemical functionalisation of their lipid bilayers often denatures native transmembrane proteins. Cyclodextrins (CDs) represent an advanced nano-biological solution. Through supramolecular host–guest chemistry, Venetoclax can be entropically trapped and solubilised within the hydrophobic cavity of CD, while CD simultaneously acts as a non-destructive, cholesterol-tethered steric anchor on the exosome surface, thereby preserving native vesicle tropism.

Objectives: Utilising Mathematical kinetic release modelling and Quality by Design (QbD) concepts to design and optimise dual-functional CD-integrated exosomes for targeted Venetoclax delivery.

Methodology: Venetoclax-CD inclusion complexes will be formulated and bound with cholesterol onto isolated exosomes. The CD-to-lipid ratio, anchor density, and incubation period will be statistically optimised against encapsulation efficiency and vesicle size using a Box-Behnken QbD design. Mathematical kinetic models (Korsmeyer-Peppas, Higuchi) will be used to assess in vitro drug release. Lastly, the CD-exosomes will be tested for cellular absorption and apoptosis in AML cell lines.

Expected Outcomes: Development of a stable CD-exosome (~120 nm) achieving >85% Venetoclax encapsulation. Kinetic modelling will confirm diffusion-controlled sustained release from the CD matrix. Biologically, the formulation will demonstrate enhanced cellular internalization and significantly amplified apoptosis in AML cells compared to the free drug.

Significance: A mechanistic paradigm for combining vesicular biotherapeutics with supramolecular host-guest chemistry is presented in this paper. It directly addresses the pharmacokinetic constraints of Venetoclax in precision haematologic oncology by establishing a repeatable, thermodynamically stable biomanufacturing paradigm for CD-anchored exosomes using statistical QbD and kinetic modelling.

Keywords: *Cyclodextrin, Exosomes, Venetoclax, Quality by Design, Kinetic Modelling, Precision Oncology.*

O-08/N/006 ORAL · ONLINE

From Plant Bioactives to Smart Plant Disease Management: Integrating Cyclodextrins, Artificial Intelligence and Quality by Design (QbD)

Simrandeep Saini[1]*

[1]*Department of Biotechnology and Food Processing Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College Bela - 140111, Ropar, Punjab, India*
Email: simrandeepsaini88@gmail.com

Introduction: Plant diseases significantly affect crop productivity and create a need for sustainable and safer disease-management approaches. Plant bioactive compounds, including phenolics, flavonoids, and essential oils, show promising antimicrobial properties, but their practical application is often limited by poor solubility, instability, and rapid degradation.

Aim & Objectives: This review explores the potential integration of cyclodextrins, Artificial Intelligence (AI), and Quality by Design (QbD) to improve the delivery and application of plant bioactives in plant disease management.

Methods: We reviewed relevant literature to assess the role of cyclodextrin-based inclusion complexes, AI-assisted prediction and optimization, and QbD-based formulation development.

Results: The literature indicates that cyclodextrins can improve the solubility, stability and controlled delivery of plant bioactives. AI can support the prediction of bioactive interactions and optimization of formulation parameters, while QbD can help identify critical quality attributes and process parameters for consistent product development.

Summary and Conclusion: Integrating plant bioactives with cyclodextrins, AI and QbD represents a promising strategy for developing smart, targeted and sustainable plant disease-management systems. Further experimental validation and field-level studies are required to translate this integrated approach into practical agricultural applications.

Keywords: *Plant Bioactives, Cyclodextrins, Artificial Intelligence, Quality by Design, Plant disease management, Sustainable agriculture.*

O-08/N/007 ORAL · ONLINE

Genomic Surveillance of OXA-Type β-Lactamases in Carbapenem-Resistant *Acinetobacter baumannii* and *Pseudomonas aeruginosa* Involved in Ventilator-Associated Pneumonia

*Dr. Manita Paneri

Faculty of Allied and Health Care, Guru Kashi University - 151001, Bathinda, Punjab, India
Email: manitaprashant@gmail.com

Background: The World Health Organization (WHO), in their 2024 'Priority Pathogen List,' highlighted *Acinetobacter baumannii* and *Pseudomonas aeruginosa* as both opportunistic pathogens harbouring Class D oxacillinase enzymes. Therefore, the present study was focused on genomic surveillance of OXA-type beta-lactamase genes in carbapenem-resistant *A. baumannii* and *Pseudomonas aeruginosa* associated with ventilator-associated pneumonia.

Material and Method: This prospective research work was conducted from March 2023 to July 2024 after obtaining approval from the Ethics Committee for Biomedical and Health Research, Adesh University. 200 samples were obtained from suspected VAP patients at the Bacteriology Laboratory of Adesh Medical Hospital, Bathinda. *Acinetobacter baumannii* and *P. aeruginosa* isolates were identified, and an antibiotic susceptibility test was done by the VITEK 2 system. *A. baumannii* and *P. aeruginosa* isolates resistant to meropenem and imipenem were further processed for bacterial genomic and plasmid DNA isolation. PCR amplification was performed using a BIORAD T100 thermocycler.

Result: In the present study, 200 ET/BAL suspected samples were collected. Gram-negative bacteria were seen in 72 samples (36%). Among 72 samples, the proportion of fermenting gram-negative bacilli was 62.50% (n=45), whereas the proportion of non-fermenting bacilli was 37.50% (n=27). *OXA23* and *OXA51* were found in all carbapenem-resistant isolates of *A. baumannii* and *P. aeruginosa*.

Conclusion: The present research indicates a high prevalence of the *blaOXA-51* and *blaOXA-23* genes in carbapenem-resistant isolates of *Acinetobacter baumannii* and *P. aeruginosa*. So, there is an unmet need for continuous molecular surveillance, strict infection control protocols, and appropriate antibiotic administration to prevent the spread of carbapenem-resistant organisms.

Keywords: *Acinetobacter baumannii, Pseudomonas aeruginosa, ventilator-associated pneumonia, carbapenem, antibiotic resistance*

O-08/N/008 ORAL · ONLINE

Development and evaluation of propolis-based hydrogel for the treatment of acne

Harsh Bothara[1], Dhrubojyoti Mukherjee[1]

Department of Pharmaceutics, School of Pharmacy & Technology Management, SVKM's Narsee Monjee Institute of Management Studies, Shirpur-425405, Maharashtra, India
Email: harshbothara1803@gmail.com

Acne vulgaris is a chronic inflammatory skin condition caused by microbial colonisation of bacteria Cutibacterium acnes (C.acnes) and Staphylococcus aureus (S.aureus). The growing rates of antimicrobial resistance have created the demand for developing natural component-based treatment modalities. The current work describes the formulation and evaluation of a propolis-loaded hydrogel involving sodium alginate, chitosan, and porcine acellular dermal matrix (PaDM) for topical treatment of acne. Ionic cross-linking was employed to synthesise a stable three-dimensional hydrogel structure, which was subsequently lyophilized. FTIR spectroscopy was used to ensure compatibility, XRD for determining amorphicity. Gel fraction revealed effective cross-linking, porosity, and swelling ratio analysis revealed a high porous structure indicating good drug diffusion. According to the analysis of in vitro degradation, the matrix degraded slowly, which is advantageous for prolonged topical residence. The composite material showed enhanced thermal stability through TGA and DSC. The FE-SEM examination showed a porous structure with well-dispersed propolis. Antimicrobial tests revealed effective inhibition zones created by the propolis-loaded sample in Staphylococcus aureus (S. aureus) and Cutibacterium acnes culture. Molecular docking was conducted for protein structures of acne using 6KHK (closed), 6KHL (blocked), and 6KHM (open). Based on the results obtained, it is likely that there will be conformation-dependent binding and multistate inhibition of these bacterial proteins that correspond to the in vitro antimicrobial results. The overall research discovers the potential efficacy of the developed hydrogel formulation in treatment against acne.

Keywords: *Acne vulgaris, propolis, chitosan, hydrogel, molecular docking, Cutibacterium acnes*

O-08/N/009 ORAL · ONLINE

Bacterial-Mediated Cancer Therapy: An Emerging Approach for Cancer Treatment

Vikrant Singh, Arti Gautam*

Shiv Bali Singh Group of Educational and Training Institute, College of Pharmacy, Malwan, Fatehpur, Uttar Pradesh, India
Email: vigyansathi50@gmail.com

Cancer is a major global health challenge, and conventional treatment methods such as chemotherapy, radiotherapy, and surgery can be associated with toxicity and limitations. Bacterial-mediated cancer therapy is an emerging therapeutic approach that explores the ability of selected bacteria to selectively target tumor tissues, destroy cancer cells, activate antitumor immune responses, and deliver therapeutic agents. Bacteria such as Salmonella, Clostridium, Listeria monocytogenes, Escherichia coli, and Ewingella americana have been investigated for their potential anticancer effects. Their activity may involve preferential colonization of the tumor microenvironment, direct cytotoxic effects on cancer cells, and stimulation of immune cells against tumors. Among bacterial therapies, BCG (Mycobacterium bovis) is an established immunotherapy for certain forms of non-muscle-invasive bladder cancer. However, many other bacterial-based approaches remain at the experimental or clinical-investigation stage. This review highlights the mechanisms, potential applications, advantages, limitations, and future prospects of bacterial-mediated cancer therapy. Overall, bacterial therapy represents a promising field of biotechnology and cancer research, but further studies are required to establish the safety, efficacy, and clinical applicability of newer bacterial therapies.

Keywords: *Bacterial-mediated cancer therapy, Cancer, Tumor targeting, Anticancer activity, Immunotherapy, Ewingella americana, BCG, Tumor microenvironment, Biotechnology.*

O-08/N/010 ORAL · ONLINE

Sodium alginate/polyethylene glycol/gelatin hybrid scaffold embedded with chitosan nanoparticle for bone tissue engineering

Ashna Samuel, Dhrubojyoti Mukherjee*

Department of Pharmaceutics, School of Pharmacy & Technology Management, SVKM's Narsee Monjee Institute of Management Studies, Shirpur-425405, Maharashtra, India
Email: ashna.samuel6@gmail.com

The design and fabrication of biomimetic scaffolds for tissue regeneration is an important area in tissue engineering. A hybrid scaffold (sodium alginate, gelatin, and polyethene glycol (PEG) was successfully prepared and further functionalized with chitosan nanoparticles in the current study to enhance its biological performance. To prepare the scaffold, a blending method was employed, followed by freeze-drying, resulting in a highly porous, interconnected structure. The compatibility and successful incorporation of all the components were confirmed by FTIR and XRD analyses, whereas thermal studies proved the improved stability of the composite system. FE-SEM analysis indicated a clear porous structure conducive to cell penetration and nutrient diffusion. The scaffold loaded with nanoparticles showed improved swelling behaviour, controlled degradation, and appropriate porosity, indicating its potential for tissue regeneration. Biological testing revealed high antibacterial activity against Staphylococcus aureus and no inhibitory activity against Escherichia coli, similar to other polymer-based scaffolds. Research on hemolysis revealed that the scaffold is hemocompatible within acceptable limits. The in vitro osteogenic evaluation using MG-63 cells showed a significant increase in alkaline phosphatase activity and calcium deposition in the nanoparticle-loaded scaffold, indicating improved osteogenic differentiation and mineralisation. Moreover, molecular docking studies showed that chitosan and sodium alginate interacted favourably with BMP3 and BMPR1A, facilitating their involvement in promoting osteogenic signalling pathways. The statistical analysis of the results proved their importance. In general, the designed hybrid scaffold demonstrates the potential for large-scale bone tissue engineering and its use within the regenerative medicine framework.

Keywords: *Chitosan nanoparticles, Alginate-based scaffold, Polyethylene glycol (PEG), Gelatin biomaterial, lyophilised porous scaffold*

O-08/N/011 ORAL · ONLINE

Discovery of Novel Apoptosis-Inducing Small Molecules for Breast Cancer Therapy: A Computational (AI) and In Vitro Approach

Piyush Kumar
JSS College of Pharmacy, Jammu, India
Email: bharbeypiyush@gmail.com

Background: Breast cancer is one of the leading causes of cancer-related mortality globally. Recent advances in targeted therapies have focused on selectively inhibiting signalling pathways that are vital for cancer cell survival and proliferation. Identifying novel small molecules with such inhibitory capabilities remains a critical step toward more effective treatments.

Methods: A computational approach was utilized to design and identify small molecule inhibitors targeting key signalling pathways implicated in breast cancer progression. Virtual screening and molecular docking analyses were conducted to identify potential lead compounds. The selected compounds were further evaluated in vitro using MCF7 breast cancer cells to determine cytotoxicity (via IC50) and to assess apoptotic effects. ADMET profiling was performed to predict pharmacokinetic properties.

Results: Two lead compounds, C12 and C18, demonstrated strong binding affinities to serine-threonine protein kinase and MAP3K5, both of which are critical regulators of apoptosis. In vitro studies revealed significant cytotoxic effects, with IC50 values of 22.49 ± 1.01 µg/ml for C12 and 14.61 ± 0.01 µg/ml for C18. Microscopic and biochemical analyses showed hallmark features of apoptosis, including nuclear condensation, DNA fragmentation, and mitochondrial membrane potential loss. ADMET predictions indicated favourable pharmacokinetic profiles for both compounds.

Conclusion: The identified compounds C12 and C18 exhibit potent cytotoxic and pro-apoptotic activity in breast cancer cells, suggesting their promise as novel therapeutic agents. Further in vivo studies are warranted to validate their efficacy and safety.Top of Form

Bottom of Form

Keywords: *Breast cancer, Molecular docking, MCF7, Signalling inhibitors, ligand-protein interactions*

O-08/N/012 ORAL · ONLINE

Molecular Docking in Drug Discovery

Mohd Afnan, Anubhuti Mishra*
Shiv Bali Singh Group of Educational and Training Institute, College of Pharmacy, Malwan, Fatehpur, Uttar Pradesh, India
Email: afnanmohd2004.aam@gmail.com

The docking methods used in structure-based virtual database screening offer the ability to quickly and cheaply estimate the affinity and binding mode of a ligand for the protein receptor of interest, such as a drug target. These methods can be used to enrich a database of compounds, so that more compounds that are subsequently experimentally tested are found to be pharmaceutically interesting. In addition, like all virtual screening methods used for drug design, structure-based virtual screening can focus on curated libraries of synthesizable compounds, helping to reduce the expense of subsequent experimental verification. In this review, we introduce the protein-ligand docking methods used for structure-based drug design and other biological applications. We discuss the fundamental challenges facing these methods and some of the current methodological topics of interest. We also discuss the main approaches for applying protein-ligand docking methods. We end with a discussion of the challenging aspects of evaluating or benchmarking the accuracy of docking methods for their improvement, and discuss future directions.

Keywords: *protein-ligand interactions, structure-based drug design, molecular docking*

P-08/N/001 POSTER · ONLINE

Atomic-Level Insights into the Catalytic Mechanism of Potato Epoxide Hydrolase from QM/MM Calculations

Maryam Haji Dehabadi[1]*, Mehdi Irani[1]

[1]*Department of Chemistry, University of Kurdistan, Sanandaj, 66177-15175, Iran*
Email: m.hajidehabadi@uok.ac.ir

Epoxide hydrolases are ubiquitous enzymes that catalyze the hydration of epoxides to yield the corresponding 1,2-diols, with well-established roles in detoxification, metabolism, and signaling throughout all domains of life. Although the overall two-step catalytic mechanism proceeding through a covalent alkyl-enzyme intermediate (alkylation) followed by its hydrolysis (dealkylation) is broadly accepted, several mechanistic details remain unresolved. These include the protonation states of active-site residues, the regioselectivity of nucleophilic attack, and the precise roles of the conserved tyrosine pair in catalysis. To address these questions, we employed hybrid quantum mechanics/molecular mechanics (QM/MM) calculations to investigate the catalytic mechanism of potato epoxide hydrolase 1 (StEH1), using the crystal structure (PDB ID: 2CJP) as the starting model and trans-stilbene oxide as the substrate. A systematic exploration of protonation states, reaction pathways, and substrate enantiomers revealed that HID300–HID104 is both the mechanistically viable and thermodynamically preferred active-site configuration. Nucleophilic attack by Asp105 occurs selectively at one of the epoxide ring carbon atoms, thereby resolving the regioselectivity of StEH1 at the atomic level. The overall reaction proceeds through three elementary steps: alkylation, dealkylation, and proton relay, during which Tyr235, but not Tyr154, donates a proton to the epoxide oxygen in the dealkylation step. Throughout the catalytic cycle, His300 remains in its neutral (HID) tautomeric form, contradicting earlier proposals invoking a doubly protonated histidine. These results clarify previously contested aspects of the epoxide hydrolase mechanism and offer a quantitative framework to guide inhibitor design and enzyme engineering efforts.

Keywords: *Epoxide Hydrolase, QM/MM, StEH1, Regioselectivity, Protonation States, Trans-stilbene Oxide.*

P-08/N/002 POSTER · ONLINE

Herbal-Based Mosquito Attractants for Better Vector Control

Yamuna Choudhary[1]*, Anju Goyal[2]

[1]*Ph.D. Research Scholar, Faculty of Pharmacy, B.N. University, Udaipur, Rajasthan, India*
[2]*Research Guide, Faculty of Pharmacy, B.N. University, Udaipur, Rajasthan*
Email: yamunachoudhary23@gmail.com

Mosquito-borne diseases remain a significant public health concern, particularly in tropical and subtropical regions. Conventional mosquito control methods often rely on synthetic chemical insecticides, whose prolonged use may lead to environmental contamination, toxicity concerns, and insecticide resistance. The present work focuses on the development of a herbal-based mosquito attractant as a potential tool for vector control. Mosquito-borne diseases remain a major public-health concern, creating a need for innovative, environmentally compatible approaches to vector surveillance and control. Mosquitoes naturally respond to plant-associated volatile organic compounds during sugar feeding, host-seeking and oviposition, making plant-derived chemicals a promising source of mosquito attractant cues. Herbal-based mosquito attractants may therefore provide an alternative strategy to conventional repellent-focused approaches by directing mosquitoes towards traps or targeted control systems. However, the practical use of herbal attractants is often limited by volatility, poor aqueous solubility, chemical instability and rapid loss of active constituents. Selected plant-derived materials are being investigated for their ability to produce volatile compounds that can attract mosquitoes toward a designated trap, thereby facilitating targeted capture and reducing mosquito populations. The proposed herbal formulation is intended to provide a plant-based, economical, and environmentally considerate alternative or complementary approach to conventional vector-control strategies. The attractant may be incorporated into suitable trapping systems and evaluated for attraction efficiency under controlled conditions. Parameters such as attractant composition, concentration, duration of activity, and mosquito response will be considered during optimization. The study may contribute to the development of a practical herbal attractant-based trapping approach for integrated mosquito and vector management. The proposed approach integrates botanical resources, mosquito chemical ecology and pharmaceutical technology to develop a standardized herbal attractant platform. Such systems may have potential applications in odor-baited traps, vector surveillance and attract-and-kill strategies. Further laboratory, semi-field and field validation will be essential to establish species-specific efficacy, safety, stability and practical applicability.

Keywords: *Herbal attractant, Mosquito, Vector control, Plant-based formulation, Mosquito trap, Integrated vector management.*

CATEGORY 9 | 75 ABSTRACTS

Clinical Pharmacy, Pharmacovigilance & Pharmacy Practice (PharmD)

Seagull Biotech

Your Partner in Analytical Excellence

Better Science for a Healthier Tomorrow

CROME D'LITE®
EXCELLENCE CENTRE



- Method Development
- Method Validation
- Application Support
- Training Facilities
- PhD Scholars Research Support

INTERNSHIP & TRAINING
- Hands-on practical training on HPLC and related techniques
- Expert guidance by experienced faculty
- Certification provided



HPLC SUPPLY
- New HPLC Systems
- Refurbished HPLC Systems
- Post-Sales Support



HPLC SERVICES
- Repair Services
- Application Support
- Laboratory Instrument Supply



COLUMNS & CONSUMABLES
- Thermo HPLC Columns
- Welch HPLC Columns
- Crome D'Lite HPLC Columns
- Syringe Filters
- HPLC Vials
- HPLC Spare Parts



Quality Products | Expert Support | Long-term Partnership | Your Success Our Priority

Seagull Biotech

Plot NO 981, Industrial Area, Phase 2
Chandigarh 160002 (UT) INDIA
+91 94634 24979
E mail : info@seagulbiotech.com
WEB: www.seagullbiotech.in

Your Complete HPLC Solutions Partner

O-09/F/001 ORAL · OFFLINE

Minoxidil-Associated Ocular Adverse Events in Patients with Alopecia Areata: A Comprehensive Review of Clinical Evidence

Ayushreeya Banga[1]*

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab*
Email: ayushreeya@isfcp.org

Background: Minoxidil, a potassium channel opener, is widely used topically and increasingly as low-dose oral therapy for alopecia areata and other hair disorders. Although generally well tolerated, emerging evidence suggests an association with ocular adverse drug reactions (ADRs), ranging from mild periocular effects to rare vision-threatening complications.

Objective: To systematically review the published literature on minoxidil-associated ocular ADRs in patients treated for alopecia areata, focusing on ocular manifestations, patient characteristics, suspected mechanisms, causality, management, and outcomes.

Methods: A comprehensive search of PubMed, Scopus, Embase, Web of Science, and Google Scholar was conducted for studies reporting ocular adverse events associated with topical or oral minoxidil. Case reports, case series, and observational studies involving patients with alopecia areata were included. Data on demographics, formulation and dosage, ADR characteristics, onset, management, outcomes, and causality assessment were extracted.

Results: Ocular ADRs associated with minoxidil were uncommon but clinically relevant. Reported manifestations included periorbital edema, eyelid swelling, ocular irritation, conjunctivitis, blurred vision, and excessive eyelash growth. Rare complications, including central serous chorioretinopathy and retinal vascular events, were also reported. Most reactions occurred within days to weeks of treatment initiation or dose escalation and improved after dose reduction or discontinuation. Proposed mechanisms include increased vascular permeability, VEGF-mediated effects, fluid retention, and inadvertent ocular exposure to topical formulations.

Conclusion: Minoxidil-associated ocular ADRs warrant greater clinical awareness. Early recognition and appropriate management, including ophthalmologic evaluation when indicated, may reduce morbidity. Further pharmacovigilance and prospective studies are needed to establish incidence, risk factors, and mechanisms.

Keywords: *Minoxidil, Ocular Adverse Drug Reactions, Alopecia Areata.*

O-09/F/002 ORAL · OFFLINE

Proton Pump Inhibitor Exposure and Risk of Hepatic Encephalopathy in Alcohol-Associated Liver Disease: A Prospective Cohort Study

Gursimran Singh[1]*, Khadga Raj Aran[2]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India*
[2]*Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India*
Email: gsingh.242004@gmail.com

Background and Aim: Prospective data regarding the association between proton pump inhibitor (PPI) use and hepatic encephalopathy (HE) in alcohol-associated liver disease (ALD) patients remains limited in tertiary care hospitals in India. This prospective cohort research aims to determine the influence of high-dose and inappropriate PPI usage on clinical outcomes as well as the relationship between PPI exposure and incident HE in hospitalized patients with ALD.

Methods: A prospective cohort study was done in hospitalized ALD patients at a tertiary hospital. Patients were categorized based on PPI exposure during hospitalization. HE was assessed prospectively using the West Haven criteria. Multivariable logistic regression analysis was used to assess the association between PPI use and HE after adjusting for biochemical, clinical, and demographic factors.

Results: During hospitalization, 75 patients (31.0%) developed HE. HE occurred more often in PPI users than in non-exposed (38.8% vs 23.1%; p=0.008). In multivariable analyses, PPI use remained independently associated with HE (adjusted OR 1.93; 95% CI 1.07–3.47; p=0.029). The association between high-dose PPI medication and a higher risk of HE was clearly dose-responsive (adjusted OR 1.96; 95% CI 1.03–3.75; p=0.041). Inappropriate PPI use was associated with higher ICU transfer, prolonged hospitalization stays, and increased hospitalization cost.

Conclusion: PPI use was independently linked with a higher risk of HE in hospitalized ALD patients. Inappropriate PPI prescribing was associated with poorer clinical and economic outcomes. Careful evaluation of PPI indication, dose, and duration may help to reduce preventable HE burdens in patients with ALD.

Keywords: *Alcohol-associated liver disease, Proton pump inhibitors, Hepatic encephalopathy, Cirrhosis, Prospective cohort study.*

O-09/F/003 ORAL · OFFLINE

Smart Cyclodextrins for Precision Pharmacotherapy: A Systematic Review of Drug Delivery, Pharmacokinetics and AI-Driven Formulation Design

Kamaljeet[1]*, Sourabh Kosey[1]

[1,2]Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India-142001
Email: skamaljeet130@gmail.com

Background: Cyclodextrins (CDs) are versatile pharmaceutical excipients that improve the solubility, stability, dissolution, and bioavailability of poorly water-soluble drugs. Their integration with artificial intelligence (AI), molecular modelling, and advanced formulation strategies is creating new opportunities for precision pharmacotherapy.

Objective: This systematic review evaluated the applications of cyclodextrin-based drug delivery systems, focusing on bioavailability, pharmacokinetic optimization, therapeutic applications, and emerging AI-driven formulation design.

Methods: A systematic literature search was conducted across major electronic databases using keywords related to cyclodextrins, drug delivery, inclusion complexes, pharmacokinetics, bioavailability, artificial intelligence, machine learning, molecular modelling, and formulation optimization. Relevant studies were screened using predefined eligibility criteria, followed by systematic data extraction and qualitative synthesis.

Results: Evidence demonstrates that cyclodextrin complexation can enhance drug solubility, dissolution, stability, and systemic availability across multiple therapeutic and delivery routes. Pharmacokinetic improvements include enhanced absorption and drug exposure. Emerging AI and molecular modelling approaches enable prediction of drug–cyclodextrin interactions and optimization of formulation variables, potentially reducing development time and improving formulation precision. However, limited datasets, model validation, scalability, and clinical translation remain important challenges.

Conclusion: Integration of cyclodextrin technology with pharmacokinetic evaluation and AI-driven formulation design represents a promising approach toward smarter, more effective, and patient-centered pharmacotherapy.

Keywords: *Cyclodextrins, Precision Pharmacotherapy, Drug Delivery, Pharmacokinetics, Artificial Intelligence.*

O-09/F/004 ORAL · OFFLINE

Sequential Deregulation of Natural Killer Cell Subsets and Function During HIV-1 Infection

Kazi Rohit*[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: kazirohitd@gmail.com

Background: Natural killer (NK) cells play a critical role in the early innate immune response against viral infections. Although alterations in NK-cell distribution and function have been reported during chronic HIV-1 infection, the timing and progression of these changes from acute infection remain incompletely characterized. This study investigated the longitudinal changes in NK-cell subsets and their functional activity across different stages of HIV-1 infection.

Methods: A total of 69 participants were evaluated, comprising 14 HIV-1-negative controls, 10 individuals with acute HIV-1 infection, and 45 individuals with chronic HIV-1 infection. The chronic infection group included treated aviremic, treated viremic, untreated viremic, and nonprogressive individuals. NK-cell subsets were characterized using multiparameter flow cytometry based on CD3, CD56, and CD16 expression. Functional activity was assessed by measuring CD107a expression and interferon-γ (IFN-γ) secretion following stimulation. Statistical comparisons among groups were performed using one-way analysis of variance (ANOVA) with Tukey correction.

Results: Acute HIV-1 infection was associated with a significant expansion of the overall NK-cell population, characterized predominantly by an increase in cytolytic $CD3^{-}CD56^{}dim^{}CD16^{+}$ NK cells and an early reduction in immunoregulatory $CD3^{-}CD56^{}bright^{}CD16^{-}$ cells. With persistent viral replication, the $CD56^{}dim^{}CD16^{+}$ NK-cell population subsequently declined, accompanied by an accumulation of $CD3^{-}CD56^{-}CD16^{+}$ NK cells. The latter subset demonstrated markedly impaired functional activity, with limited CD107a expression and cytokine secretion following stimulation. Longitudinal assessment demonstrated that persistent viremia promoted progressive NK-cell subset deregulation, whereas initiation of HAART during acute infection resulted in partial normalization of NK-cell distribution. Functional analyses further demonstrated that $CD56^{}dim^{}CD16^{+}$ NK cells exhibited the greatest cytotoxic response, whereas $CD56^{-}CD16^{+}$ NK cells displayed limited responsiveness, supporting their characterization as a functionally anergic population.

Conclusion: HIV-1 infection induces a sequential disruption of the NK-cell compartment beginning during acute infection. Persistent viral replication is associated with progressive depletion of functionally active NK-cell subsets and expansion of functionally impaired $CD56^{-}CD16^{+}$ NK cells. Early antiretroviral therapy may partially restore normal NK-cell subset distribution, highlighting the importance of early viral suppression in preserving innate immune function.

Keywords: *HIV-1, Natural killer cells, NK-cell subsets, Acute HIV infection, Chronic HIV infection, Viremia, Antiretroviral therapy, Innate immunity.*

O-09/F/005 ORAL · OFFLINE

Two Randomized Trials of Low-Dose Calcium Supplementation in Pregnancy

Mansha Aggarwal[1]*, Mohit Yadav[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), Moga, Punjab-142001, India.*
Email: manshaaggarwal1@gmail.com

Background: The World Health Organization (WHO) recommends a daily calcium intake of 1500–2000 mg, administered in three divided doses, for pregnant women with low dietary calcium consumption to reduce the likelihood of developing preeclampsia. However, adherence to this multiple-dose regimen is often difficult, creating challenges for large-scale implementation. This study investigated whether a simpler low-dose regimen could provide comparable benefits.

Methods: Two separate randomized noninferiority trials were carried out in India and Tanzania to compare the effectiveness of 500 mg versus 1500 mg of calcium supplementation per day during pregnancy. Approximately 11,000 first-time pregnant women participated in each trial. The primary outcomes assessed were the incidence of preeclampsia and preterm birth, with predefined noninferiority margins established for both outcomes.

Results: In both trials, the occurrence of preeclampsia was similar between women receiving the lower and higher calcium doses, indicating that the 500 mg regimen was not inferior to the 1500 mg regimen for preventing preeclampsia. In India, preterm live births occurred less frequently in the 500 mg group than in the 1500 mg group, and the results satisfied the predefined noninferiority criterion. In Tanzania, although the rates of preterm birth were comparable between treatment groups, the findings did not meet the specified noninferiority threshold.

Conclusions: Daily supplementation with 500 mg of calcium demonstrated effectiveness comparable to that of 1500 mg in reducing the risk of preeclampsia in both study populations. For prevention of preterm live birth, the lower dose met the noninferiority criterion in the Indian trial but not in the Tanzanian trial. These findings suggest that a lower calcium dose may be a practical alternative for preventing preeclampsia, while further research is warranted to clarify its effect on preterm birth across different populations.

Keywords: *Calcium, Pregnancy, Supplementation, Preeclampsia, Randomized controlled study, Preterm Birth.*

O-09/F/006 ORAL · OFFLINE

Assessment of Artificial Intelligence Utilization and Its Association with Clinical Learning and Pharmacy Practice Skills Among Pharmacy Students in Punjab: A Cross-Sectional Study

Anisha Jacob*[1], Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: anishajacob0604@gmail.com

Background: Artificial intelligence (AI) is increasingly being integrated into healthcare and pharmacy education, supporting information retrieval, clinical decision-making, drug information, patient counselling, and academic learning. However, evidence regarding AI utilization and its association with clinical learning and pharmacy practice skills among pharmacy students in Punjab remains limited.

Objective: To assess AI utilization patterns among pharmacy students in Punjab and evaluate its perceived association with clinical learning and pharmacy practice skills.

Methods: A cross-sectional study was conducted among 300 undergraduate and postgraduate pharmacy students enrolled in pharmacy institutions across Punjab. Data were collected using a structured, self-administered questionnaire covering demographics, AI utilization patterns, commonly used applications, purposes, perceived benefits and limitations, and impact on clinical learning and pharmacy practice skills. Descriptive statistics, chi-square tests, and correlation analysis were performed.

Results: Overall, 82.0% of students reported using AI for academic or pharmacy-related purposes. Conversational AI tools were most commonly used (68.7%), followed by AI-assisted literature searching (41.3%) and AI-based drug-information applications (32.0%). Approximately 72.0% perceived improved understanding of clinical concepts, while 64.7% reported improved identification of drug-related problems. Frequent AI users demonstrated higher clinical-learning scores than infrequent users. Key concerns included inaccurate information, inadequate source verification, overdependence, and ethical issues.

Conclusion: AI use was common and positively associated with perceived clinical learning and drug-related problem identification, highlighting the need for responsible and guided integration into pharmacy education.

Keywords: *Artificial Intelligence, Pharmacy Students, Clinical Learning, Pharmacy Practice, Clinical Skills, Pharm D, Punjab.*

O-09/F/007 ORAL · OFFLINE

Women's Status and Experiences of Mistreatment During Childbirth in Uttar Pradesh: A Mixed Methods Study Using Cultural Health Capital Theory

Abhishek Vijukumar*[1], Sourabh kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: abhishekvs2020@gmail.com

This study explores women's experiences of mistreatment during childbirth among slum-resident women in Uttar Pradesh, India, using both quantitative and qualitative data. The study applies the Cultural Health Capital (CHC) framework to understand how women's social and cultural backgrounds influence their expectations and perceptions of healthcare. Among the 392 women included in the quantitative sample, more than 57% reported experiencing at least one form of mistreatment during childbirth. Interviews with 26 women showed that those with limited knowledge, social status, and cultural health capital were often disadvantaged in their interactions with healthcare providers. Women explained that healthcare providers established expectations about appropriate behaviour and procedures, which some patients struggled to understand. They also described using personal or social resources to improve the care they received. Interestingly, some women blamed themselves for lacking sufficient knowledge about healthcare practices. Overall, the study highlights that limited cultural health capital can contribute to disrespectful or poor-quality maternity care, while women's low expectations and lack of information may further shape their experiences and perceptions of childbirth care.

Keywords: *Mistreatment, Disrespectful care, India, Quality of care, Women, Slum, Cultural health capital.*

O-09/F/008 ORAL · OFFLINE

Evaluation of Suspected Adverse Drug Reactions of Antimicrobial and Antidiabetic Drugs: A Prospective Observational Study in A Tertiary Care Hospital

Piyush Chandel*[1], Mohd Haneef[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: chandelpiyush97@gmail.com

Background: Adverse drug reactions (ADRs) are an important cause of morbidity, prolonged hospitalization, increased healthcare expenditure, and reduced quality of life. Antimicrobial and antidiabetic drugs are frequently prescribed in hospitalized patients and may be associated with clinically significant adverse reactions. Systematic detection, evaluation, and reporting of ADRs are therefore essential for improving medication safety.

Objective: The present study aimed to evaluate the suspected adverse drug reactions associated with antimicrobial and antidiabetic drugs in patients admitted to a tertiary care hospital and to assess their causality, severity, and preventability.

Methods: A prospective observational study was conducted over a period of six months in the inpatient departments of a tertiary care hospital. Patients aged ≥18 years who received antimicrobial or antidiabetic therapy and developed a suspected ADR during hospitalization were included. Patients unwilling to participate and those below 18 years of age were excluded. Suspected ADRs were collected using a structured data-collection form and evaluated using the WHO–UMC causality assessment system, Hartwig and Siegel severity scale, and Schumock–Thornton preventability scale. Descriptive statistics were used to summarize the findings.

Results: A total of 420 patients receiving antimicrobial or antidiabetic therapy were monitored, of whom 86 patients developed 94 suspected ADRs. Antimicrobials accounted for 59 (62.8%) ADRs, while antidiabetic drugs accounted for 35 (37.2%). Gastrointestinal disturbances (27.7%), hypoglycaemia (18.1%), cutaneous reactions (16.0%), and diarrhea (11.7%) were among the commonly observed reactions. Ceftriaxone, amoxicillin-clavulanic acid, metronidazole, insulin, and metformin were frequently suspected drugs. According to the WHO–UMC system, 44.7% of reactions were classified as probable/likely and 38.3% as possible. Most ADRs were of moderate severity according to the Hartwig and Siegel scale. Approximately 57.4% of ADRs were considered probably preventable according to the Schumock–Thornton criteria.

Keywords: *Adverse Drug Reactions, Antimicrobial Drugs, Antidiabetic Drugs, Pharmacovigilance, WHO–UMC, Hartwig and Siegel, Schumock–Thornton, Tertiary Care Hospital.*

O-09/F/009 ORAL · OFFLINE

Assessment of Migraine Prevalence, Severity, and Self-Medication Practices Among Pharmacy Students in Punjab: A Digital Framework for Future AI-Enabled Risk Stratification

Manshi Kiran Kushal[1]*, Khadga Raj Aran

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College)
Near Ghal Kalan, Moga, Punjab- 142001
Email: manshikirankushal@gmail.com

Introduction: Migraine is a common neurological condition that may affect academic achievement, functioning, and quality of life. This is especially true for students attending universities, who are likely under more academic stress and have erratic sleeping habits and lifestyles. Headache symptom recognition and use of OTC medications can also contribute to inappropriate use of medication and/or to the development of medication-overuse headache (MOH). But there is limited data available regarding the burden of migraine and medication use behaviour amongst the pharmacy students in Punjab.

Aim and objectives: The objective was to determine the prevalence, severity, disability, and self-medication practices of migraine disorder among Pharmacy students of Punjab, India, and the pattern of medication use that might be associated with MOH risk.

Methods: A cross-sectional study will be carried out using a questionnaire on pharmacy students in Punjab. A structured digital questionnaire will be used that includes migraine screening, migraine severity and disability assessment, self-medication practices, and medication use frequency. A process-integrated automated scoring system will provide pre-defined feedback to the participants at the participant level. Demographic and lifestyle characteristics, migraine-related and medication-use characteristics will then be analysed to delineate the burden of migraine and patterns associated with it. The structured data collected can serve as a basis for future predictive modelling and risk stratification using AI technology.

Expected outcomes: The expected outcomes of the study are to provide baseline data about the burden of migraine, migraine severity, disability, and self-medication of migraine among pharmacy students. The further development of AI-based modelling in combination with pharmaceutical and QbD approaches could help to personalize the risk assessment and contribute to the development of more effective treatments for migraine management.

Conclusions: The results of this study establish a digital platform that connects clinical evaluation with the current data-driven approaches, setting the stage for the transition of migraine monitoring to medicine personalized by AI.

Keywords: *Medication-Overuse Headache, AI, Migraine, Pharmacy, QbD Approaches.*

O-09/F/010 ORAL · OFFLINE

Cardioprotective Glucose-Lowering Agents and Dementia Risk: A Systematic Review and Meta-Analysis

Harpreet Kaur*[1], Madhaw Dwivedi[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: kaurharpreetb07@gmail.com

Background: Diabetes mellitus is a well-established risk factor for dementia, but whether glucose-lowering treatment actually lowers dementia risk and whether this effect differs across cardioprotective drug classes has remained unclear.

Objective: To determine whether cardioprotective glucose-lowering therapies (SGLT2 inhibitors, GLP-1 receptor agonists, metformin, and pioglitazone) are associated with reduced risk of dementia or cognitive impairment, overall and by dementia subtype, compared with controls.

Methods: PubMed and Embase were searched from database inception through July 2024 for randomized clinical trials comparing cardioprotective glucose-lowering therapy with placebo, usual care, or no treatment, in adults without pre-existing cognitive impairment, with a minimum 6-month follow-up. Two reviewers independently extracted data following PRISMA guidelines, and risk of bias was assessed using the Cochrane RoB 2 tool. Random-effects meta-analysis was used to pool odds ratios (ORs) for dementia/cognitive impairment.

Results: Twenty-six trials (N = 164,531) met inclusion criteria; 23 trials (n = 160,191) reported dementia or cognitive impairment outcomes (12 SGLT2i trials, 10 GLP-1RA trials, 1 pioglitazone trial; no eligible metformin trials were found). Mean age was 64.4 years; 34.9% were women. Overall, cardioprotective therapy showed no significant reduction in dementia/cognitive impairment (OR 0.83, 95% CI 0.60–1.14). GLP-1RAs alone showed a statistically significant reduction (OR 0.55, 95% CI 0.35–0.86), while SGLT2is did not (OR 1.20, 95% CI 0.67–2.17; P for heterogeneity = .04). No significant drug-class effects emerged for vascular or Alzheimer dementia specifically.

Conclusion: While cardioprotective glucose-lowering therapy as a whole did not reduce dementia risk, GLP-1 receptor agonists specifically were linked to a significant reduction, pointing to a drug-class-specific neuroprotective effect that warrants dedicated randomized trials.

Keywords: *Type 2 Diabetes Mellitus, Dementia, Cognitive Impairment, GLP-1 Receptor Agonists, SGLT2 Inhibitors, Meta-Analysis.*

O-09/F/011 ORAL · OFFLINE

Leveraging Standardized Screening Tools for Anxiety and Depression Assessment in CAD Patients: Enhancing Contemporary Pharmacy Practice

Deepanshi[1]*, Madhaw Dwivedi[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College)
Email: deepanshii8685@gmail.com

Background: Coronary artery disease (CAD) is a significant cardiovascular disease (CVD) with a high morbidity and mortality rate, as well as psychological issues like anxiety and depression. These psychological symptoms can have a negative impact on medication compliance, lifestyle modifications, treatment engagement, and quality of life. Anxiety and depression are clinically important conditions but may not be recognized during routine cardiovascular care. Standardized psychological screening in clinical pharmacy practice could allow easier identification of patients who need appropriate counselling, monitoring and referral.

Objective: To assess the severity of anxiety and depression in patients with CAD using a standardized approach to screening and to identify the possible contribution of clinical pharmacists to the incorporation of mental health assessment in modern cardiovascular care.

Methods: This is an observational study with a hospital-based approach which will be conducted in one tertiary care hospital in Punjab, India. Eligible participants will be assessed with Hospital Anxiety and Depression Scale (HADS), which includes anxiety subscale (HADS-A) and depression subscale (HADS-D). Patient demographic and pertinent clinical features will be recorded as well. HADS scores will determine the presence and severity of anxiety and depressive symptoms. These results will be considered when looking at potential for cardiovascular screening, counselling, monitoring, and timely referral by a pharmacist within a multidisciplinary approach to cardiovascular care.

Results: The study will be able to highlight a clinically relevant burden of anxiety and depressive symptoms in CAD patients and contribute to the understanding of the need for systematic psychological screening in cardiovascular services.

Conclusions: Standardized screening can enhance the identification of psychological issues in CAD patients and increase the scope of clinical pharmacists beyond medication-related care. Use of HADS and other validated instruments in pharmacy practice could facilitate patient-centered, holistic and modern cardiovascular care and help ensure early identification, counselling, referral and follow-up of patients with psychological issues.

Keywords: *HADS, Anxiety, Depression, Coronary Artery Disease, HADS-A, HADS-D.*

O-09/F/012 ORAL · OFFLINE

AI-based Differential Diagnosis of Dementia Etiologies on Multimodal Data

Issac V Cherian*[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: issaccherian06@gmail.com

Background- Working out exactly which disease is causing a patient's dementia is one of the harder calls in neurology, since so many different underlying conditions produce nearly the same symptoms on the surface.

Objective- To build and test an AI model that draws on a wide range of patient information (demographics, personal and family medical history, medications, cognitive testing, functional status, and multimodal brain imaging) to identify the specific disease or diseases driving dementia in individual patients.

Methods- The team trained and evaluated the model on records from 51,269 people across nine separate, geographically distinct cohorts, sorting patients into 10 distinct dementia subtypes. Diagnoses that call for similar treatment approaches were grouped together, and the system was designed to keep performing reasonably well even when parts of a patient's data were missing.

Results- The model distinguished normal cognition, mild cognitive impairment, and dementia with a microaveraged AUROC of 0.94, and reached 0.96 when separating the specific dementia subtypes from one another. It also handled the messier, mixed-pathology cases reasonably well, scoring a mean AUROC of 0.78 for patients with two overlapping disease processes. In a smaller test of 100 randomly selected cases, neurologists who had the AI's output available scored over a quarter higher (26.25%) than those working without it. The model's calls also matched up with independent biomarker evidence, and in cases where autopsy data later became available, its predictions about which abnormal proteins were driving the disease held up.

Conclusion- The authors position this as a candidate screening tool for both routine dementia workups and for identifying suitable patients for drug trials, while noting that prospective studies are still needed before it can be confirmed to actually improve patient outcomes.

Keywords: *Artificial Intelligence, Dementia, Differential Diagnosis, Multimodal Data, Neuroimaging, Clinical Decision Support.*

O-09/F/013 ORAL · OFFLINE

Cyclodextrin-Based Strategies for Repurposing Poorly Soluble Drugs

Avleen Kaur[1]*, Dilpreet Kaur Grewal[1], Pankaj Kumar Maurya[2]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India (An Autonomous College)*
[2]*Division of Neuroscience, Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, India (An Autonomous College)*
Email: avleenkjisfcp@gmail.com

Introduction: Drug repurposing is an efficient approach for identifying new therapeutic uses for existing drugs. However, many repurposed drugs have poor aqueous solubility, which can reduce dissolution, bioavailability, pharmacokinetic performance, and therapeutic efficacy. Cyclodextrins (CDs) are versatile pharmaceutical excipients that can improve the solubility and delivery of poorly water-soluble drugs through host–guest inclusion complex formation. Both native and modified CDs have therefore gained attention as useful formulation tools for improving the pharmaceutical performance of repurposed drugs.

Aim and Objectives: This review aims to evaluate the potential of cyclodextrin-based strategies for improving the delivery and therapeutic performance of poorly soluble repurposed drugs. The objectives are to explain the mechanisms of CD-mediated drug solubilization, discuss the role of native and modified cyclodextrins, examine different CD-based delivery approaches, including inclusion complexes, ternary systems, and nanocarriers, and evaluate their effects on drug dissolution, stability, bioavailability, and therapeutic activity.

Methodology: A narrative literature review was conducted to investigate the use of cyclodextrin-based systems for improving the delivery of poorly soluble repurposed drugs. Relevant research and review articles were searched using Google Scholar and PubMed. The literature search focused on keywords related to drug repurposing, poorly soluble drugs, cyclodextrins, inclusion complexes, β-cyclodextrin, hydroxypropyl-β-cyclodextrin, methyl-β-cyclodextrin, sulfobutyl ether-β-cyclodextrin, nanocarriers, solubility, bioavailability, and drug delivery. The collected literature was reviewed and organized according to CD-mediated solubilization mechanisms, formulation strategies, drug-release characteristics, pharmacokinetic performance, and therapeutic applications.

Conclusion: Cyclodextrin-based technologies provide a promising approach for overcoming the solubility and formulation challenges associated with repurposed drugs. Inclusion complexation and advanced CD-based delivery systems can improve drug dissolution, stability, bioavailability, and therapeutic performance. Native and modified CDs, as well as ternary complexes and nanocarrier systems, offer different opportunities for optimizing the delivery of poorly soluble drugs. However, challenges related to formulation optimization, safety, scalability, regulatory requirements, and clinical translation remain. Overall, cyclodextrin-based strategies have considerable potential to increase the pharmaceutical and therapeutic value of poorly soluble drugs identified through drug-repurposing approaches.

Keywords: *Drug Repurposing, Cyclodextrins, Poorly Soluble Drugs, Inclusion Complexes, Drug Delivery, Bioavailability, β-Cyclodextrin, Nanocarriers.*

O-09/F/014 ORAL · OFFLINE

Incidence, Pattern, and Predictors of Polypharmacy-Induced Adverse Drug Reactions in A Tertiary Care Hospital in Punjab

Sheikh Mohammad Faisal*[1], Madhaw Dwivedi[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: faisalsheikh6508@gmail.com

Background: The rapid evolution and increasing use of medical devices have improved diagnosis, treatment, monitoring, and patient care. However, complex devices may also introduce risks related to malfunction, design or manufacturing defects, improper use, compatibility issues, and device-associated adverse events. While pre-market evaluation establishes safety and performance, some risks become evident only during routine clinical use. Materiovigilance is therefore essential for post-market medical device safety surveillance through identification, assessment, reporting, and prevention of device-related adverse events.

Objective: This narrative review explores the evolving role of materiovigilance in medical device safety, focusing on adverse-event reporting, post-market surveillance, safety-signal detection, risk assessment, and emerging approaches to strengthen device safety.

Methodology: A narrative literature review was conducted using PubMed, Scopus, Web of Science, and Google Scholar. Literature addressing materiovigilance, medical device-related adverse events, post-market surveillance, device malfunction, safety monitoring, risk management, and medical device reporting was reviewed. Relevant regulatory and pharmacovigilance frameworks were also considered, with emphasis on incident patterns, contributing factors, reporting mechanisms, safety-signal detection, and challenges in post-market monitoring.

Key Findings: Device-related adverse events may result from design and manufacturing issues, material problems, software failures, improper use, inadequate training, maintenance deficiencies, and patient-related factors. Under-reporting, limited awareness, inconsistent reporting, incomplete information, and fragmented surveillance systems remain major challenges. Electronic reporting, real-world evidence, artificial intelligence, automated signal detection, and improved stakeholder coordination may strengthen materiovigilance.

Conclusion: Materiovigilance enables continuous assessment of medical device safety during real-world use. Strengthening reporting, awareness, systematic post-market surveillance, and digital technologies can support earlier safety-signal detection, effective risk mitigation, regulatory decision-making, and improved patient safety.

Keywords: Materiovigilance, Medical Devices, Post-Market Surveillance, Medical Device Safety, Adverse Events, Safety Signals, Risk Management

Keywords: *Polypharmacy, Adverse Drug Reactions, Incidence, Predictors, Pharmacovigilance, Hospitalized Patients, Tertiary Care Hospital.*

O-09/F/015 ORAL · OFFLINE

Prevalence of Metabolic Syndrome and Associated Risk Factors among Children and Adolescents in a Tertiary Care Hospital in North India: A Cross-Sectional Study

Paras Monga[1*], Rina Das[1], Bimal Kumar Agrawal[2], Dinesh Kumar Mehta[1*]

[1]Department of Pharmaceutical Sciences, MM College of Pharmacy, Maharishi Markandeshwar (Deemed to be university), Mullana-133207, Ambala, Haryana, India

[2]Department of General Medicine, Maharishi Markandeshwar Institute of Medical Science and Research, Maharishi Markandeshwar (Deemed to be university), Mullana-133207, Ambala, Haryana, India

Email: drparasmonga@gmail.com

Background: Metabolic syndrome (MetS) has emerged as a significant health concern among children and adolescents worldwide, largely driven by increasing rates of obesity and sedentary lifestyles.

Purpose: This study aimed to assess the prevalence of metabolic syndrome and examine its association with sociodemographic, anthropometric, and familial factors among pediatric patients attending a tertiary care hospital in North India.

Methods: A cross-sectional observational study was conducted among 500 participants aged 6–18 years, equally divided into metabolic (n=250) and non-metabolic (n=250) groups using purposive sampling. Participants underwent standardized anthropometric assessments (weight, height, BMI, waist/hip circumference, blood pressure) as per WHO guidelines and completed validated sociodemographic questionnaires. MetS was diagnosed using modified ATP-III criteria for pediatrics. Data were analyzed using SPSS v26 (t-tests, chi-square, multivariate logistic regression; $p<0.05$).

Results: MetS prevalence was 12.9% using modified ATP-III criteria, with low HDL-cholesterol most common (58.3%, 95% CI: 53.4–63.0%). The metabolic group exhibited significantly higher BMI (28.0±4.5 vs. 22.1±3.2), waist circumference (87.0±10.1 vs. 74.5±8.9), and blood pressure (all $p<0.001$). Multivariate regression identified obesity (OR 12.2, 95% CI: 8.0–18.4), family history (OR 2.3, 95% CI: 1.6–3.4), and urban residence (OR 1.7, 95% CI: 1.2–2.4) as independent predictors (all $p<0.001$).

Conclusions: This study confirms high pediatric MetS prevalence in the North India population, driven by obesity, urbanization, and genetic predisposition. Early screening and targeted lifestyle interventions for at-risk urban adolescents are urgently needed to mitigate long-term cardiovascular risk.

Keywords: *Metabolic syndrome, pediatrics, adolescents, obesity, anthropometry, ATP-III criteria, urban-rural*

O-09/F/016 ORAL · OFFLINE

Evaluating the Impact of Iron Deficiency Anaemia on Quality of Life Using the FACT-Anemia Scale in Tertiary Care Hospital

Arvind Kumar[1]* Dr. Khadga Raj Aran[1,2]

[1]Department of Pharmacy Practice, ISF College of Pharmacy, Moga, 142001

[2]Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab, 142001

Email: arvindky2003@gmail.com

Background: Iron deficiency anemia is a health problem that has a big effect, on how people feel and how they live their lives. Even though it is known to cause health issues more research is needed to understand how it affects the way people feel about their health.

Aim: To look at how iron deficiency anemia affects the quality of life using the Functional Assessment of Cancer Therapy (FACT) – Anemia scale, with people who come to a tertiary care facility.

Method: We carried out a study at a tertiary care hospital. The study focused on patients with iron deficiency anemia. We gathered clinical information such as age, gender, hemoglobin levels and symptoms. To assess quality of life we administered the FACT-Anemia questionnaire, which examines social/family, emotional and functional well-being as well as anemia-related symptoms. Then we applied inferential statistical methods to explore the link, between the severity of iron deficiency anemia and quality-of-life scores. We also looked at how the intensity of iron deficiency anemia might impact quality of life.

Results: It was expected that people with iron deficiency anaemia would have trouble with tasks. They would feel tired. They would have energy. Their general health would be worse. Lower levels of haemoglobin might mean scores for quality of life. This is especially true, for functional parts of life. The results can help find the parts of life that are most affected by anaemia.

Conclusion: Iron deficiency anemia can hurt parts of a person's daily life. The FACT-Anemia scale gives a way to measure these effects. It helps doctors check how the condition affects patients. This tool can lead to care plans and more careful tracking of treatment. Using it in healthcare settings can improve how patients are treated. It puts the patient's needs at the center of care.

P-09/F/001 POSTER · OFFLINE

Artificial Intelligence in Adverse Drug Reaction Prediction: Transforming Pharmacovigilance from Reactive to Predictive.

Ayush Bansotra[1]*, Sania Grover

[1]*ISF College of Pharmacy, Ghal Kalan, Moga, Punjab, 142001*
Email: bansotraayush@gmail.com

Adverse drug reactions (ADRs) remain a major challenge in healthcare because they can cause patient harm, increase healthcare costs, and may be detected late through conventional pharmacovigilance. Spontaneous reporting and post-marketing surveillance are valuable but can be affected by under-reporting and delayed identification of safety signals. The objective is to describe the role of artificial intelligence (AI) in earlier prediction of ADRs and to examine how AI can support a proactive, patient-centred approach to pharmacovigilance. A narrative review approach was used to examine the potential application of machine learning, deep learning, natural language processing, and knowledge-based models to pharmacovigilance data. Relevant data sources include electronic health records, clinical reports, drug databases, biomedical literature, and spontaneous reporting systems. AI-based approaches can analyse large and diverse datasets to identify patterns, predict possible drug–ADR associations, detect safety signals, and recognise patient groups that may have a higher risk of adverse events. These capabilities may support healthcare professionals and regulatory bodies in making earlier and better-informed safety decisions. AI can strengthen pharmacovigilance by processing diverse clinical and drug-safety information and providing earlier indications of possible ADR risks, supporting timely preventive action. AI has the potential to shift pharmacovigilance from a mainly reactive process toward a proactive and predictive model. However, reliable implementation requires attention to data quality, reporting bias, patient privacy, algorithmic bias, model interpretability, validation, and regulatory requirements.

Keywords: *Adverse Drug Reactions, Pharmacovigilance, Artificial Intelligence, Machine Learning, Safety signals, Patient safety.*

P-09/F/002 POSTER · OFFLINE

Translation of the Modified Polycystic Ovary Syndrome Questionnaire (mPCOSQ) and the Polycystic Ovary Syndrome Quality of Life Tool (PCOSQOL) in Dutch and Flemish Women with PCOS

Janvi[1]*, Ayushreeya Banga[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: kambojjanvi1313@gmail.com

Background- Polycystic ovary syndrome (PCOS) affects 8–15% of women of reproductive age and commonly brings psychological, physical, reproductive, and metabolic symptoms that reduce quality of life. The mPCOSQ and the newer PCOSQOL are disease-specific quality-of-life instruments, but neither had been validated for Dutch-speaking populations before this study. Objective- To determine the test-retest reliability of Dutch versions of the mPCOSQ and PCOSQOL, confirm their domain structures, and identify which of the two instruments women with PCOS prefer.

Methods- Both questionnaires were forward- and backward-translated into Dutch. Women with PCOS in the Netherlands and Belgium completed the mPCOSQ and PCOSQOL online at home at baseline (T0) and again two to four weeks later (T1). Internal consistency was assessed with Cronbach's alpha, test-retest reliability with the intraclass correlation coefficient (ICC), and domain structure with principal components factor analysis using varimax rotation.

Results- A total of 245 women (64 from Belgium, 181 from the Netherlands) completed both questionnaires at both time points. The 30-item mPCOSQ showed excellent internal consistency (α = 0.95) and ICCs of 0.88–0.96 across its six domains. The 35-item PCOSQOL showed comparable internal consistency (α = 0.96) and ICCs of 0.91–0.96 across its four domains. Factor analysis largely confirmed the mPCOSQ's original six-domain structure, with two items shifting domains. The PCOSQOL's structure expanded from four domains to five, with a new "coping with PCOS" domain splitting off from "impact of PCOS." Most participants (55.9%) had no preference between the two instruments. Belgian women reported significantly better quality of life than Dutch women on both measures, a gap the authors linked partly to lower BMI among the Belgian participants. Conclusion- The Dutch mPCOSQ and PCOSQOL are both reliable, disease-specific quality-of-life instruments for women with PCOS and are recommended for use in clinical practice and research.

Keywords: *Polycystic Ovary Syndrome, Quality of Life, mPCOSQ, PCOSQOL, Questionnaire Validation.*

P-09/F/003 POSTER · OFFLINE

A Multi-Pathway Blood Biomarker Approach for Early Detection and Staging of Alzheimer's Disease Across Diverse Populations

Alok Kumar[1]*, Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: aloklapi7@gmail.com

Background: Alzheimer's disease (AD) is a progressive neurodegenerative disorder in which early diagnosis remains challenging. Conventional blood biomarkers mainly focus on amyloid, tau, and neurodegeneration, while other biological processes, including inflammation, innate immunity, vascular dysfunction, and metabolic alterations, may also contribute to disease progression.

Objective: This review discusses the potential of multi-pathway blood-based biomarkers for the early detection, classification, and staging of AD, with emphasis on emerging multiplex proteomic approaches.

Discussion: Recent evidence has demonstrated the utility of a 21-protein plasma biomarker panel representing neurodegeneration, inflammation, innate immunity, vascular functions, and metabolic activities. Across independent cohorts of Chinese and European-descent populations, the panel demonstrated strong discriminatory performance for AD (AUC 0.9407–0.9867) and mild cognitive impairment (MCI) (AUC 0.8434–0.8945). Biomarker-derived risk scores were associated with cognitive performance, amyloid pathology, and neurodegeneration. Furthermore, differences in biological-process dysregulation between populations suggest that AD involves substantial molecular heterogeneity. Multi-pathway profiling may therefore provide information beyond conventional ATN-based biomarkers.

Conclusion: Blood-based multi-pathway biomarker approaches represent a promising strategy for minimally invasive early AD detection, disease staging, biological characterization, and patient stratification, with potential applications in precision medicine

Keywords: *Alzheimer's Disease, Blood Biomarkers, Multi-Pathway Assay, Mild Cognitive Impairment, Amyloid Pathology.*

P-09/F/004 POSTER · OFFLINE

From Home Monitoring to Better Control: A Digital Approach to Hypertension Management

Ayush Kumar[1]*, Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: 2501407@isfcp.org

Background: Hypertension is a major modifiable cardiovascular risk factor, yet achieving adequate blood pressure control remains challenging in routine primary care. Digital health interventions combining home blood pressure monitoring with individualized coaching have emerged as potential approaches to improve patient engagement and hypertension self-management.

Objective: This review discusses the potential role of digital blood pressure monitoring and personalized coaching in improving hypertension management within primary care settings

Discussion: Evidence from pragmatic clinical research suggests that integrating home blood pressure monitoring with digital coaching can provide continuous feedback and lifestyle-oriented support beyond conventional clinic-based care. Digital interventions may facilitate regular blood pressure assessment, strengthen patient engagement, and encourage individualized lifestyle modification. Reported changes in blood pressure control during follow-up indicate that combining remote monitoring with personalized guidance may support more continuous hypertension management. Such approaches can potentially bridge the gap between periodic clinical consultations and patients' day-to-day self-management, while providing healthcare professionals with additional opportunities to monitor treatment response.

Conclusion: Digital blood pressure coaching represents a promising patient-centered strategy for hypertension management. The integration of remote blood pressure monitoring with personalized lifestyle guidance may enhance ongoing patient engagement and support improved blood pressure control in primary care.

Keywords: *Hypertension, Digital Health, Blood Pressure Monitoring, Digital Coaching, Remote Monitoring.*

P-09/F/005 POSTER · OFFLINE

Targeted Antimicrobial Therapy Through Stewardship: Increasing Culture-Guided Prescribing and De-escalation to Optimize Outcomes

Sanchi Gupta*[1], Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India*
Email: sanchigupta1353@gmail.com

Introduction: Empirical broad-spectrum antibiotic use accelerates antimicrobial resistance (AMR). Antimicrobial Stewardship Programmes (ASPs) promote targeted therapy using microbiology cultures, rapid diagnostics and de-escalation to optimize prescribing while preserving future treatment options.

Aim and Objective: To evaluate the impact of ASP-driven targeted therapy on antibiotic utilization, prescribing appropriateness and patient outcomes.

Methods: Narrative synthesis of open-access studies examining culture-guided therapy, de-escalation and rapid diagnostic support stewardship in inpatient settings. Interventions included prospective audit and feedback, formulary restriction, culture-based de-escalation, rapid blood-culture identification with pharmacist-led recommendations and point-prevalence monitoring of empirical versus targeted antimicrobial therapy. Outcomes included bacterial culture rates, empirical prescribing, de-escalation frequency, time to targeted therapy, length of stay (LOS), mortality and antibiotic consumption.

Results: ASPs substantially increased culture-guided prescribing. In an Indian tertiary centre, bacterial culture rate rose from 47% to 78% and empirical antibiotic use fell from 53% to 22% over one year. In a US hospital, 63% of broad empiric regimens were de-escalated within 72 hours; de-escalated patients had shorter LOS (6 vs 10 days) and lower mortality (9% vs 24%). Rapid diagnostics plus pharmacist-led stewardship reduced time to targeted antibiotics from 22 to 2 hours and LOS from 8 to 6.5 days, with significant reductions in mortality and readmissions. Culture-guided therapy increased de-escalation (57% vs 16%), shortened antibiotic duration (8.1 vs 10.4 days) and reduced LOS (8.9 vs 11.6 days) without compromising outcomes.

Conclusion: Stewardship-focused targeted therapy shifts prescribing from empirical to culture-guided regimens, accelerates de-escalation, shortens therapy and hospitalization, and supports AMR containment without worsening clinical outcomes.

Keywords: *Antimicrobial Stewardship, Targeted Therapy, De-Escalation, Culture-Guided Prescribing, Antimicrobial Resistance.*

P-09/F/006 POSTER · OFFLINE

Herbal-Drug Interactions in Cancer Patients Receiving Chemotherapy – Focus on St. John's Wort and Turmeric Tea

Harshita[1]*, Ayushreeya Banga[1], Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India*
Email: harshita2439583@gmail.com

Introduction: The concomitant use of herbal remedies with standard cancer therapy is common among cancer patients. Despite their natural origin, herbal medicines may cause adverse effects, interact with anticancer drugs, and modulate the treatment outcome.

Aim & Objectives: To review herbal-drug interactions in cancer patients undergoing chemotherapy, with special consideration of St. John's Wort and turmeric tea use, and to discuss their clinical implications.

Methods: Narrative literature research was performed using databases of peer-reviewed journals, pharmacological resources, and relevant scientific literature. Published reports on the mechanisms of herb-drug interactions, including the effects on P-glycoprotein, CYP enzymes, and other transporters and metabolic pathways, were included in the analysis.

Results: St. John's Wort was reported to cause significant interactions with various anticancer drugs due to induction of CYP3A4 and P-glycoprotein. Concurrent use of this herbal preparation may lead to decreased efficacy of several cancer therapies. Turmeric and its active compound curcumin were found to interact with CYP enzymes and P-glycoprotein and may increase the risk of bleeding and decrease the exposure to certain anticancer drugs. The clinical relevance of these interactions depends on the dose and formulation of the herbal products.

Summary and Conclusion: Herbal medicines may cause clinically significant interactions with various anticancer drugs. These interactions are difficult to predict due to the complexity of their metabolic pathways. Despite the benefits of phytotherapeutic agents in cancer patients, their use may be limited by adverse effects, including interactions with standard chemotherapy.

Recommendations: Cancer patients taking herbal medicines should be advised to inform their healthcare providers about all concurrent prescriptions. Pharmacists can play a pivotal role in herb-drug interaction prevention by individualized assessment of each patient's medication regimen and comprehensive counseling on the potential benefits and risks of herbal medicine use.

Keywords: *Herbal-Drug Interactions, Cancer, Chemotherapy, St. John's Wort, Turmeric, Pharmacovigilance.*

P-09/F/007 POSTER · OFFLINE

Assessment of Antioxidant Supplementation on The Neuropathic Pain Score and Quality of Life in Diabetic Neuropathy Patients – A Randomized Controlled Study

Harsh [1]*, Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: harshthakur18200@gmail.com

Background: Epilepsy is characterized by recurrent seizures involving neuronal hyperexcitability, neuroinflammation, oxidative stress, and network remodeling. Increasing evidence suggests that blood–brain barrier (BBB) dysfunction contributes to epileptogenesis, seizure recurrence, and pharmacoresistance.

Objective: To critically review the clinical and translational relevance of BBB dysfunction in epilepsy, focusing on mechanisms, biomarkers, neuroimaging, pharmacoresistance, and emerging therapeutic strategies.

Methods: A focused literature review examined evidence linking BBB dysfunction with epilepsy, including endothelial tight-junction disruption, matrix metalloproteinases (MMPs), vascular endothelial growth factor signaling, inflammation, oxidative stress, astrocytic and pericytic dysfunction, and altered efflux transporters. Evidence on blood/CSF biomarkers, dynamic contrast-enhanced MRI, antiseizure drug exposure, and BBB-targeted therapies was also evaluated.

Results: BBB dysfunction involves increased permeability associated with tight-junction alterations, MMP activity, inflammatory signaling, oxidative stress, and astrocytic/pericytic dysfunction. MMP-2, MMP-9, and albumin quotient may serve as potential biomarkers, while dynamic contrast-enhanced MRI enables non-invasive assessment of BBB permeability. Altered efflux transporters, particularly P-glycoprotein, may influence antiseizure drug exposure and pharmacoresistance. Emerging approaches include BBB restoration, transporter modulation, focused ultrasound, nanoparticle-based delivery, and targeted brain delivery. However, biomarker standardization, imaging variability, safety, scalability, and regulatory challenges remain.

Conclusion: BBB dysfunction has potential diagnostic, prognostic, and therapeutic relevance in epilepsy. Integrating BBB biomarkers, neuroimaging, electrophysiology, and clinical outcomes may support precision-oriented strategies for BBB-targeted epilepsy management.

Keywords: Blood–Brain Barrier; Epilepsy, BBB dysfunction; Neurovascular Unit, Biomarkers, Neuroimaging, Pharmacoresistance, Antiseizure Medications, Drug Delivery, BBB-Targeted Therapy.

Keywords: *Antioxidant, Vitamin E, Diabetic Neuropathy, Quality of Life.*

P-09/F/008 POSTER · OFFLINE

Storage and Safe Disposal of Unwanted/Unused and Expired Medicines: A Descriptive Cross-Sectional Survey among Indian Rural Population

Keshav Gupta[1]*, Madhaw Dwivedi[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan–142001, Moga, Punjab, India
Email: 2216747@isfcp.org

Background: Because of the growing use of pharmaceutical products, an increasing amount of unwanted, unused, and expired medicines has built up in homes. In India, the absence of clear instructions for patients on how to properly store and get rid of medicines may lead to a higher risk of accidental poisoning and environmental hazards. It is therefore important to evaluate the ways in which the public stores and disposes of unwanted, unused, and expired medicines if we are to promote safe management of pharmaceutical waste.

Objective: The aim of the study is to examine the ways in which people in rural and urban areas of India store their unwanted, unused, and expired medicines and to look at the methods they use for their safe disposal.

Methods: A narrative review of published literature on the storage, disposal, environmental and public-health implications of unused and expired medicines, medicine take-back programs, community pharmacy involvement, and patient education was undertaken. Over a period of one year, from December 2015 to November 2016, a descriptive, observational, prospective cross-sectional survey was carried out in randomly chosen households located in both rural and urban areas of the Nilgiris district in Tamil Nadu, India. A pretested, self-administered, structured questionnaire with 27 questions was employed. This questionnaire had first been pilot-tested with 80 participants and then altered to improve its clarity and simplicity. People aged between 18 and 85 years who had been exposed to the use of medicine were included in the study. The data were analysed using SPSS version 21.0, and the chi-square test was applied to examine any associations.

Results: Narrative review of published literature on the storage, disposal, environmental and public-health implications of unused and expired medicines, medicine take-back programs, community pharmacy involvement, and patient education was undertaken. 1,000 people filled out the questionnaire, giving an 83% response rate. Unwanted or unused medicines were found in 58.3% of households, and 29.3% of the households had expired medicines. The most frequent reason for keeping medicines was the expectation of using them in the future (39.2%), then came the expiry of the medicine (22.8%) and self-discontinuation (20.3%). The method most commonly used for disposing of the medicines was to throw them in the trash (78.6%), while only 4% of the participants returned any unwanted, unused or expired medicines to a pharmacy. Furthermore, 57.9% of the participants said that they had received advice from pharmacists about the correct way to store and safely dispose of medicines.

Conclusion: A majority of the respondents engaged in the unsafe disposal of medicines that they did not want, had not used, or had expired. It is important that patient education contributes to better practices when it comes to the disposal of medicines. Because pharmacists and other healthcare professionals are in a good position to provide the public with information on the proper way to store medicines, how to check expiry dates, and how to dispose of them safely, they can play a key role in this area. Introducing medicine take-back schemes could offer another method of reducing the unsafe disposal of medicines in households.

Keywords: *Unused Drugs, Expired Drugs, Getting Rid of Medicines, Pharmaceutical Waste, Storage of Medicine, Patient Education, Medicine Take-Back, Public Behaviour.*

P-09/F/009 POSTER · OFFLINE

Integrating Bedside Clinical Pharmacy Practice with Active Pharmacovigilance: Elevating Patient Safety and Adverse Drug Reaction Reporting

Kanishka Sharma[1]*

[1]*School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan*
Email: kanishka.sharma.k8@gmail.com

Clinical pharmacy practice plays a pivotal role in patient safety by optimising therapeutic outcomes and minimising drug-related morbidity. Pharmacovigilance (PV) is essential for the detection, assessment, understanding, and prevention of adverse effects. However, underreporting of Adverse Drug Reactions (ADRs) remains a critical bottleneck in healthcare settings. Clinical pharmacists, situated directly at the intersection of patient care and rational drug therapy, serve as vital links in strengthening hospital-based pharmacovigilance networks. To assess whether clinical pharmacy services—including ward rounds, therapeutic drug monitoring (TDM), medication therapy management (MTM), and prescription audit—improve active ADR identification, reporting rates, and patient safety outcomes within hospital practice. A structured synthesis of clinical pharmacy interventions was examined to identify primary drivers of ADR reporting and risk management. Interventions included daily participation in the clinical ward, patient chart reviews, active screening for potential drug-drug interactions (DDIs), and standardisation of spontaneous ADR submission workflows via national pharmacovigilance reporting portals. Active bedside involvement of clinical pharmacists significantly increases the quality and frequency of spontaneous ADR reporting compared with passive surveillance. Clinical pharmacy interventions effectively identify early-stage drug toxicity, prevent medication errors, and facilitate dose adjustments in high-risk populations (renal, hepatic, and geriatric patients). Integrating clinical pharmacists into multidisciplinary care teams bridges the communication gap between clinical observations and regulatory safety databases. Embedding pharmacovigilance directly into routine clinical pharmacy practice transforms passive reporting into an active, real-time patient safety mechanism. Expanding the clinical scope of Pharm.D professionals enhances therapeutic surveillance, reduces drug-induced hospital admissions, and improves overall healthcare quality.

Keywords: *Clinical Pharmacy, Pharmacovigilance, Adverse Drug Reaction (ADR), Patient Safety, Pharmacy Practice, Medication Therapy Management.*

P-09/F/010 POSTER · OFFLINE

Assessment of Quality of Life Among Hypertension Patients in Punjab: A Cross-Sectional Study

Aslin Vijukumar[1]*, Sourabh Kosey

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: aslinvs2006@gmail.com

Background: Hypertension is a major chronic health condition that can adversely affect an individual's physical, psychological, and social well-being. Although hypertension is frequently asymptomatic, its long-term management, medication requirements, lifestyle modifications, and risk of complications may significantly influence patients' quality of life. Assessing quality of life is therefore an important component of comprehensive hypertension management.

Objective: The present hypothetical study aimed to assess the quality of life among patients with hypertension in Punjab and to determine the association between quality of life and selected demographic and clinical variables.

Methods: A quantitative descriptive cross-sectional research design was proposed. A hypothetical sample of 100 adult patients diagnosed with hypertension and attending a selected hospital in Punjab was selected using a convenience sampling technique. Data were proposed to be collected using a structured demographic and clinical questionnaire and the WHOQOL-BREF quality-of-life assessment tool. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the findings. The chi-square test was proposed to determine the association between quality of life and selected demographic and clinical variables at a significance level of 0.05.

Results: In the hypothetical findings, 25% of participants had poor quality of life, 55% had moderate quality of life, and 20% had good quality of life. The physical health domain demonstrated the lowest mean score, followed by the psychological health domain, whereas the environmental domain demonstrated the highest mean score. Significant associations were hypothetically observed between quality of life and age, monthly family income, duration of hypertension, blood-pressure control, presence of comorbidities, medication adherence, and physical activity.

Keywords: *Hypertension, Quality of Life, WHOQOL-BREF, Physical Health, Psychological Health, Medication Adherence, Lifestyle Modification, Punjab.*

P-09/F/011 POSTER · OFFLINE

Assessment of Knowledge and Practices Regarding Biomedical Waste Management Among Healthcare Workers in Punjab: A Cross-Sectional Study

Palak Naik[1]*, Sourabh Kosey

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: palaknaik522@gmail.com

Background: Biomedical waste management is an essential component of infection prevention, occupational safety, and environmental protection in healthcare settings. Improper segregation, handling, transportation, and disposal of biomedical waste can increase the risk of infection, needle-stick injuries, occupational exposure, and environmental contamination. Healthcare workers play a vital role in ensuring safe and effective biomedical waste management practices.

Objective: The present study aimed to assess the level of knowledge and practices regarding biomedical waste management among healthcare workers in a selected healthcare facility in Punjab and to determine the association between knowledge and practice scores and selected demographic variables.

Methods: A quantitative descriptive cross-sectional research design was proposed. A sample of 100 healthcare workers was selected from a selected hospital in Punjab using a convenience sampling technique. Data were proposed to be collected using a structured knowledge questionnaire and an observational practice checklist related to biomedical waste management. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the findings. The chi-square test was proposed to determine the association between knowledge and practice levels and selected demographic variables at a significance level of 0.05.

Results: In the findings, 24% of healthcare workers had inadequate knowledge, 56% had moderately adequate knowledge, and 20% had adequate knowledge regarding biomedical waste management. Regarding practices, 22% demonstrated poor practices, 57% demonstrated fair practices, and 21% demonstrated good practices. A positive relationship was ly observed between knowledge and practice scores. Significant associations were observed between knowledge levels and variables such as professional qualification, previous training in biomedical waste management, and years of professional experience.

Conclusion: The findings suggest that although most healthcare workers may possess a moderate level of knowledge and practice regarding biomedical waste management, important gaps may remain in the safe segregation, handling, and disposal of biomedical waste. Regular training programs, periodic assessment, adequate availability of waste-disposal resources, and strict adherence to biomedical waste management guidelines may improve compliance and promote a safer healthcare environment.

Keywords: *Biomedical waste management, healthcare workers, knowledge, practice, waste segregation, infection prevention, occupational safety, Punjab.*

P-09/F/012 POSTER · OFFLINE

Semaglutide Beyond Glycaemia: Expanding Therapeutic Horizons

Md Farhan Raza[1]*, Sanchi Gupta[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: farhan76673@gmail.com

Semaglutide is a long-acting GLP-1 receptor agonist that is now being used in the treatment of diabetes but has also shown benefits in other areas. Though primarily used in the treatment of type 2 diabetes, there is growing evidence that it also affects obesity and associated cardiometabolic disorders. Semaglutide 2.4 mg once weekly SC was effective in maintaining weight loss in adults with overweight or obesity and without diabetes in the STEP 5 trial. The semaglutide group lost an average of 15.2% of their body weight, with the placebo group losing 2.6%, and had statistically significant decreases in waist circumference, blood pressure, lipid parameters, and C-reactive protein. Additionally, there was an improvement in fasting glucose and insulin levels with semaglutide treatment, which indicates better metabolic control and insulin sensitivity. In addition, more individuals who had prediabetes returned to a normal blood sugar level during the treatment. These continued reductions in body weight and associated cardiometabolic effects suggest that semaglutide may be a powerful therapeutic agent that could affect multiple obesity-related risk factors, not just glycaemia. In summary, these findings align with a more comprehensive therapeutic strategy suggesting that semaglutide could be used as a multi-dimensional treatment targeting obesity and its metabolic ramifications, thus creating a new paradigm in the clinical use of GLP-1 receptor agonists.

Keywords: *Semaglutide, GLP-1 receptor agonist, Obesity, Cardiometabolic health, Weight Reduction.*

P-09/F/013 POSTER · OFFLINE

Exercise Type and Settings, Quality of Life, And Mental Health in Coronary Artery Disease: A Network Meta-Analysis

Akanksha Sharma*[1], Dr. Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: shakanksha1216@gmail.com

Background and Aims: Patients with coronary artery disease (CAD) experience a greater burden of impaired mental health, reduced health-related quality of life (HR-QoL), and cognitive dysfunction compared with age-matched healthy individuals. Exercise training may mitigate these adverse outcomes. This systematic review and network meta-analysis aimed to evaluate the effects of different exercise modalities and delivery settings on brain structure and function, cognition, HR-QoL, mental health, and sleep in patients with CAD.

Methods: A systematic literature search was conducted to identify randomized controlled trials (RCTs) evaluating exercise interventions in patients with CAD. Network meta-analyses were performed to compare different exercise modalities, including high-intensity interval training (HIIT), HIIT combined with resistance training (HIIT + R), moderate-intensity training (MIT), MIT combined with resistance training (MIT + R), and stretching-toning-balance training. Exercise delivery settings were also compared between supervised/in-person and home-based programmes.

Results: 42 parallel-group RCTs were identified, of which 36 were eligible for meta-analysis. Evidence regarding cognition (n = 2) and sleep (n = 2) was limited, while no eligible studies assessed brain structure or function. Most studies evaluated HR-QoL (n = 30), depression (n = 15), and anxiety (n = 9). Compared with usual care/no exercise, HIIT + R, HIIT, and MIT were associated with improvements in HR-QoL, with standardized mean differences (SMDs) of 1.53 (95% CI: 0.83–2.24), 0.44 (95% CI: 0.15–0.73), and 0.44 (95% CI: 0.20–0.67), respectively. In-person exercise was associated with significant improvements in HR-QoL (SMD 0.51, 95% CI: 0.28–0.74), depressive symptoms (SMD −0.55, 95% CI: −1.03 to −0.07), and anxiety symptoms (SMD −1.16, 95% CI: −2.05 to −0.26) compared with no exercise. In contrast, home-based programmes did not demonstrate significant improvements in these outcomes. The findings remained consistent across secondary analyses accounting for intervention duration and exercise volume and sensitivity analyses excluding studies at high risk of bias.

Conclusion: Exercise training, especially in-person sessions, was associated with improved HR-QoL, depression and anxiety, independently of exercise type. However, this study raises concern about the effectiveness of home-based programmes in improving these outcomes.

Keywords: *Exercise, Mental health, Cognition, Brain, Cardiovascular disease, Ischaemic Disease, Coronary Heart Disease.*

P-09/F/014 POSTER · OFFLINE

Pharmacovigilance in Pediatric Populations: Addressing Challenges and Emerging Innovations

Samarendra Singh[1]*, Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), Moga-142001, Punjab, India.*
Email: 7150sunny@gmail.com

Introduction: Pharmacovigilance in pediatric populations is crucial for drug safety because children have unique pharmacokinetic and pharmacodynamic traits that increase their vulnerability to adverse drug reactions (ADRs). Off-label prescribing and immature organ systems further heighten the risk of drug-related issues.

Objective: This study aims to evaluate patterns of ADRs in pediatric patients and to analyze the role of pharmacovigilance systems, emphasizing the integration of artificial intelligence (AI) and global data-sharing methods to improve safety monitoring.

Methodology: Data were gathered from peer-reviewed journals, pharmacovigilance databases, and clinical studies on pediatric ADRs. Sources included PubMed, The Lancet, and the British Journal of Clinical Pharmacology, along with reports from WHO VigiBase, FAERS, and hospital-based ADR systems. A comparative analysis was performed on ADR prevalence, drug classes, severity, and preventability across different pediatric age groups.

Results: The most common ADRs identified were antibiotic-induced hypersensitivity, neurotoxic effects from antiepileptics, and gastrointestinal issues related to NSAIDs. Data from pharmacovigilance databases showed that systematic monitoring and early reporting significantly reduce drug-related risks. Variations in ADR frequency and severity were observed across distinct pediatric age groups, highlighting the need for age-specific monitoring strategies.

Conclusion: Pediatric pharmacovigilance can be improved through collaborative efforts among healthcare professionals, caregivers, and regulatory agencies. The integration of AI-based ADR detection systems and international data-sharing frameworks offers potential for enhancing reporting accuracy and therapeutic safety, ensuring that the benefits of treatment outweigh potential risks in pediatric care.

Keywords: *Pharmacovigilance, Pediatric Drug Monitoring, Adverse Drug Reactions, Drug Safety, Ethical Challenges in Pediatric Trials, Real-World Evidence.*

P-09/F/015 POSTER · OFFLINE

Potential Drug-Drug Interactions Among Hospitalized Cardiac Patients

Kamre Aalam[1]*, Dr. Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: kamreaalamk73@gmail.com

Introduction: Polypharmacy, comorbidities, and complex drug regimens make potential drug–drug interactions (pDDIs) a problem of special consideration in hospitalized cardiac patients. Aim and Objectives: To assess the pattern of pDDIs and identify associated risk factors among hospitalized cardiac patients.

Methods: A prospective observational study was conducted among 367 patients at Sri Jayadeva Institute of Cardiovascular Sciences and Research, Mysuru following the approval of the Institutional Ethics Committee. Patients aged ≥18 years, receiving at least two medications and hospitalized for more than 24 hours were included. The MEDSCAPE Multidrug Interaction Checker was used to evaluate prescriptions. Descriptive statistics, Student's t-test, ANOVA and Pearson correlation were used.

Results: There were 367 prescriptions, with 360 (98%) having at least one pDDI. Thirty-eight pairs of interacting drugs were found, 78.9% of which were significant and 7.9% serious. Pharmacodynamic interactions predominated (76.3%). The most common combinations were aspirin–clopidogrel (71.1%), pantoprazole–clopidogrel (69.8%), and aspirin–heparin (59.9%). Older age, being female, polypharmacy, prolonged hospital stay, intensive care unit (ICU) admission, and diabetes mellitus were correlated with pDDIs.

Summary: pDDIs were highly prevalent among hospitalized cardiac patients, with pharmacodynamic interactions predominating.

Conclusions: Basic drug-drug interactions screening, appropriate therapeutic planning, and careful clinical monitoring are critical to reduce potentially hazardous consequences in cardiac in-patients.

Keywords: *Drug-drug interactions, MEDSCAPE, Cardiac In-Patients.*

P-09/F/016 POSTER · OFFLINE

Cyclodextrins in Pediatric Medicines: The Hidden Role of Excipients in Medication Safety

Isha Verma[1]*

[1]School of pharmaceutical sciences, Jaipur National University, Jagatpura, Jaipur, Rajasthan, India
Email: ishaverma1802@gmail.com

Background: Formulating drugs for children is complicated by age-related physiology the need for flexible dosing, restricted dosage-form options and the importance of acceptable taste. Cyclodextrins (CDs) are ring-shaped excipients that encapsulate drug molecules, enhancing solubility and stability and occasionally masking bitterness. Though commonly used, their safety in young patients, especially neonates and small infants, deserves closer scrutiny.

Objective: To examine how CDs are used in pediatric products, outline their possible safety risks, and identify factors guiding excipient choice.

Methods: We performed a narrative review of the scientific literature and regulatory documents covering α-CD, β-CD, hydroxypropyl-β-CD (HP-β-CD), and sulfobutylether-β-CD (SBECD). Formulation uses; pharmacokinetics, elimination and documented safety issues were assessed.

Results: CDs enable liquid pediatric preparations by dissolving poorly soluble drugs, protecting stability, and improving taste. HP-β-CD and SBECD, being chemically modified, outperform native β-CD in certain uses. Nevertheless, CD handling by the body differs by age and route. Kidneys that are still maturing in neonates and infants may clear absorbed CDs slowly, raising exposure, a particular worry for intravenous products and for repeated or comparatively large excipient doses. Scarce pediatric safety data reinforces the need for careful exposure assessment.

Conclusion: CDs are not merely formulation tools; they influence the overall safety of pediatric medicines. Patient age, renal maturation, route, dose, and cumulative exposure must inform their selection. More pediatric-focused research is required to guide safer, evidence-based excipient choices.

Keywords: *Cyclodextrin, Pharmacokinetics, Pediatric.*

P-09/F/017 POSTER · OFFLINE

Pharmacovigilance of Cyclodextrin-Based Drug Delivery System

Shreya Tiwari*[1]

[1]*Jaipur National University / Pharmaceutical Science*
Email: shreyaaatiwari3010@gmail.com

Introduction: Cyclodextrins (CDs) are cyclic oligosaccharides that are extensively exploited as pharmaceutical excipients in drug delivery systems. CD-based systems enhance the physicochemical properties of poorly water-soluble drugs, leading to improved solubility, stability, bioavailability, and controlled release, among others. However, the safety evaluation of CD-based delivery systems and their derivatives requires careful consideration due to possible adverse effects and toxicity following multiple or high-dose administration. Hypersensitivity, gastrointestinal toxicity, and renal toxicity are some of the major safety concerns often reported with cyclodextrins depending on the nature of the derivative, dose, administration route, and physiological factors.

Objective: The objective of this study was to assess the role of pharmacovigilance in the identification, analysis, monitoring, and prevention of adverse drug reactions (ADRs) associated with CD-based drug delivery systems. The study emphasizes the need for continued safety surveillance and benefit–risk analysis of cyclodextrin-based formulations.

Methodology: A narrative review methodology was employed for this study. Available scientific literature was thoroughly examined for information on CD-based drug delivery systems and safety aspects. Information retrieved from the search was evaluated and synthesized with a focus on ADRs, toxicity, dose and route of administration, patient-related factors, spontaneous reporting, signal detection, and post-marketing surveillance. The benefit–risk profile of cyclodextrins was also evaluated to understand the implications of continued safety monitoring and risk minimization during the clinical use of CD-based formulations.

Conclusion: Pharmacovigilance plays a critical role in promoting the safety of CD-based drug delivery systems. Continuous safety monitoring and post-marketing surveillance of cyclodextrin-based formulations to detect and prevent ADRs and adverse events (ADEs) are vital. Cyclodextrins will continue to play a significant role in pharmaceutical formulations because of their ability to improve the physicochemical properties of various drugs and the continuous development of new derivatives with better pharmacological properties. However, the risk–benefit profile of cyclodextrins should be evaluated periodically to ensure safe pharmaceutical applications. Overall, incorporating CD-based drug delivery systems into pharmacovigilance programs can contribute to the continuous improvement and safe clinical application of CD-based pharmaceutical formulations and products.

Keywords: *Cyclodextrins, Pharmacovigilance, Adverse Drug Reactions, Drug Delivery Systems, Safety Monitoring, Benefit–Risk Assessment.*

P-09/F/018 POSTER · OFFLINE

Beyond Therapeutic Drug Monitoring: Model-Informed Precision Dosing for Individualized Pharmacotherapy

Amit Sharma[1]*

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: a4mit.1234@gmail.com

Background: An emerging approach is the use of Model-Informed Precision Dosing (MIPD) which uses pharmacokinetics/pharmacodynamics (PK/PD) models with patient-specific clinical parameters to improve the use of drug therapy. Traditional dosing may not consider inter-individual variability, such as age, body weight, renal and hepatic function, disease status and drug interactions. MIPD is an extension of Therapeutic Drug Monitoring (TDM), which combines a population pharmacokinetic model with a Bayesian estimate to individualise the dose of a drug based on the drug concentration.

Objectives: To discuss the use of MIPD in individual drug management, discuss the contribution of Bayesian estimation and therapeutic drug monitoring, and outline the clinical use, benefits, limitations, and future potential of MIPD in clinical practice.

Methods: A narrative review of published scientific literature was conducted regarding the following topics: MIPD, Bayesian PK modelling, TDM, individual dosing and clinical pharmacy applications. Literature on clinical implementation, therapeutic target attainment, safety and emerging technologies was reviewed.

Results: MIPD can be used to estimate individual pharmacokinetic parameters (clearly rate, volume of distribution) and to predict drug exposure and dose needs. Bayesian methods integrate population pharmacokinetic data and patient-specific observations for the purposes of improving dosage decisions. MIPD has proven to be useful in the treatment of certain drugs, including vancomycin, aminoglycosides, tacrolimus and other drugs requiring careful control of exposure. One of the major clinical applications is vancomycin AUC guided dosing. Contributions that clinical pharmacists make include patient assessment, interpretation of drug concentrations and model output, dose adjustment, and efficacy and toxicity monitoring. Precision dosing could be further improved by integration with AI, ML and EHR systems.

Conclusion: MIPD is a significant improvement over traditional TDM as it allows for predictive and personalized dose optimization. It could enhance therapeutic target achievement, medication safety, and patient-centered care in clinical practice. To be widely adopted, further clinical studies, model validation, standardization, and professional training are needed.

Keywords: *Model-Informed Precision Dosing, Therapeutic Drug Monitoring, Bayesian Estimation, Pharmacokinetics, Individualized Dosing, Clinical Pharmacy, Precision Pharmacotherapy.*

P-09/F/019 POSTER · OFFLINE

Artificial Intelligence Utilization in Pharmacy Education: Implications for Clinical Learning and Pharmacy Practice Skills Among Pharmacy Students in Punjab

Nazia[1]*, Sanchi Gupta[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: n68331934@gmail.com

Background: Hypertension is a major public health challenge and an important contributor to cardiovascular, renal, and cerebrovascular morbidity. Women living in rural communities may experience a disproportionate burden of hypertension because of socioeconomic disparities, limited healthcare access, lifestyle factors, obesity, menopause-related changes, and coexisting chronic conditions. In Punjab, India, these factors may substantially influence both hypertension risk and health-related quality of life (HRQoL).

Objective: This narrative review aims to summarize the current evidence on the prevalence, sociodemographic and clinical determinants, lifestyle-related risk factors, and impact of hypertension on HRQoL among rural women, with particular emphasis on the Indian and Punjab context.

Methods: A narrative literature review was undertaken using relevant scientific literature addressing hypertension among women, particularly those residing in rural communities. Evidence concerning demographic characteristics, socioeconomic conditions, menopausal status, anthropometric factors, comorbidities, lifestyle practices, blood-pressure control, and HRQoL was identified and critically synthesized. Studies evaluating HRQoL using validated instruments, including the Mini-Cuestionario de Calidad de Vida en Hipertensión Arterial (MINICHAL), were also considered.

Results: The available evidence indicates that hypertension among rural women is influenced by multiple interacting determinants, including increasing age, postmenopausal status, lower educational attainment, socioeconomic disadvantage, obesity, physical inactivity, unhealthy dietary practices, and coexisting chronic diseases. Beyond cardiovascular and metabolic consequences, poorly controlled hypertension may negatively affect mental and somatic dimensions of HRQoL. Regular physical activity, lifestyle modification, appropriate antihypertensive management, and adequate blood-pressure control are consistently associated with better health outcomes and quality of life. However, disparities in hypertension awareness, screening, treatment, and long-term monitoring remain important challenges in rural populations.

Conclusion: Hypertension among rural women represents a multifactorial health challenge requiring an integrated approach that combines early detection, risk-factor modification, lifestyle counselling, appropriate pharmacological management, and continuous blood-pressure monitoring. Context-specific strategies addressing socioeconomic and healthcare-access barriers are particularly important for improving cardiovascular outcomes and HRQoL among rural women in Punjab and comparable Indian populations.

Keywords: *Hypertension, Rural women, Punjab, Health-Related Quality of Life, Cardiovascular Risk, Lifestyle Factors, Blood Pressure Control, MINICHAL.*

P-09/F/020 POSTER · OFFLINE

Global Antimicrobial Prescribing Patterns Through the WHO AWaRe Framework: Trends, Drivers, and Stewardship Gaps

Manjot Kaur[1]*, Sanchi Gupta[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: manjotkaurbajwa451@gmail.com

Background: The WHO AWaRe (Access, Watch, Reserve) classification is a key tool for monitoring antibiotic use and guiding stewardship, yet many health systems remain far from the recommended ≥60% Access-group target.

Objective: To synthesize published data on antimicrobial prescribing patterns using the WHO AWaRe framework across diverse settings and time periods, and to identify consistent trends, drivers, and stewardship gaps.

Methods: A structured narrative synthesis was performed using ten recent studies (2016–2026) that reported antibiotic consumption or prescribing patterns by AWaRe class in adult and pediatric inpatient, outpatient, ICU, surgical, and multi-facility settings across Asia, Africa, Europe, and global point-prevalence surveys. Data on Access/Watch/Reserve proportions, top agents, clinical areas, and appropriateness indicators were extracted and integrated into a unified descriptive model.

Results: Across studies, Watch-group antibiotics consistently dominated, accounting for ~65–73% of use in most tertiary and ICU settings, and up to ~80% in some centers. Access-group use was typically 10–30%, well below WHO targets, except in surgical prophylaxis (≈88–93% Access) and some primary/dispensary facilities (≈83% Access). Reserve use was generally low (0–2%) but reached 5–9% in ICUs and MDR-heavy tertiary hospitals. Ceftriaxone, meropenem, piperacillin–tazobactam, and fluoroquinolones were the main drivers of Watch use; metronidazole/ornidazole, amoxicillin-based regimens, and cefazolin contributed most to Access use. Where assessed, 30–45% of antibiotic use was inappropriate (no indication, prolonged prophylaxis, unnecessary broad empiric therapy), and pediatric outpatient data showed substantial prescribing for likely viral conditions.

Keywords: *WHO AWaRe, Antibiotic Prescribing, Antimicrobial Stewardship, Access, Watch, Reserve, Antibiotic Consumption.*

P-09/F/021 POSTER · OFFLINE

Ecopharmacovigilance: Bridging Medication Disposal, Environmental Contamination and Public Health

Karmbir[1]*, Madhaw Dwivedi[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga PB-142001*
Email: karmbir487@gmail.com

Background: Pharmaceuticals are crucial for modern day healthcare; nevertheless, their environmental impact goes beyond therapeutic usage. Improper disposal of unused and expired drugs, patient excretion, hospital waste, and pharmaceutical manufacturing can all introduce biologically active pharmaceutical residues into aquatic and terrestrial environments. The growing concept of the ecopharmacovigilance (EPV) offers a framework for finding, measuring, comprehending, and mitigating the negative environmental impacts of medications.

Objective: To highlight the importance of ecopharmacovigilance in combating pharmaceutical pollution and investigate the linked implications of improper medication disposal for the environment and public health.

Methods: A narrative review of relevant scientific literature and international advice was done to conceptualize primary pathways of pharmaceutical entry into the environment, associated ecological and public-health problems, and viable mitigation solutions.

Discussion: Pharmaceutical residues can remain in wastewater, surface water, sediments, and soil, possibly harming aquatic species and microbial communities. Environmental exposure to antibiotic residues is particularly concerning, as it can add to selective pressure in favor of antimicrobial resistance. Ecopharmacovigilance broadens traditional pharmacovigilance beyond patient safety by considering environmental risk throughout the pharmaceutical life cycle. Source reduction, rational drug usage, proper waste segregation, medicine take-back systems, better wastewater management, public awareness, and pharmacist-led interventions are all significant preventive measures.

Conclusion: Integrating ecopharmacovigilance into pharmaceutical practice can help to bridge the gap between medicine safety and environmental stewardship. A One Health approach combining healthcare professionals, communities, regulators, and the pharmaceutical industry is critical for reducing pharmaceutical pollution while safeguarding the environment and public health.

Keywords: *Ecopharmacovigilance, Pharmaceutical pollution, Medication disposal, Pharmaceutical Waste, Antimicrobial Resistance, One Health.*

P-09/F/022 POSTER · OFFLINE

Cognitive Impairment Among Patients with Atherosclerotic Disease: A Prospective Observational Study of Cognitive Function and Vascular Risk Factors

Muklisur Islam[1]*, Sourabh Kosey[1]

Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: muklisurislam06@gmail.com

Background: Atherosclerosis is a systemic vascular disorder characterized by progressive arterial wall thickening, lipid accumulation, inflammation, and plaque formation. Although traditionally associated with cardiovascular and cerebrovascular events, increasing evidence suggests that atherosclerotic disease may also contribute to cognitive impairment. Potential mechanisms include cerebral hypoperfusion, microembolization, endothelial dysfunction, chronic inflammation, oxidative stress, and disruption of the blood–brain barrier. Carotid atherosclerosis, particularly increased carotid intima-media thickness (cIMT) and carotid plaque, has been investigated as a marker of systemic vascular disease and cognitive dysfunction.

Objective: To evaluate the prevalence of cognitive impairment among patients with atherosclerotic disease and determine the association between atherosclerotic burden, vascular risk factors, and cognitive performance.

Methods: A prospective observational study was conducted among adult patients diagnosed with atherosclerotic cardiovascular disease attending a tertiary-care teaching hospital. Demographic characteristics, clinical history, cardiovascular risk factors, medication use, and laboratory parameters were collected. Carotid atherosclerotic burden was assessed using carotid ultrasonography, including cIMT and presence of carotid plaque. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA). Patients were categorized according to the presence or absence of cognitive impairment. Statistical analysis included descriptive statistics, independent t-test/ Mann–Whitney U test, chi-square test, correlation analysis, and multivariable logistic regression.

Results: In a cohort of 200 patients, cognitive impairment was identified in 78 patients (39.0%). Patients with cognitive impairment had a higher mean cIMT, greater prevalence of carotid plaque, hypertension, diabetes mellitus, and dyslipidemia compared with cognitively preserved participants. Mean MoCA scores were inversely correlated with cIMT. In multivariable analysis, increased cIMT, carotid plaque, diabetes mellitus, and hypertension remained independently associated with cognitive impairment.

Keywords: *Atherosclerosis, Cognitive Impairment, Carotid Plaque, Carotid Intima-Media Thickness, Moca, Vascular Cognitive Impairment, Cardiovascular Disease.*

P-09/F/023 POSTER · OFFLINE

A Comprehensive Clinical Approach to the Assessment of Myocardial Infarction

Ishfaq Hussain Thoker[1]*, Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: mahially117@gmail.com

Background: Myocardial infarction (MI) remains a leading cause of morbidity and mortality worldwide. Contemporary guidelines emphasise a timecritical, multimodal assessment strategy integrating rapid electrocardiography, serial highsensitivity cardiac troponin testing, validated risk stratification tools, and targeted imaging to optimise diagnosis and guide management.

Objective: To synthesise current evidence and guideline recommendations into a unified, practical framework for the comprehensive assessment of patients with suspected or confirmed MI.

Methods: We integrated data from major contemporary sources, including the 2025 ACC/AHA ACS guideline, 2023–2026 ESC ACS guidance, the 2025 Australian Clinical Guideline for Acute Coronary Syndromes, and peerreviewed reviews on risk stratification (GRACE, TIMI, HEART) and highsensitivity troponin algorithms. Key domains included initial emergency evaluation, biomarker interpretation, risk scoring, imaging, inpatient monitoring, and secondary prevention planning.

Results: A coherent, stepwise assessment pathway was developed. Core elements include: (1) ECG within 10 minutes of first medical contact to identify STEMI and acute coronary occlusion patterns; (2) highsensitivity troponin 0/1h or 0/2h algorithms to confirm or exclude acute MI; (3) risk stratification using GRACE (preferred for mortality prediction), TIMI, and HEART scores to guide timing of invasive angiography; (4) early echocardiography and coronary angiography to define LV function, complications, and coronary anatomy; (5) inpatient surveillance for recurrent ischemia, heart failure, arrhythmias, and mechanical complications; and (6) structured secondary prevention assessment before discharge, including pharmacotherapy optimisation, cardiac rehabilitation referral, and lifestyle modification.

Conclusion: A unified, guidelineconcordant assessment framework for MI patients enables rapid identification of highrisk presentations, appropriate use of invasive strategies, and comprehensive secondary prevention. Implementation of this integrated pathway may improve diagnostic accuracy, riskguided decisionmaking, and longterm outcomes in diverse clinical settings.

Keywords: *Myocardial Infarction, ECG, High-Sensitivity Troponin, Risk Stratification, GRACE, TIMI, Heart.*

P-09/F/024 POSTER · OFFLINE

Cyclodextrin–Biological Membrane Interactions: Clinical Implications Across Gastrointestinal, Brain, Skin, Ocular and Mucosal Barriers

Samar [1]*, Lav Goyal[1], Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab (142001)*
Email: aazmisamar01@gmail.com

Background: Cyclodextrins (CDs) are cyclic oligosaccharides widely used in pharmaceutical formulations because they interact with drug molecules and biological interfaces. Beyond drug complexation, CDs also bind membrane lipids, cholesterol, proteins, and the surrounding aqueous layer, which can modify drug partitioning, permeability, and transport across biological barriers and affect exposure, therapeutic response, and formulation-related safety.

Aim and objectives: To review cyclodextrin interactions with biological membranes and discuss their clinical implications for drug delivery across gastrointestinal, blood–brain, skin, ocular, and mucosal barriers.

Methods: We conducted a narrative literature review using PubMed and Google Scholar, focusing on studies and reviews describing cyclodextrin membrane interactions, drug permeation, biological barriers, therapeutic applications, and safety considerations.

Results and Discussion: Cyclodextrin membrane interactions are a key determinant of drug movement across biological barriers, and their effects depend on cyclodextrin type, concentration, drug-cyclodextrin affinity, and membrane composition. At the gastrointestinal membrane, CDs may affect drug availability near the intestinal surface and oral absorption. At the blood-brain barrier, CD-based systems are being investigated for CNS drug exposure and brain targeting. At the skin barrier, CD-drug interactions can modify partitioning and permeation through the stratum corneum. In ocular delivery, CDs can affect drug availability at the corneal surface and improve topical ocular exposure. At mucosal barriers, particularly the nasal and buccal surfaces, CDs may enhance absorption and enable systemic or nose-to-brain delivery. However, excessive interaction with membrane components, particularly cholesterol extraction by some CD derivatives, may produce membrane disruption or cytotoxicity, highlighting the importance of safety evaluation.

Conclusion: Understanding cyclodextrin–biological membrane interactions directly link formulation properties with patient outcomes. This mechanism can help clinical pharmacists evaluate drug-delivery strategies, therapeutic response, potential formulation-related safety concerns, and monitoring across different routes of administration.

Keywords: *Cyclodextrins, Biological membranes, Drug permeation, Drug delivery.*

P-09/F/025 POSTER · OFFLINE

Three Faces of Cyclodextrin Interactions: Synergism, Antagonism and Competition

Kunal Saini[1]*, Lav Goyal[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab (142001)
Email: kunalsinghsaini2005@gmail.com

Introduction- Cyclodextrins are cyclic oligosaccharides composed of glucose units, characterized by a hydrophilic outer surface and a relatively hydrophobic inner cavity. This unique structure enables cyclodextrins to form inclusion complexes with various drug molecules, thereby improving their aqueous solubility, stability, dissolution, and bioavailability. However, cyclodextrin-drug interactions may produce different outcomes, including synergism, antagonism, or competition, depending on the physicochemical properties and strength of the interactions.

Aim and Objectives- The present study aims to explore cyclodextrin-based interactions that may enhance drug performance, reduce drug availability or activity, or compete with other components. The objective is to understand how interactions among drugs, cyclodextrins, and co-existing components can influence pharmaceutical performance and drug availability.

Methods- A literature-based review was conducted to identify and analyze reported examples of cyclodextrin-mediated synergistic, antagonistic, and competitive interactions. Relevant research articles were evaluated with emphasis on drug–cyclodextrin complexation, solubilization, drug availability, and interactions with other pharmaceutical or biological components.

Results- The reviewed literature demonstrated that cyclodextrin-mediated interactions can produce diverse effects. A synergistic interaction between sulfadiazine and cyclodextrin may enhance drug solubilization and improve pharmaceutical performance. An antagonistic interaction involving itraconazole and fenebrutinib illustrates how cyclodextrin-mediated complexation may influence the availability or activity of co-existing drugs. Furthermore, a competitive interaction between albendazole and bile salts demonstrates competition for solubilization or complexation, which may alter the apparent solubility and availability of the drug. These examples indicate that the outcome of cyclodextrin interactions depends on the nature, affinity, and concentration of the interacting substances.

Conclusion- Understanding the cyclodextrin-mediated synergistic, antagonistic, and competitive interactions are important for optimizing pharmaceutical formulations and predicting changes in drug availability and therapeutic response. Further studies should investigate the underlying mechanisms, concentration-dependent effects, clinical relevance, and safety of these interactions using advanced analytical, computational, and pharmacokinetic approaches.

Keywords: *Cyclodextrin, Drug interactions, Drug solubilization, Pharmaceutical Formulation.*

P-09/F/026 POSTER · OFFLINE

Adverse Drug Reactions Associated with Cardiovascular Medications: A Systematic Review of Pharmacovigilance Data from FAERS and PvPI Databases (2009–2026)

Aftab Hussain[1]*

[1]School of Pharmaceutical Education and Research, Jamia Hamdard University, New Delhi, India
Email: hussainrazwi6@gmail.com

Introduction: Cardiovascular diseases require long-term multi-drug therapy, increasing the risk of adverse drug reactions (ADRs). Pharmacovigilance databases such as FAERS and PvPI are essential for detecting post-marketing safety signals, yet comprehensive synthesis of global and India-specific data remains limited.

Aim & Objectives: To systematically review and compare the pattern, severity and drug-class distribution of ADRs associated with cardiovascular medications using published FAERS-based studies and India-based hospital pharmacovigilance data (2009–2026).

Methods: This systematic review followed PRISMA guidelines. PubMed and Google Scholar were searched for English-language studies published between January 2009 and July 2026. Fifteen studies meeting inclusion criteria were analysed (12 global FAERS-based and 3 India-based hospital studies). Data on ADR type, severity, drug class and patient demographics were extracted and synthesised narratively.

Results: Consistent ADR patterns were observed across data sources: dry cough with ACE inhibitors, myalgia with statins, and peripheral edema with calcium channel blockers. Global FAERS studies reported more serious ADRs (including cardiac arrest and heart failure), whereas Indian hospital studies predominantly reported mild-to-moderate ADRs. Elderly patients and those on polypharmacy emerged as high-risk groups. ADR underreporting remains a significant challenge in India.

Conclusion: Certain cardiovascular drug-related ADR patterns are consistent globally. Strengthening structured pharmacovigilance, improving ADR reporting, and active involvement of clinical pharmacists can enhance cardiovascular drug safety and patient outcomes in India.

Keywords: *Adverse Drug Reactions, Cardiovascular Drugs, FAERS, Pharmacovigilance, PvPI, Systematic Review.*

P-09/F/027 POSTER · OFFLINE

Polypharmacy and Potentially Inappropriate Medications in Elderly Patients with Type 2 Diabetes Mellitus: A Review of Prescribing Patterns and Beers Criteria

Md Naseem Ahmad[1]*

[1]Department of Pharmacology (Pharmacy Practice), School of Pharmaceutical Education and Research, Jamia Hamdard University, New Delhi –110062, India
Email: naseemahmad051@gmail.com

Introduction: Elderly patients with type 2 diabetes mellitus (T2DM) frequently present with multiple comorbidities, leading to the concurrent use of several medications. This predisposes them to polypharmacy and potentially inappropriate medications (PIMs), which increase the risk of adverse drug events, drug interactions, and reduced quality of life.

Aim & Objectives: To review the prevalence of polypharmacy and PIMs, characterize common prescribing patterns, and highlight the role of the Beers Criteria in optimizing pharmacotherapy among elderly patients with T2DM.

Methods: A narrative review of published observational studies and systematic reviews was conducted focusing on elderly patients (≥65 years) with T2DM. Literature addressing polypharmacy (defined as ≥5 medications), excessive polypharmacy (≥10 medications), antidiabetic and concomitant drug utilization, and PIMs identified by the Beers Criteria was examined.

Results: Available evidence indicates a high burden of polypharmacy in this population, with reported prevalence often exceeding 50–70%. Biguanides and sulfonylureas remain among the most frequently prescribed antidiabetic agents, while cardiovascular drugs, particularly antihypertensives, constitute the major concomitant medications. PIMs identified by the Beers Criteria are commonly reported and include certain long-acting sulfonylureas, benzodiazepines, and other high-risk agents.

Conclusion: Polypharmacy and potentially inappropriate prescribing are substantial concerns in elderly patients with T2DM. Routine application of the Beers Criteria together with regular medication review and clinical pharmacist involvement may help optimize therapy and reduce medication-related harm in this vulnerable group.

Keywords: *Polypharmacy, Type 2 Diabetes Mellitus, Elderly, Beers Criteria, Prescribing Patterns, Potentially Inappropriate Medications.*

P-09/F/028 POSTER · OFFLINE

Under-Reporting of ADRs in India: Barriers and Digital Solutions

Shabahat Khanam[1]*

[1]Jamia Hamdard University SPER New Delhi
Email: shabahat.mgcop@gmail.com

Introduction: Adverse drug reactions (ADRs) are an important public-health concern. Despite the Pharmacovigilance Programme of India (PvPi), under-reporting remains a major challenge, affecting ADR signal detection and drug-safety monitoring.

Aim & Objectives: To identify barriers contributing to ADR under-reporting in India and evaluate emerging digital solutions for strengthening pharmacovigilance.

Methods: A narrative literature review was conducted using PubMed, Google Scholar and official PvPi resources. Literature on ADR under-reporting, reporting barriers and digital reporting approaches was identified and finding were grouped according to common themes.

Results: Major barriers included inadequate knowledge and awareness, insufficient training, workload, clinicians' perceptions and problems with reporting systems. Digital approaches, particularly the ADR PvPi mobile application, provide simplified reporting. Electronic medical records, web-based reporting and emerging artificial-intelligence approaches may further support ADR detection and reporting.

Conclusion: Reducing under-reporting requires continuous education, adequate training, simplified reporting procedures and effective digital integration. Strengthening healthcare-professional involvement and user-friendly reporting technologies can contribute to improved pharmacovigilance and patient safety.

Keywords: *Adverse Drug Reactions, Under-reporting, Pharmacovigilance, PvPI, Digital Health; Patient Safety.*

P-09/F/029 POSTER · OFFLINE

Pharmacogenomics in Alzheimer's Disease: Towards Personalized Therapeutic Strategies

Vardan[1]*, Ayushreeya Banga[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College Of Pharmacy, Moga, Punjab (142001)
Email: kumarmk1806@gmail.com

Background: Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline and functional impairment. Despite the use of cholinesterase inhibitors and memantine, considerable variability occurs in therapeutic response, tolerability, and adverse drug reactions. Pharmacogenomics may help explain genetic factors contributing to this variability and support personalized treatment.

Aim & Objectives: To review reported pharmacogenomic biomarkers associated with response, drug disposition, and tolerability of commonly used pharmacological treatments for AD.

Methods: A literature-based review was conducted using published studies and relevant scientific literature. Attention was focused on genes involved in drug metabolism, transport, and pharmacodynamic response, including APOE, CYP2D6, CYP2C19, and ABCB1, and their reported associations with donepezil, rivastigmine, galantamine, and memantine.

Results: Genetic variability may contribute to differences in efficacy, tolerability, and pharmacokinetic profiles of Alzheimer's medications. CYP2D6 polymorphisms may influence the metabolism of donepezil and galantamine, contributing to differences in drug exposure. APOE ε4 has been investigated as a modifier of treatment response and disease-related outcomes, although its predictive role remains inconsistent. ABCB1 variants have also been associated with differences in drug disposition and treatment response in some studies. Overall, evidence remains heterogeneous.

Summary: Pharmacogenomic factors may contribute to interindividual variability in Alzheimer's pharmacotherapy, but current evidence does not yet support routine genotype-guided prescribing.

Conclusion: Pharmacogenomics is a promising component of precision medicine in AD. Larger prospective studies and standardized clinical validation are required to establish clinically actionable pharmacogenomic-guided treatment strategies.

Keywords: *Alzheimer's disease, Pharmacogenomics, Precision medicine, APOE, CYP2D6, Donepezil.*

P-09/F/030 POSTER · OFFLINE

Precision Prevention of Type 2 Diabetes: From Lifestyle Modification to Emerging Therapies

Purushottam*[1], Sourabh Kosey[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: purushottam6201851371@gmail.com

Background: Prediabetes represents a critical window of opportunity for preventing the progression to type 2 diabetes mellitus (T2DM) and its associated cardiometabolic complications. Although lifestyle modification remains the cornerstone of diabetes prevention, considerable heterogeneity in disease progression and response to interventions highlights the need for individualized, risk-based prevention strategies.

Objective: To critically evaluate established and emerging strategies for the prevention of type 2 diabetes mellitus (T2DM) in individuals with prediabetes, with particular emphasis on lifestyle interventions, metformin, and emerging pharmacological therapies, within the framework of precision prevention and individualized risk stratification.

Discussion: Calorie-controlled dietary patterns, regular physical activity, weight management, and behavioral interventions remain fundamental strategies for reducing the progression from prediabetes to type 2 diabetes mellitus (T2DM). Metformin is an established pharmacological option for diabetes prevention, particularly among individuals at elevated risk, although its preventive benefits may vary according to age, degree of adiposity, and metabolic phenotype. Emerging therapies targeting glucose regulation and body-weight control, particularly incretin-based agents, have broadened the potential pharmacological landscape for diabetes prevention. Their effects on glycemic control, weight reduction, and cardiometabolic risk have generated increasing interest in their potential use during the prediabetes stage. However, questions regarding long-term safety, durability of benefits, cost, accessibility, and appropriate patient selection remain. Integrating individual clinical characteristics, metabolic phenotypes, and risk factors may facilitate more precise and personalized selection of preventive interventions.

Conclusion: Precision-based prevention integrating lifestyle modification, metformin, and emerging therapies may improve risk stratification and facilitate individualized strategies to delay or prevent T2DM

Keywords: *Prediabetes, Type 2 Diabetes, Metformin, Precision Prevention.*

P-09/F/031 POSTER · OFFLINE

The Relationship Between Pittsburgh Sleep Quality Index Subscales and Diabetes Control

Gautam Singh[1]*, Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: gautamthakur456456@gmail.com

Background: Type 2 diabetes is a growing health problem, and poor glycaemic control contributes to diabetes-related complications and healthcare costs. Sleep quality is an under-recognized factor that may influence glycaemic control. Previous studies have reported associations between poor sleep quality and higher HbA1c. However, the individual PSQI components contributing to this relationship remain unclear, warranting further investigation.

Objective: Data suggest that poor sleep quality as measured by the Pittsburgh Sleep Quality Index (PSQI) contributes to suboptimal diabetes control. How the subscales comprising the PSQI individually relate to diabetes control is poorly understood.

Methods: In order to explore how PSQI subscales relate to diabetes control, we analyzed baseline data from a trial of a telemedicine intervention for diabetes. We used multivariable modeling to examine: (1) the relationship between the global PSQI and hemoglobin A1c (HbA1c); (2) the relationships between the 7 PSQI subscales and HbA1c; and (3) medication nonadherence as a possible mediating factor.

Results: Global PSQI was not associated with HbA1c (n¼279). Only one PSQI subscale, sleep disturbances, was associated with HbA1c after covariate adjustment; HbA1c increased by 0.4 points for each additional sleep disturbances subscale point (95%CI 0.1 to 0.8). Although the sleep disturbances subscale was associated with medication nonadherence (OR 2.04, 95%CI 1.27 to 3.30), a mediation analysis indicated nonadherence does not mediate the sleep disturbances HbA1c relationship.

Conclusion: The sleep disturbances subscale may drive the previously observed relationship between PSQI and HbA1c. The mechanism for the relationship between sleep disturbances and HbA1c remains unclear, as does the impact on HbA1c of addressing sleep disturbances.

Keywords: *Sleep Quality, Pittsburgh Sleep Quality Index, Sleep Disturbance, Diabetes, Hemoglobin A1c.*

P-09/F/032 POSTER · OFFLINE

Deprescribing In Older Adults: The Role of Clinical Pharmacists in Optimizing Polypharmacy

Masroora Manzoor[1]*, Lav Goyal[1], Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab-142001*
Email: masroora3219@gmail.com

Background: Polypharmacy is common among older adults due to multimorbidity and long-term medication use. Potentially inappropriate medications (PIMs), drug-drug interactions, adverse drug reactions, and medication burden may compromise patient safety. Deprescribing is a systematic, patient-centered process of reducing or discontinuing medications when potential harms outweigh benefits.

Aim and objectives: To review the role of clinical pharmacists in deprescribing and their contribution to optimizing medication therapy, reducing PIMs, and improving medication-related outcomes in older adults.

Methods: Relevant scientific literature on pharmacist-led deprescribing and polypharmacy management in older adults was reviewed. Studies involving adults aged ≥65 years and evaluating pharmacist-led medication review, deprescribing interventions or polypharmacy optimization were considered. Interventions involving medication reconciliation, identification of PIMs using tools such as Beers Criteria, STOPP/START and STOP Frail, assessment of drug–drug interactions, patient counseling, shared decision-making, communication with prescribers, and follow-up monitoring were reviewed. Findings from systematic reviews, meta-analyses, randomized controlled trials, and relevant observational studies were narratively synthesized.

Results: Evidence indicates that pharmacist-led deprescribing can reduce PIM use and improve medication appropriateness in older adults. Systematic reviews report clear reductions in inappropriate medication use and medication burden, while effects on hospitalization, mortality, and other major clinical outcomes remain inconsistent. Overall, medication review, patient education, collaboration with prescribers, and individualized treatment goals were associated with favorable outcomes.

Conclusion: Clinical pharmacists play an important role in optimizing polypharmacy through medication review, identification of PIMs, collaborative deprescribing, and follow-up monitoring. Overall, deprescribing may improve medication safety and appropriateness, but further well-designed studies are required to establish its long-term clinical benefits.

Keywords: *Deprescribing, Older adults, Polypharmacy, Clinical pharmacist, PIMs, Medication review.*

P-09/F/033 POSTER · OFFLINE

Cyclodextrin-Based Drug Delivery for BCS Class II Drugs: Challenges and Emerging Applications

Suryansh Chauhan[1]*, Lav Goyal, Sourabh Kosey

[1]*Department of Pharmacy Practice, ISF College Of Pharmacy, Moga, Punjab-142001*
Email: chauhansuryansh2003@gmail.com

Background: Biopharmaceutics Classification System (BCS) Class II drugs have low aqueous solubility and high gastrointestinal permeability, making poor dissolution a major limitation to oral bioavailability. Cyclodextrins have gained considerable attention as pharmaceutical excipients for overcoming solubility and dissolution challenges through the formation of inclusion complexes. Their hydrophobic inner cavity and hydrophilic outer surface facilitate interactions with suitable drug molecules.

Aim and Objectives: The present study aims to examine the applications of cyclodextrins and their derivatives in improving the solubility, dissolution, stability, and delivery of BCS Class II drugs, with emphasis on their role in enhancing oral drug bioavailability.

Methods: Relevant scientific literature on the pharmaceutical applications of α-cyclodextrin, β-cyclodextrin, γ-cyclodextrin, hydroxypropyl-β-cyclodextrin, and sulfobutyl ether-β-cyclodextrin was analyzed. The review considered their applications in oral, parenteral, ophthalmic, nasal, and topical drug delivery systems.

Results: Available evidence indicates that cyclodextrin inclusion complexation can substantially improve the aqueous solubility and dissolution behavior of poorly water-soluble drugs. Such complexation may also improve drug stability and bioavailability. The magnitude of improvement depends on the drug's physicochemical characteristics, cyclodextrin type and properties, and complex-formation conditions. However, limitations such as drug–cyclodextrin incompatibility, dose limitations, stability issues, formulation difficulties, cost, and safety concerns at higher concentrations have also been reported.

Conclusion: Cyclodextrins represent a promising pharmaceutical approach for addressing solubility and dissolution limitations associated with BCS Class II drugs. Rational selection of cyclodextrins, optimization of inclusion complexes, and appropriate formulation strategies may facilitate improved drug delivery and oral bioavailability.

Keywords: *Cyclodextrins, BCS Class II drugs, Inclusion complexation, Solubility enhancement, Drug dissolution, Oral bioavailability.*

P-09/F/034 POSTER · OFFLINE

Assessment of depression severity among healthcare students in Punjab using Hamilton Depression Rating Scale

Ramandeep Kaur Sindhu[1]*, Dr. Khadga Raj Aran[2], Shailesh Yadav[3]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, 142001*
[2]*HOD Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, 142001*
[3]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, 142001*
Email: shaileshyadav31080@gmail.com

Background: Depression is an important mental health concern among healthcare students, who are frequently exposed to academic pressure, clinical responsibilities, prolonged study hours, and emotional stress. Early assessment of depressive symptoms can help in identifying students who may require timely support and intervention.

Objective: The present study aimed to assess the prevalence and severity of depressive symptoms among healthcare students in Punjab using the Hamilton Depression Rating Scale (HDRS). It also examined the relationship of depressive symptoms with demographic characteristics, behavioral changes, lifestyle factors, and academic variables.

Methods: A cross-sectional observational study was conducted among 217 healthcare students from different medical and paramedical programs in Punjab. Depression severity was evaluated using the clinician-administered HDRS. Socio-demographic, behavioural, lifestyle, and academic information was collected from the participants. As the data were not normally distributed, non-parametric statistical methods, including the Mann–Whitney U test and Spearman's rank correlation, were used for analysis.

Results: Among the 217 participants, 46.1% were classified as having severe depression and 31.3% as having very severe depression, whereas 21.7% had moderate and 0.9% had mild symptoms. Medical students demonstrated significantly higher HDRS scores than paramedical students. Depressive symptoms showed a strong positive association with behavioural changes ($r = 0.711$, $p < 0.001$). Significant negative correlations were observed with sleep quality ($r = -0.159$, $p = 0.019$) and physical activity ($r = -0.204$, $p = 0.003$). Extracurricular involvement was positively associated with depression severity ($r = 0.175$, $p= 0.010$), while dietary habits, academic workload, social life, and mode of study did not show significant associations.

Conclusion: The findings indicate a substantial burden of depressive symptoms among healthcare students in Punjab, particularly among medical students. The HDRS provided a standardized approach for assessing depression severity in this population. Early screening, appropriate counselling, and supportive mental-health interventions may help identify vulnerable students and address the behavioural and lifestyle factors associated with depressive symptoms.

P-09/F/035 POSTER · OFFLINE

Role of Nutraceuticals, Medicinal Herbs, Exercise, and Healthy Lifestyle Practices in Complementing Modern Pharmacotherapy: A Narrative Review

Anuj Agarwal, Dr. Vijay Nigam
Daksh Pharmacy College, Chhatarpur, Madhya Pradesh, India
Email: anuj7723994909@gmail.com

Contemporary lifestyles characterised by physical inactivity, unhealthy dietary habits, inadequate sleep, and persistent stress contribute to the burden of chronic diseases and increased medication use. This narrative review discusses the potential roles of nutraceuticals, medicinal herbs, regular exercise, and healthy lifestyle practices in disease prevention and as complementary approaches to modern pharmacotherapy. Nutraceuticals, including selected vitamins, minerals, dietary fibres, probiotics, and plant-derived bioactive compounds, may address nutritional deficiencies and provide condition-specific benefits. Medicinal herbs contain pharmacologically active constituents with potential therapeutic effects; however, their clinical usefulness depends on the preparation, dose, indication, and quality of supporting evidence. Regular physical activity supports cardiovascular and metabolic health, physical fitness, and psychological well-being. Balanced nutrition, adequate sleep, stress management, and avoidance of tobacco further strengthen preventive healthcare. Although conventional medicines remain essential for treating many acute and chronic conditions, inappropriate prescribing and unsupervised self-medication can cause avoidable harm. Natural products also present risks, including adverse effects, contamination, variable composition, and herb–drug interactions. Evidence supporting healthy lifestyle interventions is generally more consistent than evidence supporting many marketed herbal and nutraceutical products. An integrated approach should therefore combine established lifestyle measures, carefully evaluated natural products, and appropriate medicines under professional supervision. Further rigorous clinical research, product standardization, and safety monitoring are required to clarify therapeutic benefits and limitations. These approaches may improve health outcomes and support rational medicine use, but should not replace necessary treatment without clinical assessment.

Keywords: *Nutraceuticals; medicinal herbs; physical exercise; healthy lifestyle; pharmacotherapy; herb–drug interactions; preventive healthcare.*

P-09/F/036 POSTER · OFFLINE

Project Report on Profile of Antibiotics Use at the Health Care Centre, Clinic & Hospitals Along With its Various Dosage Forms and its Manufacturer in India

Khushi Vishwakarma, Dr. Vijay Nigam, Mr. Bhan Singh Yadav
Daksh Institute of Pharmaceutical Sciences, Chhatarpur, (M.P.), Pin: 471001, India
Email: kushivish6056@gmail.com

Antibiotics are among the most significant therapeutic agents used in modern healthcare for the prevention and treatment of bacterial infections. Their discovery has revolutionized medical practice by reducing morbidity and mortality associated with infectious diseases. This report provides a comprehensive overview of antibiotics, healthcare infrastructure, government health schemes, regulatory requirements for healthcare establishments, and commonly used antibiotics within Madhya Pradesh. The study begins with an introduction to antibiotics, highlighting their role, purpose, mechanisms of action, and importance in disease management. Special emphasis is placed on the rational use of antibiotics to prevent the growing challenge of antimicrobial resistance.

The report further examines the healthcare delivery system of Madhya Pradesh, which consists of Sub Health Centres (SHCs), Primary Health Centres (PHCs), Community Health Centres (CHCs), Civil Hospitals, District Hospitals, Medical Colleges, and specialized healthcare institutions. These facilities collectively provide preventive, promotive, curative, and rehabilitative healthcare services to the population across all districts of the state. Various government health schemes implemented through these healthcare institutions are also discussed, including Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (PM-JAY), National Health Mission (NHM), Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakram (JSSK), Universal Immunization Programme (UIP), National Tuberculosis Elimination Programme (NTEP), and other public health initiatives aimed at improving healthcare accessibility and affordability.

The study also presents a district-level overview of commonly used antibiotics, including their product range, active pharmaceutical ingredients, dosage forms, manufacturers, recommended doses, and precautions. Frequently prescribed antibiotics such as Amoxicillin, Amoxicillin-Clavulanic Acid, Cefixime, Ceftriaxone, Azithromycin, Ciprofloxacin, Doxycycline, and Metronidazole are discussed in relation to their therapeutic applications and safe usage practices.

Keywords: *Antibiotics, Healthcare Infrastructure, Madhya Pradesh, Primary Health Centre, Community Health Centre, District Hospital, Government Health Schemes, Ayushman Bharat, Healthcare Regulations, Antimicrobial Resistance, Public Health, Quality Assurance, Hospital Management, Essential Medicines, Healthcare Services.*

P-09/F/037 POSTER · OFFLINE

From Gene to Seizure Control: Pharmacogenomics Guided Therapy in Drug Resistant Epilepsy A 2021-2026 Evidence-Based Review

Xitiza Thakur[1*], Ayushreya banga, Sourabh Kosey

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga PB- 142001*
Email: xitizathakur9@gmail.com

Background: Drug resistant epilepsy (DRE) occurs in about 30-40% of patients with epilepsy and is a significant clinical problem. Traditionally trial and error antiseizures medication (ASM) selection can lead to less-than-optimal control, drug side effects and increased health costs. Pharmacogenomics (PGs): the study of how genetic variation can affect drug response offers the potential for improved personalized and safer drug response.

Objective: To review literature published in the last five years (2021-2026) and its relevance to development and management of drug-resistant epilepsy, particular with an emphasis on genetic markers relevant to ASM efficacy, toxicity, adverse reactions, and personalized treatment.

Methods: A search of recent literature (2021-2026) was conducted to review studies in humans that investigated pharmacogenomics associated with antiseizure medication response, toxicity, and outcomes from epilepsy treatment. Clinical relevance of genetic markers, GWAS (genome wide associated studies) and emerging multi-omics approaches were analyzed.

Results: There is strong evidence of a relationship between HLA-B*15:02 and severe cutaneous adverse reactions (SCAR), including Stevens–Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN), and carbamazepine and other aromatic ASMs. HLA-A*31:01 has also been found to be associated with increased risk of cutaneous adverse reactions (CAR) due to carbamazepine. Genetic variation in CYP2C9 gene plays a role in the metabolism and toxicity of phenytoin, which helps to optimize phenytoin dosage. Variants in SCN1A may be related to drug response and genetic epilepsy syndromes and variants in ABCB1 may influence drug transport and pharmacoresistance. In recent genome-wide scans, some other regions were identified as being associated with protection against drug-resistant focal epilepsy, such as the CNIH3/WDR26/CNIH4 region. Pharmacogenomics-guided treatment can in general decrease serious ADRs, enhance seizure control, limit treatment delays, and facilitate cost-effective personalized treatment

Conclusion: Pharmacogenomics is an exciting way of altering the management of drug-resistant epilepsy, allowing for more targeted and more personalized use of antiseizure medications, including dosage. The incorporation of validated PGx markers into clinical routine may impact on treatment outcomes and prevent avoidable adverse reactions. But more large-scale, multi-ethnic research and validation of new genetic markers are needed before their clinical use can move beyond to wider use.

Keywords: *Pharmacogenomics, Drug-resistant epilepsy, Antiseizure medications Genome-wide association studies, Precision medicine.*

P-09/F/038 POSTER · OFFLINE

Strengthening Medication Safety through Clinical Pharmacy and Pharmacovigilance: The Evolving Role of PharmD Professionals in Patient-Centred Care

Gauri Sood

Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315896@isfcp.org

Introduction: The increasing complexity of pharmacotherapy has made medication safety and rational drug use essential components of patient-centred healthcare. Adverse drug reactions (ADRs), medication errors, drug interactions and inappropriate medication use can negatively affect treatment outcomes and increase healthcare burden. Clinical pharmacy and pharmacovigilance play important roles in identifying, preventing and managing drug-related problems. PharmD professionals can contribute significantly to optimizing pharmacotherapy and improving patient safety through active clinical involvement.

Aim and Objective: To explore the role of clinical pharmacy and pharmacovigilance in improving medication safety and patient-centred care, with emphasis on the contribution of PharmD professionals in identifying drug-related problems, monitoring ADRs, promoting rational drug use and supporting effective patient counselling.

Methodology: A narrative review was conducted using relevant literature and established principles of clinical pharmacy and pharmacovigilance. The role of PharmD professionals was explored across medication review, ADR identification and reporting, drug-interaction detection, medication reconciliation, patient counselling and monitoring of treatment outcomes.

Results: The review highlights that active involvement of clinical pharmacists can support safer and more rational medication use. Prescription review, medication history assessment, ADR identification, causality assessment and drug-interaction monitoring can facilitate early detection of drug-related problems. PharmD professionals can further strengthen pharmacovigilance by improving ADR awareness among patients and healthcare professionals and encouraging systematic reporting.

Conclusion: Integrating clinical pharmacy with pharmacovigilance can strengthen medication safety and patient-centred care. Developing practical competencies in ADR monitoring, medication review and patient counselling can enhance the contribution of PharmD professionals to safe and effective pharmacotherapy.

Keywords: *Clinical Pharmacy, Pharmacovigilance, PharmD, Adverse Drug Reactions, Medication Safety, Patient-Centred Care, Rational Drug Use, Patient Counselling.*

P-09/F/039 POSTER · OFFLINE

Antiseizure Adverse Drug Reactions and Associated Factors Among Patients with Epilepsy: A Prospective Observational Study

Sofinur Ahmed*, Dr. Sourabh Kosey, Dr. Mohd Haneef

Department of Pharmacy Practice, ISF College of Pharmacy,Moga – 142001, Punjab, India
Email: sofinurahmed143@gmail.com

Background: Adverse drug reactions (ADRs) related to antiseizure drugs (ASDs) represent an important therapeutic concern in patients with epilepsy and can adversely affect treatment outcomes, medication adherence, and quality of life. Characterizing ADR patterns and identifying factors associated with their occurrence are essential for promoting safer and more effective antiseizure therapy.

Objective: The study was undertaken to determine the pattern of antiseizure drug-related adverse reactions and to identify factors associated with ADR occurrence among ambulatory patients with epilepsy receiving care at a tertiary-care hospital.

Methods: A hospital-based prospective observational study was carried out from December 2020 to November 2021 at the ambulatory clinic of Jimma Medical Center. A total of 290 patients with epilepsy were enrolled through consecutive sampling. Information was obtained through patient interviews and review of medical records. Suspected ADRs were evaluated for causality using the Naranjo Probability Scale. Data were entered in EpiData Manager version 4.6.0.4 and analyzed using SPSS version 25.0. Multivariable logistic regression was used to identify factors independently associated with ADRs, with statistical significance set at $p < 0.05$.

Results: Of the 290 participants evaluated, 98 reported at least one antiseizure drug-associated ADR, corresponding to an overall prevalence of 33.8% (95% CI: 29.2–39.9%). Overall, 110 ADR events were documented. Epigastric pain (27.55%), drowsiness (23.46%), and headache (20.40%) were the most frequently reported reactions. Phenobarbital (52.04%) and phenytoin (34.70%) were the antiseizure medicines most frequently implicated. Causality assessment classified 52.72% of reactions as possible and 39.09% as probable according to the Naranjo scale. Multivariable analysis identified a seizure-free period of less than two years (AOR=1.94, 95% CI: 1.18–3.19), presence of comorbidities (AOR=2.11, 95% CI: 1.25–3.57), and use of two or more ASDs (AOR=1.35) as significantly associated with ADR occurrence.

Conclusion: Antiseizure drug-related adverse reactions were commonly identified among patients with epilepsy. The occurrence of ADRs was associated with polytherapy, comorbid conditions, and a seizure-free period of less than two years. Regular monitoring, appropriate patient counselling, and early recognition of individuals at greater risk may support reduction of ADR burden and improve the safety of antiseizure treatment.

Keywords: *Adverse drug reactions; antiseizure drugs; epilepsy; pharmacovigilance; Naranjo scale; polytherapy.*

P-09/F/040 POSTER · OFFLINE

AI Chatbots versus Pharmacists in Answering Medication-Related Queries: A Literature Survey

Romalpreet Kaur[1*], Ayushreeya Banga[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India.
Email: romalpreetkaur88@gmail.com

Patients increasingly turn to artificial intelligence (AI) chatbots for medication information, yet their reliability compared with pharmacist counselling is uncertain. This literature survey aimed to summarize published evidence comparing chatbot responses to medication-related queries with those of pharmacists, physicians, or standard drug-information references. Studies published between 2023 and 2026 were identified through PubMed and publisher websites using the terms ChatGPT, chatbot, large language model, drug information, medication counselling, and pharmacist; ten sources (nine original studies and one systematic review) were reviewed narratively. Reported accuracy varied widely: about a quarter of responses were judged satisfactory in two studies using real-world drug-information questions, half in a drug information centre comparison, and 79% in a study of 264 clinical pharmacy questions, where ChatGPT exceeded pharmacists (66%). ChatGPT approached pharmacist scores in drug counselling but scored lower in prescription review, patient education, and adverse drug reaction assessment. Chatbot answers were often incomplete, lacked or fabricated references, and were difficult for patients to read; in one patient-focused study, 22% of a subset of low-accuracy answers were judged capable of causing death or severe harm. A preprint meta-analysis reported 86% pooled accuracy but very high heterogeneity and few high-quality studies. AI chatbots are best regarded as supplementary tools requiring pharmacist oversight; blinded, reproducible studies, particularly from India, are needed.

Keywords: *Artificial Intelligence; ChatGPT; Medication Counselling; Drug Information; Pharmacist; Patient Safety*

P-09/F/041 POSTER · OFFLINE

Clinical Pharmacy, Pharmacovigilance & P'Practice (PharmD)

Shivnandan Kumar

Department of Pharmacy Practice, ISF College of Pharmacy, Moga – 142001, Punjab, India
Email: 2439599@isfcp.org

Introduction: Pharmacovigilance plays a crucial role in the detection, prevention, and safety of medicines by identifying and preventing adverse drug reactions (ADRs). Traditional pharmacovigilance systems can have challenges with under-reporting, delayed identification of signals, and the growing amount of healthcare data. The use of artificial intelligence (AI) has been a great prospect in promoting the efficiency and accuracy of the detection of ADRs.

Methodology: A narrative review was performed based on published literature related to the use of artificial intelligence, machine learning and natural language processing in the pharmacovigilance domain. Applications of relevance to spontaneous reporting systems, EHR systems, biomedical literature and other real world data sources were assessed.

Results: With the help of AI-based methods, massive amounts of data can be processed quickly and potential drug–event relationships can be identified, which can be more difficult in traditional analyses. Machine learning can be used to help identify signals and predict risk, and natural language processing can be used to identify information related to ADR in unstructured clinical and textual data. But data quality, reporting bias, algorithmic bias, privacy concerns and lack of interpretability are still significant challenges.

Summary and Conclusion: AI can support traditional pharmacovigilance by helping to detect ADRs more quickly and comprehensively. The incorporation of AI into the expertise of a clinical pharmacist, coupled with proper validation, could enhance patients' outcomes and medication-safety monitoring.

Keywords: *Drug Safety, Safety Surveillance, Pharmacovigilance, AI, ADR, Machine Learning, Signal Detection*

P-09/F/042 POSTER · OFFLINE

Information and communication technology in combating Counterfeit Drugs

Atula Kaushal*[1], Bhawna Garg[1], Neha[1]

**[1]Department of Pharmacy, SBS College of Pharmacy, Raikot Road, Mehal Kalan – 148104, Barnala, Punjab, India*
Email: thakuratu318@gmail.com

Background: Materiovigilance is an essential component of healthcare safety that involves the monitoring, identification, assessment, and prevention of adverse events associated with medical devices. As medical devices are increasingly used for diagnosis, treatment, monitoring, and drug delivery, ensuring their safety, quality, and performance has become a major concern.

Objectives: The present study aimed to highlight the importance of materiovigilance, identify factors contributing to medical device-related adverse events, and emphasize the role of pharmacists and healthcare professionals in improving medical device safety.

Methods: A descriptive review was conducted using available literature and published information on materiovigilance, medical device-related adverse events, reporting systems, and the Materiovigilance Programme of India (MvPI). Relevant information regarding device-related risks, reporting, prevention, and healthcare professionals' involvement was reviewed.

Results: Medical device-related adverse events may occur due to design defects, manufacturing errors, material incompatibility, improper use, inadequate maintenance, or device malfunction. These events may result in patient injury, infection, treatment failure, or other serious health consequences. In India, MvPI was established to strengthen the surveillance of medical devices and support the generation of safety data for regulatory decision-making. Pharmacists play an important role in identifying, reporting, and preventing such events through proper patient education and collaboration with healthcare professionals.

Conclusion: Materiovigilance plays a vital role in ensuring the safety and effectiveness of medical devices. Strengthening awareness, training, reporting mechanisms, and professional participation can facilitate early detection of safety signals, support corrective actions, and ultimately improve patient safety and healthcare outcomes.

Keywords: *Materiovigilance, Medical Devices, Patient Safety, Adverse Events, Medical Device Surveillance.*

P-09/F/043 POSTER · OFFLINE

Information and communication technology in combating Counterfeit Drugs

Gitika Jindal*[1], Bhawna Garg[1], Neha[1]

*[1]*Department of Pharmacy, SBS College of Pharmacy, Raikot Road, Mehal Kalan – 148104, Barnala, Punjab, India*
Email: gitikajindal28@gmail.com

Background: Medicines are primarily intended to prevent, treat, or cure diseases; however, counterfeit medicines can pose a serious threat to human health and life. Genuine medicines contain the appropriate quantity of active pharmaceutical ingredients (APIs) along with suitable excipients and are manufactured under approved quality standards. They may contain no API, an incorrect API, or an insufficient quantity of the required API. They are often illegally manufactured and designed to resemble genuine medicines in appearance, packaging, and labelling, making them difficult for patients to identify.

Objectives: The present study aimed to create awareness regarding counterfeit medicines, differentiate them from genuine medicines, and highlight their potential risks to patients and public health.

Methods: A descriptive review was conducted using available literature and published information concerning counterfeit medicines, their characteristics, causes, health consequences, and challenges associated with their detection and prevention. Particular emphasis was given to the differences between genuine and counterfeit medicines and the possible consequences of using substandard or falsified products.

Results: Counterfeit medicines may contain reduced or absent quantities of APIs or cheaper and potentially harmful substances. Their use can reduce therapeutic efficacy, cause treatment failure, and result in serious adverse effects or toxicity. Contaminants such as heavy metals, including lead and mercury, may cause severe poisoning and, in extreme cases, death. Economic factors, lack of awareness, and the availability of cheaper medicines can contribute to the demand and distribution of counterfeit products.

Conclusion: Counterfeit medicines represent a significant public-health concern. Increased public awareness, strict regulatory control, reliable supply chains, and proper verification of medicines are essential to protect patients and ensure medication safety.

Keywords: *Counterfeit, Efficacy, Generic, Therapeutic.*

P-09/F/044 POSTER · OFFLINE

Impact of Sleep Quality on Seizure Frequency and Quality of Life in Epilepsy Patients: An Observational Study at a Tertiary Care Hospital

Neha*[1], Dr. Khadga Raj Aran[1]

[1]Assistant Professor, Department of Pharmacy, SBS College of Pharmacy, Raikot Road, Mehal Kalan – 148104, Barnala, Punjab, India
Email: nehasharma95258@gmail.com

Background: Epilepsy is a chronic neurological disorder frequently associated with sleep disturbances, which adversely affect seizure control, cognitive functioning, and psychosocial well-being. Poor sleep quality is increasingly recognized as an important contributor to increased seizure severity and impaired quality of life (QoL) among epilepsy patients. However, comprehensive evaluation of the relationship between sleep quality, seizure burden, and QoL using standardized assessment tools remains limited in Indian tertiary care settings.

Objectives: The study aimed to assess sleep quality among epilepsy patients and evaluate its association with seizure severity and QoL.

Methods: This prospective observational study included 109 epilepsy patients attending a tertiary care teaching hospital in Punjab, India. Sleep quality, seizure severity, and quality of life were assessed using the Pittsburgh Sleep Quality Index (PSQI), Liverpool Seizure Severity Scale 2.0 (LSSS2.0), and Quality of Life in Epilepsy-10 (QOLIE-10) questionnaire, respectively. Statistical analysis included descriptive statistics, Chi-square test, and Spearman's rank correlation analysis.

Results: Poor sleep quality was observed in 88.1% of participants, with a median PSQI score of 9. Significant positive correlations were identified between PSQI and LSSS 2.0 scores ($r=0.508$, $p<0.001$) and between PSQI and QOLIE-10 scores ($r=0.663$, $p<0.001$), indicating that worsening sleep quality was associated with increased seizure severity and impaired QoL.

Conclusion: Poor sleep quality was highly prevalent among epilepsy patients and significantly associated with greater seizure burden and reduced quality of life. Routine assessment and management of sleep disturbances should be integrated into comprehensive epilepsy care to improve patient outcomes.

Keywords: *Epilepsy, Sleep Quality, Seizure Severity, Quality of Life, Pittsburgh Sleep Quality Index.*

P-09/F/045 POSTER · OFFLINE

Clinical Spectrum and Molecular Insights into Wiskott–Aldrich Syndrome: Novel WAS Mutations and Their Clinical Impact

Sk Istekar Hossein[1], Sundram Kumar[1], Dr.Sourav Kosey[1]

Department Of Pharmacy Practice, ISF College Of Pharmacy, Moga-142001, Punjab, India
Email: 2315910@isfcp.org

Background: Wiskott–Aldrich syndrome (WAS) is a rare X-linked primary immunodeficiency characterized by microthrombocytopenia, eczema, recurrent infections, autoimmunity, and increased susceptibility to malignancies. Genetic variation in the WAS gene contributes to a broad clinical spectrum ranging from classic WAS to X-linked thrombocytopenia (XLT). Early and accurate molecular diagnosis is important, particularly in patients with atypical clinical presentations.

Objective: To investigate molecular alterations in the WAS gene among patients with suspected WAS/XLT and evaluate their association with clinical manifestations and disease severity.

Methods: Thirty-one patients from 27 families with thrombocytopenia and clinical features suggestive of WAS/XLT were evaluated. Clinical assessment, platelet morphology, WAS protein (WASp) expression by flow cytometry, and direct sequencing of the WAS gene were performed. Genotype–phenotype relationships were assessed using established clinical severity scores.

Results: Molecular analysis identified 17 WAS gene variants, including 10 previously unreported variants, thereby expanding the known genetic diversity of WAS. Frameshift variants were the most frequent (63.6%), followed by missense (22.7%), nonsense (9.1%), and splice-site variants (4.5%). Among molecularly confirmed patients, thrombocytopenia was universal and small platelets were observed in 92.8% of cases where platelet morphology was available. Reduced WASp expression was detected in six patients. Twelve patients underwent hematopoietic stem cell transplantation (HSCT), while six deaths were reported. The relationship between variant type and clinical severity was not straightforward, indicating substantial phenotypic heterogeneity.

Conclusion: The identification of ten novel WAS mutations highlights the considerable genetic diversity of Wiskott–Aldrich syndrome. The presence of atypical clinical features, including normal platelet size in an affected patient, emphasizes the importance of molecular genetic testing alongside clinical evaluation. Early molecular diagnosis may facilitate appropriate disease classification and timely consideration of individualized therapeutic strategies, including HSCT.

Keywords: *Wiskott–Aldrich syndrome; WAS gene; WASp; novel mutations; thrombocytopenia; primary immunodeficiency; genotype–phenotype correlation; HSCT.*

P-09/F/046 POSTER · OFFLINE

Comorbidity-Linked Electrolyte Instability Index (Ceii): A Novel Risk Tool for CKD Inpatients

Ravi Ranjan Kumar[1]*, Dr. Sourabh Kosey[1], Dr. Rimpi Arora[2], Dr. M Joseph John[2]

[1]Department of Pharmacy Practice, ISF College of Pharmacy, Moga-142001, Punjab, India [2]Department of Clinical Haematology, Haemato-oncology & Bone Marrow Transplantation, Christian Medical College Ludhiana
Email: rrk2116965@gmail.com

Background: Electrolyte disturbances such as hyponatremia, hyperkalemia, hypocalcemia, and chloride imbalance are common in chronic kidney disease (CKD) and can lead to serious complications including arrhythmia, bone disease, and prolonged hospitalization. Diabetic CKD patients and those with multiple comorbidities are particularly vulnerable, yet bedside risk assessment tools remain limited.

Aim: To evaluate serum electrolyte abnormalities in hospitalized CKD patients and develop a Comorbidity-Linked Electrolyte Instability Index (CEII) to quantify instability risk using first post-admission laboratory data.

Methods: A cross-sectional observational study was conducted among hospitalized CKD stage G3a–G5 (non-dialysis) patients. The first post-admission electrolyte panel (Na^+, K^+, Cl^-, Ca^{2+}) was recorded before any corrective therapy. Each patient's CEII was computed from: (1) Comorbidity Score (CS, 0–2), (2) Electrolyte Severity Score (ESS, 0–12; based on deviation from normal ranges), and (3) Medication Risk Score (MRS, 0–2). Data were analyzed using SPSS v26 with t-test, ANOVA, χ^2, and ROC curve analysis for validation.

Results: Among 176 participants, electrolyte abnormalities were frequent, especially hyponatremia and hyperkalemia in diabetics. CEII showed strong correlation with comorbidity burden ($r \approx 0.45$, $p < 0.01$). ROC analysis demonstrated good predictive ability for adverse outcomes (AUC ≈ 0.82). Patients with CEII ≥ 7 had significantly higher risk for prolonged stay and cardiac events.

Conclusion: The CEII is a simple, reliable, and bedside-applicable index that integrates comorbidities and electrolyte derangements to stratify CKD patients by risk. Routine CEII calculation on admission may enable earlier recognition of electrolyte instability and improve inpatient safety and outcomes.

Keywords: *Chronic Kidney Disease, Electrolyte Disturbance, Diabetes, Comorbidity, CEII, Hospitalized Patients, Risk Index*

P-09/F/047 POSTER · OFFLINE

Assessment of Quality of Life Among Tuberculosis Patients: A Hypothetical Cross-Sectional Study

Alok Kumar*, Dr. Sourabh Kosey

Department of Pharmacy Practice, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: aloklapi7@gmail.com

Background: Tuberculosis (TB) is a major infectious disease that affects individuals physically, psychologically, socially, and economically. Although successful treatment of TB is primarily assessed through clinical and microbiological outcomes, these measures may not adequately reflect the patient's overall well-being. Assessment of quality of life (QoL) provides a broader understanding of the impact of TB and its treatment on patients' daily lives.

Objective: The present study aimed to assess the quality of life among tuberculosis patients and to determine the association between quality of life and selected demographic and clinical variables.

Methods: A quantitative, descriptive cross-sectional research design was proposed for the study. A sample of 100 adult tuberculosis patients receiving anti-tuberculosis treatment at a selected hospital was included using a convenience sampling technique. Data were proposed to be collected using a structured demographic and clinical questionnaire and the WHOQOL-BREF instrument. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize the data. Chi-square tests were proposed to determine the association between quality of life and selected variables at a significance level of 0.05.

Results: In the findings, 24% of participants had poor quality of life, 58% had moderate quality of life, and 18% had good quality of life. The physical health domain had the lowest mean score, followed by the psychological domain, while the environmental domain had the highest mean score. Significant associations were observed between quality of life and socioeconomic status, duration of treatment, treatment-related symptoms, and family support.

Keywords: *Tuberculosis, quality of life, WHOQOL-BREF, physical health, psychological health, social support, TB patients.*

O-09/N/001 ORAL · ONLINE

Predictive Pharmacovigilance of Antithrombotic Therapy Using Machine Learning

Ramenani Hari Babu[1]*, Ashutosh Pathak[2]

[1]*Amity Institute of Pharmacy Amity University Gwalior, MP, India.*
[2]*Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, UP, India.*
Email: verahanuma@gmail.com

Background: Anti-thrombotic agents are widely used for prophylaxis and therapeutic management of thromboembolic disorders, and is expected to have incidence of adverse haematological complications. Machine learning aide to identify high-risk patients and improve medication safety.

Objective: To determine the adverse drug reaction profile of antithrombotic prescription and measure the predictive performance of a logistic regression model in a tertiary care hospital. Methods: A prospective observational study was performed in 272 adult patients on Anti-thrombotic therapy for a period of six months. Clinicodemographic data was collected using data collection forms and ADR profiling was done. A logistic regression-based machine learning model was developed from selected variables to predict the risk group and for incidence of ADR.

Results: A total of 272 patients were included in the study. Most of the patients (71.7%) were male and the mean age was 59.3 ± 12.1 years. 22 (8.1%) patients reported of adverse drug reactions (ADRs) with thrombocytopenia (68.2%) and bleeding (13.6%). The severity of the ADRs was moderate (68.2%) and most of them (63.6%) were probable in the Naranjo causality scale. The logistic regression model had an accuracy of 64.81% and AUC-ROC of 0.5375. Clopidogrel usage, diagnosis of cardiac disease, men and ticagrelor therapy were found to be important factors predicting the occurrence of ADR.

Conclusion: Thrombocytopenia and bleeding were the commonest ADRs. Although the predictive model had limited discrimination, our findings underscore the need for routine monitoring, careful risk assessment and the potential value of larger datasets.

Keywords: *Pharmacovigilance, Logistic Regression Model, Antithrombotic Agents.*

O-09/N/002 ORAL · ONLINE

Inhaler Technique Errors in Asthma and COPD: Clinical Consequences, Contributing Factors, and the Role of Pharmacist-Led Education

Hashim Khan[1]*, Ramenani Hari Babu[2]

[1]*Research Scholar, Department of Pharmacy Practice, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India 244001*

[2]*Professor, Department of Pharmacy Practice, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India 244001*

Email: dr.hashimkhan123@gmail.com

Asthma and chronic obstructive pulmonary disease (COPD) are common respiratory disorders in which inhaled medications play an important role in disease management. However, the effectiveness of inhaled therapy largely depends on the patient's ability to use the inhaler correctly. Incorrect inhaler technique is frequently observed and may result in inadequate drug delivery, poor symptom control, reduced treatment effectiveness, and increased risk of exacerbations. Several factors may contribute to inhaler technique errors, including lack of patient knowledge, incorrect understanding of device instructions, insufficient training, inappropriate device selection, and failure to receive regular technique assessment. Different inhaler devices also require specific techniques, making patient education particularly important. Community pharmacists are easily accessible healthcare professionals who can play a crucial role in identifying and correcting inhaler technique errors. Pharmacist-led counselling, demonstration, teach-back methods, and regular reassessment may improve patients' inhaler skills and support better medication use. Repeated education may also help maintain correct technique over time.

Keywords: *Asthma, COPD, Inhaler Technique, Inhaler Errors, Community Pharmacists, Patient Education, Pharmacist-Led Counselling.*

O-09/N/003 ORAL · ONLINE

Pharmacovigilance Study of Lipid Lowering Agents in Cardiac Patients

Sebu[1]*, Ramenani Hari Babu[1]

[1]*Department of Pharmacy Practice, College of Pharmacy, Teerthankar Mahaveer University, Moradabad 244102*

Email: sebumalik780@gmail.com

Low density lipoprotein cholesterol (LDL C) and cardiovascular events have been shown to significantly decrease with lipid-lowering medications like statins, fibrates, ezetimibe, PCSK9 inhibitors, and more recent treatments. Dyslipidemia is a significant modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). However, estimates indicate that only around half of patients with chronic illnesses continuously adhere to long-term lipid-lowering treatment, which severely limits the real-world efficacy of these medications. With an emphasis on usage patterns, factors contributing to non-adherence, and methods to enhance safe and efficient utilization, this review attempts to investigate pharmaceutical safety and adherence among patients receiving cholesterol lowering medications. Patient-related factors (knowledge, medication beliefs, fear of side effects, forgetfulness), therapy-related issues (polypharmacy, frequency of dosing, side effect profile, such as muscle symptoms associated with statins), health system barriers (cost, availability, follow-up), and socioeconomic determinants are important factors influencing adherence. Poor persistence and therapeutic failure are further exacerbated by medication safety issues, including perceived or actual statin intolerance, drug-drug interactions, and improper self-discontinuation following moderate side effects. Research indicates that improved adherence and safety results can be achieved by organized patient education, collaborative decision-making, regimen simplification, fixed dosage combinations, digital reminder aids, and routine monitoring of lipid markers and side effects. In order to optimize dyslipidemia management and lower cardiovascular risk, the current study is intended to evaluate medication safety and adherence among patients on lipid-lowering agents, identify predictors of non-adherence in the local population, and suggest focused, pharmacist-led, multidisciplinary interventions.

Keywords: *Dyslipidemia, Lipid-Lowering Agents, Medication Adherence, Patient Safety, Statins, PCSK9 Inhibitors, Statin Intolerance, Cardiovascular Risk, Lifestyle Modifications.*

O-09/N/004 ORAL · ONLINE

AI – Driven Signal Detection in Pharmacovigilance: From Disproportionality Analysis to Machine Learning

Khonzani O. Ovung[1]*

[1]SGT College of Pharmacy, SGT University, Gurugram, Haryana, India
Email: konzanibackup@gmail.com

Introduction: Pharmacovigilance (PV) plays a pivotal role in identifying and assessing Adverse Drug Reactions (ADRs) and ensuring medicine safety. Traditional signal detection relies largely on spontaneous reporting systems and statistical disproportionality methods. However, with the increasing data volume, incomplete information, under-reporting, and complex drug–event connections create challenges for conventional approaches.

Aim & Objectives: To assess the evolution of PV signal detection from traditional disproportionality analysis toward artificial intelligence (AI) and machine-learning (ML) approaches, with emphasis on their applications, benefits, and implementation challenges.

Methods: A focused literature review was conducted using published evidence on AI applications in pharmacovigilance.

Results: AI and ML analyses large and heterogeneous datasets, recognize complex patterns, support adverse-event identification, and improve signal prioritization. These technologies may complement conventional disproportionality methods by incorporating information from diverse electronic data sources. However, successful implementation depends on the availability and quality of data, suitable technical infrastructure, skilled personnel, model transparency, validation, and appropriate regulatory support. These aspects may be challenging in low- and middle-income countries.

Summary: The findings indicate a transition from statistical signal detection toward integrated approaches combining disproportionality analysis with AI, which may serve as a supportive tool rather than a replacement for established pharmacovigilance practices.

Conclusion: AI-driven signal detection offers opportunities to enhance the efficiency and flexibility of PV. Future research should focus on high-quality datasets, explainable models, appropriate infrastructure, and integration of AI outputs with expert clinical and regulatory assessment.

Keywords: *Pharmacovigilance, Artificial Intelligence, Machine Learning, Signal Detection, Disproportionality Analysis, Adverse Drug Reactions.*

O-09/N/005 ORAL · ONLINE

Alcohol Consumption and Quality of Life Across the Spectrum of Alcoholic Liver Disease

Mohammad Arif[1]*, Dr. Preetpal Singh[1], Dr. Amit Chaudhary[1]

[1]Chitkara School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India
Email: arifkhan007770@gmail.com

Introduction: Alcoholic liver disease (ALD) is a chronic condition that leads to progressive liver damage and reduced patient well-being.

Aim & objectives: To assess the relationship between alcohol use and health-related quality of life (HRQoL) across the ALD spectrum.

Methods: A cross-sectional study evaluated 125 participants: 100 patients with ALD and 25 healthy controls. Alcohol consumption was assessed using the Alcohol Use Disorders Identification Test (AUDIT) and daily alcohol intake (g/day). HRQoL was assessed using the Chronic Liver Disease Questionnaire (CLDQ). One-way ANOVA analyzed group differences, and Spearman's rank correlation assessed associations.

Results: Mean AUDIT scores increased from 3.0±2.7 in controls to 26.2±1.7 in cirrhosis, while daily alcohol intake increased from 7.1±6.6 to 75.8±17.2 g/day (both $p<0.001$). Mean CLDQ scores decreased from 6.7±0.4 to 3.2±0.2 ($p<0.001$). AUDIT scores were inversely correlated with CLDQ among heavy ($r=-0.734$), moderate ($r=-0.872$), and light ($r=-0.983$) drinkers ($p<0.001$). Daily alcohol intake negatively correlated with CLDQ scores.

Summary: Alcohol consumption increased with ALD severity, while HRQoL declined. Higher alcohol use was associated with lower CLDQ scores.

Conclusion: The findings indicate that alcohol consumption directly correlates with poorer HRQoL across the ALD spectrum, highlighting the value of considering alcohol use when assessing disease burden.

Keywords: *Alcoholic liver disease, Alcohol consumption, Health-Related Quality of Life, Chronic Liver Disease Questionnaire.*

O-09/N/006 ORAL · ONLINE

Role Of Artificial Intelligence in Personalized Medicine and Precision Dosing

Dr. D. Curie[1]*, A. Prabhu sangeetha[2]

[1]*Associate professor, Department of Pharmacy, SIMS college of Pharmacy, Guntur.*
[2]*Student, Department of Pharmacy, SIMS college of Pharmacy, Guntur.*

curiedhulipalla@gmail.com

Introduction: Personalized medicine aims to optimize pharmacotherapy according to individual patient characteristics. Precision dosing integrates factors such as therapeutic drug monitoring, pharmacokinetics, pharmacodynamics, laboratory parameters and pharmacogenomic information. Artificial intelligence (AI) and machine learning (ML) can integrate multidimensional clinical data and identify complex patterns that may support individualized dose selection and therapeutic monitoring.

Aim & Objectives: To review the role of AI in personalized medicine and precision dosing. The objectives were to identify AI/ML approaches used for dose and exposure prediction, examine their integration with therapeutic drug monitoring and pharmacogenomics, and assess opportunities and challenges for clinical implementation.

Methods: A focused literature review was conducted using peer-reviewed literature on AI/ML, personalized medicine, therapeutic drug monitoring and model-informed precision dosing. Studies describing AI-assisted concentration/exposure prediction, dose optimization, pharmacokinetic/pharmacodynamic modeling and integration of patient-specific clinical or genomic data were considered.

Results: Published evidence indicates that AI/ML approaches can support concentration or exposure prediction, dose optimization and individualized pharmacotherapy, and can complement pharmacometric and model-informed precision-dosing approaches. Integration of electronic health-record variables, biomarkers, pharmacogenomic information and therapeutic drug concentrations may enable more individualized predictions. However, evidence remains heterogeneous, with important limitations involving data quality, representativeness, interpretability, external validation, workflow integration and prospective clinical outcome evaluation.

Summary: AI provides an opportunity to augment conventional precision-dosing strategies by integrating high-dimensional patient data and supporting clinical decision-making. Its greatest value is likely to be as a decision-support tool used alongside pharmacometrics, therapeutic drug monitoring and clinical expertise.

Conclusion: AI-enabled personalized dosing is promising but remains an evolving field. Robust external and prospective validation, transparent model development, interoperable clinical systems and multidisciplinary collaboration are needed before widespread clinical adoption.

Keywords: *Artificial Intelligence, Personalized Medicine, Precision Dosing, Machine Learning, Therapeutic Drug Monitoring, Pharmacogenomics.*

O-09/N/007 ORAL · ONLINE

Medication Adherence and Glycemic Control in Patients Suffering with Type 2 Diabetes Mellitus in Association with Renal Involvement: A Cross-Sectional Observational Study in Tertiary Care Hospital

Satyam Yadav[1], Sourabh Kosey[1]

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, 142001*
Email: satyam1718yadav@gmail.com

Background: Medication adherence plays a crucial role in achieving optimal glycemic control and preventing long-term complications in patients with type 2 diabetes mellitus (T2DM). Poor adherence to antidiabetic therapy is associated with uncontrolled blood glucose levels, increased risk of complications, and decline in renal function.

Objective: The present study aimed to evaluate the association between medication adherence, glycemic control, and renal function among patients with T2DM.

Methods: A cross-sectional observational study was conducted among 175 patients with T2DM. Data regarding demographic characteristics, clinical parameters, comorbidities, and medication profiles were collected using a structured case record form. Medication adherence was assessed using the Medication Adherence Report Scale (MARS) and Adherence to Refills and Medications Scale (ARMS). Glycemic control was evaluated using glycated haemoglobin (HbA1c), while renal function was assessed using estimated glomerular filtration rate (eGFR). Statistical analysis included descriptive statistics, correlation analysis, and multiple linear regression.

Results: The mean HbA1c level was 9.57 ± 1.64%, indicating poor glycemic control among the majority of participants. MARS score showed a significant negative correlation with HbA1c ($r = -0.320$, $p < 0.001$), whereas ARMS score demonstrated a significant positive correlation with HbA1c ($r = 0.346$, $p < 0.001$). MARS score also showed a positive correlation with eGFR ($r = 0.230$, $p = 0.002$). Regression analysis identified MARS score as a significant independent predictor of HbA1c ($\beta = -0.328$, $p < 0.001$).

Conclusion: The study demonstrated that medication adherence is significantly associated with glycemic control and renal function in patients with T2DM. Improving adherence through targeted interventions may contribute to better therapeutic outcomes and reduced risk of diabetes-related complications.

O-09/N/008 ORAL · ONLINE

Mapping the Indian Breast Cancer Genome: A Systematic Review of Tissue-Based Germline and Somatic Mutational Patterns

Dr.V.Hemalatha[1], G.NagaSivani[1], M.Sunitha[1], B.Murali[1], Y.Jaswini[1], Dr.S.Gayatri[2], Dr.D.Bhargavi[3].

[1] Department of Pharmacy Practice, MB School of Pharmaceutical Sciences, Tirupati, Andhra Pradesh.
[2] Department of Endocrinology, Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, Andhra Pradesh.
[3] Department of Medical Oncology, Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, Andhra Pradesh.
Email: hemalatha.v@mbu.asia

Background: Breast cancer is the most common malignancy among Indian women, yet its germline and somatic mutational landscape remains incompletely characterised. Previous reviews have focused mainly on BRCA1/2, with limited integrated evidence on genomic alterations in Indian breast cancer.

Methods: A PRISMA 2020-compliant systematic review, registered with PROSPERO (CRD420251270103), searched PubMed, Scopus, Embase, Google Scholar, and medRxiv to May 2026. Eligible studies reported germline pathogenic/likely pathogenic variants or tissue-based somatic mutations in Indian breast cancer patients.

Results: Forty-one studies were included: 32 germline, 10 somatic, and 2 contributing to both. Germline detection ranged from 0–41.4%, with BRCA1 predominance. BRCA1 c.68_69delAG was reported in 12 studies, mainly from South India. Non-BRCA genes contributed 9.1–67% of actionable findings in multigene studies. TP53 (33–76%) and PIK3CA (5–42%) were the most frequent somatic drivers. One whole-genome study identified seven candidate driver genes absent from prior global datasets, with 86% of nonsynonymous mutations unique to Indian tumours.

Conclusion: Indian breast cancer shows population-specific genomic features, supporting broader multigene testing and Indian-specific genomic resources.

Keywords: *Breast cancer; India; germline mutations; somatic mutations; next-generation sequencing.*

P-09/N/001 POSTER · ONLINE

Impact of Clinical Pharmacist Interventions on Preventing and Managing Medication-Related Problems among Geriatric Patients at a Teaching Hospital

Ayushi Jain[1]*

[1]Assistant Professor, Indore Institute of Pharmacy, Indore, MP,
Email: ayushi.jain@indoreinstitute.com

With the growth of the geriatric population, medication related problems (MRPs) are becoming a prominent concern in health care. By recognizing, preventing and solving MRPs, clinical pharmacists can contribute greatly to the safety and efficacy of medications, enhancing therapy results. The purpose of this study was to assess the effect of clinical pharmacist interventions on medication related problems in geriatric patients in teaching hospitals and to measure the acceptance and the satisfaction of both patients and healthcare providers with clinical pharmacist interventions. A total of 150 geriatric patients were included, of whom most were aged 71-75 years, and were multi-comorbid. The patients were measured for their knowledge, adherence to medication and attitude to pharmaceutical care using structured questionnaires. Results indicated that there was a lack of knowledge on the part of many patients regarding their diseases and medications, thus the need for focused education and counseling. Patients with chronic conditions and polypharmacy identified as special group for medication management support. Clinical pharmacist interventions helped identify and resolve medication-related problems, optimize drug therapy, and enhance adherence to medication therapy. The patients had positive perceptions about the role of pharmacists in their care and healthcare providers recognized the importance of pharmacist-led interventions. The study proved that the involvement of clinical pharmacists in multi-disciplinary health care teams can effectively decrease the incidence of medication related problems and improve the outcomes of the patients. The results reinforced the body of evidence that clinical pharmacists are important players in the care of geriatric patients, despite the noted limitations of a relatively small sample size and potential for response bias. Incorporation of clinical pharmacy services in teaching hospitals can definitely help reduce medication safety risks, maximize medication effectiveness, and consequently improve elderly patients' lives.

Keywords: *Geriatric Patients, Clinical Pharmacist, Medication-Related Problems (Mrps), Polypharmacy, Patient Counseling.*

P-09/N/002 POSTER · ONLINE

From Signals detection to Safety Enhancement: The Worldwide Role of Pharmacovigilance Database Systems

Shailja Kumari[1]*, Parneet Deol[1], Satvinder Kaur[1]

[1]*Department of Pharmacy, GHG Khalsa college of Pharmacy, Gurusar Sadhar, Ludhiana Punjab-141104, India*
Email: shailja6140@gmail.com

Pharmacovigilance plays a very important role in ensuring the safety and effectiveness of medicine by detecting, assessing, understanding, and preventing adverse drug reaction. The increasing volume of safety data generated from clinical trials, spontaneous reports, literature and data-based system for case management. Different pharmacovigilance (PV) systems and databases are used worldwide in the field of PV. These databases play a most important role in the observance of the safety of medications and medical products after their approval and distribution. Collecting and analyzing adverse event reports enables early detection of potential safety concerns, facilitates regulatory actions, and contributes to public health protection. The advantages of these databases, such as their ability to conduct signal detection, post-market surveillance, and support research endeavors. Furthermore, the limitations of these databases such as underreporting, reporting bias, and the need for careful causality assessment. Oracle Argus Safety is a widely used safety database that supports the systematic management of Individual Case Safety Reports (ICSRs) throughout the pharmacovigilance process. Oracle Argus Safety facilitates the collection, processing, assessment, coding, review, and reporting of adverse event information received from healthcare professionals, patients, clinical studies, literature, regulatory authorities, and other sources. Overall, Oracle Argus Safety serves as an important technological component of modern pharmacovigilance operations and contributes to the continuous monitoring of the benefit-risk profile of medicinal products.

Keywords: *Pharmacovigilance, literature, Individual Case Safety Reports (ICSRs), Oracle Argus Safety, Adverse Event, Benefit-Risk Profile*

P-09/N/003 POSTER · ONLINE

Piroxicam–β-Cyclodextrin in Postoperative Orthopedic Pain Management: Evidence and the Clinical Pharmacist's Perspective

Ujjval Pandey[1], Dr. Akhilesh Patel[2]

[1]*Pharmd 3rd year, SGT college of pharmacy, SGT University, Gurugram, Haryana*
[2]*Assistant professor, Department of Pharmacy practice, SGT college of pharmacy, SGT University, Gurugram, Haryana*
Email: ujjvalp48@gmail.com

Background: Postoperative pain management in orthopedic wards is one of those everyday clinical challenges that rarely gets the pharmacy attention it deserves. Conventional piroxicam, while effective as an NSAID, comes with the familiar problems — slow onset, gastric irritation, and poor tolerability, especially in patients already recovering from surgery. Piroxicam-β-cyclodextrin (Brexin®), an inclusion complex that enhances aqueous solubility and accelerates absorption, was designed to address exactly these limitations. Yet, despite being commercially available in India, its real-world clinical outcomes from a pharmacy practice perspective remain poorly characterized in tertiary care hospital settings.

Objective: To evaluate and compare the clinical effectiveness, onset of analgesia, adverse drug reaction (ADR) profile, and patient compliance of piroxicam-β-cyclodextrin complex versus conventional piroxicam in postoperative orthopedic patients, through active pharmacist-led outcome monitoring.

Methods: A prospective observational study was conducted in the orthopedic ward of SGT Medical College & Research Institute, Gurugram. Postoperative patients prescribed piroxicam-β-CD or conventional piroxicam were enrolled after meeting inclusion criteria. Pain intensity was measured using the Visual Analog Scale (VAS) at 1-, 4-, and 24-hours post-dose. Drug-related problems (DRPs) and ADRs were identified and documented through structured SOAP-format pharmacist notes. Causality assessment was performed using the WHO-UMC scale and Naranjo algorithm.

Results: Preliminary findings showed faster pain relief and significantly lower VAS scores at early time points in patients receiving piroxicam-β-CD compared to the conventional group. Gastrointestinal complaints — including epigastric discomfort and nausea — were notably fewer in the cyclodextrin arm. Patient-reported satisfaction and medication adherence were also higher. Pharmacist-led clinical review identified and resolved DRPs including suboptimal dosing and potential drug interactions in both patient groups.

Conclusion: Cyclodextrin complexation of piroxicam offers a clinically meaningful advantage in orthopedic postoperative pain management — not just as a formulation upgrade, but as a real opportunity for pharmacist intervention. This study underscores the clinical pharmacist's active role in monitoring therapeutic outcomes, detecting ADRs, and ensuring rational prescribing of cyclodextrin-based formulations. It is a reminder that pharmaceutical science only reaches its potential when someone trained in both the chemistry and the clinic is present at the bedside.

Keywords: *Piroxicam-β-cyclodextrin, Orthopedic pain, Postoperative analgesia, Clinical pharmacy, Adverse drug reactions, Drug-related problems, Pharmacovigilance, NSAID Inclusion complex*

P-09/N/004 POSTER · ONLINE

Pharmacovigilance and Clinical Safety: The Role of Patient Empowerment in Adverse Drug Reaction Reporting in India

Aparna Ballavi Panda[1*]

[1]*Pharm.D Scholar, Department of Pharmacy Practice, School of Pharmaceutical Sciences, Jaipur National University, Rajasthan, 302017, India*
Email: panx1325@gmail.com

Background: Clinical safety is understood as preventing avoidable patient harm during healthcare, while over 1 in 10 patients globally are harmed, many cases being preventable; ADRs and ADEs are also reported to contribute to nearly 30% of hospital admissions among older adults. Despite high public awareness that drugs can cause adverse effects (89% in a 2024 Indian survey), only 1% of the general population knew that ADRs could be reported to an Adverse Drug Reaction Monitoring Centre, and around 60% believed reporting was solely the responsibility of medical personnel.

Objective: The study is aimed to know about the burden of adverse drug reactions, the Pharmacovigilance Programme of India (PVPI), and the role of patient empowerment in strengthening ADR reporting in India.

Methods: This study data is collected from various International and National data and publishing agencies like the World Health Organization, PubMed, the Indian Pharmacopoeia Commission (IPC/CDSCO), WHO-UMC, and journals such as StatPearls, Current Medical Research and Opinion, and the World Journal of Biology, Pharmacy and Health Sciences.

Result: ADRs burden healthcare systems; PVPI improves reporting, yet under-reporting, data gaps, and traditional-medicine monitoring persist.

Conclusion: It is concluded that pharmacovigilance is essential for patient safety and that integrating patient reporting into national PV systems through simple reporting tools, awareness campaigns, and health literacy strengthens drug safety and supports patient-centred care in India.


MOLECULAR & BIOCHEMICAL SUPPLIES
RANDHEER
BIO SOLUTION
Everything your laboratory needs — under one roof. Reliable products, trusted brands and dependable service for research & academic labs.
RESEARCH
DIAGNOSTICS
ACADEMIA
BEST WISHES FOR
ICS 22
Wishing all delegates, researchers, academicians, and organizers
a successful conference filled with knowledge, innovation, and meaningful collaborations.
ONE-STOP SOLUTION FOR EVERY RESEARCH LAB
OUR PRODUCT RANGE
Molecular Biology
Reagents, enzymes & kits
Biochemicals
All kinds of research chemicals
Antibodies
Primary & secondary
NGS
Sequencing solutions
ELISA Kits
Wide range of assay kits
Plasticware
Tubes, tips & consumables
Glassware
Quality laboratory glassware
Instruments
Lab equipment & instruments
BRANDS WE DEAL IN
Spark Scientific • Grant • Labindia • Moxcare • Elabscience • Glassco • MCE • Affinity
CALL / WHATSAPP
88728 42458
randheerbiosolution@gmail.com
#347, 2nd Floor, Near Partap Dairy, Village Mohali,
Phase-1, Mohali, Punjab

CATEGORY 10 | 36 ABSTRACTS

Pharmacognosy & Phytopharmaceuticals

Tirupati Group

FOSTERING LIFE THROUGH INNOVATION

End-to-End Healthcare Solutions in Pharmaceuticals & Nutraceuticals

HEALTHIER PEOPLE BRIGHTER TOMORROW



State-of-the-Art Manufacturing Facility

Paonta Sahib, Himachal Pradesh, India

20+ Years of Excellence

End-to-End Healthcare Solutions

Quality Innovation Global Reach

OUR BUSINESS VERTICALS

PHARMACEUTICALS

High-quality, science-driven therapeutic solutions across key therapy areas

- Tablets
- Capsules
- Oral Liquids
- Topicals
- Injectables (as per facility)

NUTRACEUTICALS

Innovative, high-performance wellness formulations for a healthier tomorrow

- Dietary Supplements
- Vitamins & Minerals
- Herbal Extracts
- Functional Foods & Beverages
- Specialty Nutraceuticals

THERAPEUTIC FOCUS

- Cardiovascular
- Anti-Diabetic
- Immunology
- Pain Management
- Gastroenterology
- Orthopedics
- Respiratory
- Women's Health
- CNS & Neurology
- General Health & Wellness

OUR STRENGTHS

- State-of-the-Art Manufacturing Infrastructure
- Quality Assurance & Compliance
- Advanced R&D and Product Development
- Experienced and Dedicated Team
- Global Presence and Partnerships
- Innovation for a Healthier Tomorrow


Advanced Manufacturing


Research & Development


Quality Control


Innovative Formulations


Sustainable Healthcare

www.tirupatigroup.co.in | info@tirupatigroup.co.in | +91 9816700121 / 122 / 123

Partnering for a Healthier World

O-10/F/001 ORAL · OFFLINE

Natural Polysaccharides for Ulcerative Colitis

Prabhleen Kaur*, Akshita

ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India
Email: 2501074@isfcp.org

Ulcerative colitis is a colonic disease characterized by the disruption of the mucosal epithelial layer and inflammation. For the treatment of this disease, various chemotherapeutic agents are available. However, the toxicities associated with chemotherapeutics greatly hamper treatment.

Polysaccharide from natural resources is emerging as a potentially therapeutic substance with comparative minimum adverse effects. In this article, we are discussing polysaccharide from diverse sources (plants, edible mushrooms, and algae) which are being used in the treatment of ulcerative colitis. These polysaccharides exert their therapeutic action on ulcerative colitis through several mechanisms, including suppression of inflammatory cascades NF-κB, MAPK, IL-6/JAK2/STAT3, preventing the release of certain inflammatory mediators, modulating the intestinal microbiome, maintaining the integrity of intestinal barriers, and regulating certain inflammatory markers. The present review compiles the role of different polysaccharides being used successfully in the management/treatment of ulcerative colitis. Special emphasis was given to explaining the biomolecular pathway.

Keywords: *Ulcerative colitis, Polysaccharides, Natural products, Anti-inflammatory activity, NF-κB, MAPK, IL-6/JAK2/STAT3.*

O-10/F/002 ORAL · OFFLINE

Formulation and Evaluation of Herbal Anti-Lice Shampoo from Pongamia Pinnata Leaves

Rahul Sharma*, Vivek Asati, G.S. Sharma

Department of Pharmaceutical Analysis, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India
Email: rsharma200208@gmail.com

This study focuses on the formulation of an herbal anti-lice shampoo for paediatric use, utilizing petroleum ether extract of Pongamia pinnata leaves. The extract demonstrated strong pediculicidal and ovicidal activity against Pediculus humanus capitis, addressing the growing concern of drug resistance in head lice treatment. Pongamia pinnata contains various bioactive compounds, including flavonoids, polyphenols, alkaloids, and saponins, which contribute to its therapeutic properties. By using herbal antilice shampoo in place of synthetic sntilice shampoo, the emergence of resistance shown by lice against shampoo can be reduced. The collected leaves were dried using hot air oven, followed by extraction using petroleum ether with soxhlation process. The soxhlation was done for 4 hr. at 40oc. Resulting extract was then concentrated using rotary evaporator. The concentrated extract was incorporated into a shampoo formulation containing glycerine, sodium benzoate, cocoamidopropyl betaine, ethylene glycol monostearate, essential oils, and other mild surfactants to enhance efficacy and stability. The shampoo was evaluated for color, odour, texture, pH, viscosity, and stability, dirt dispersion, cleaning action, pediculocidal and ovicidal activity. The results indicate that the formulation effectively eliminates lice by enhancing the penetration and bioavailability of active oil components. This study highlights the potential of herbal alternatives in paediatric lice treatment while ensuring reduced toxicity and irritation compared to conventional chemical-based shampoos. Key words: Pongamia pinnata, shampoo, pediculocidal, ovicidal, stigmasterol.

Keywords: *Pongamia pinnata, Herbal shampoo, Pediculicidal activity, Ovicidal activity, Head lice.*

O-10/F/003 ORAL · OFFLINE

Cyclodextrin-Driven Nanotechnology for Phytopharmaceuticals: Unlocking the Therapeutic Potential of Plant Bioactives

Mohammed Shakir[1]*, Mohammed Ghouse Professor & HOD,

Department of Pharmacognosy & Phytochemistry Aurangabad Pharmacy College, Mitmita, Aurangabad (CSN), Maharashtra India
Email: mohammedshakir979@gmail.com

Phytopharmaceuticals represent a valuable and expanding class of therapeutic agents owing to the diverse biological activities of plant-derived bioactive compounds. Despite their considerable therapeutic potential, the pharmaceutical development of many phytoconstituents is constrained by poor aqueous solubility, limited permeability, chemical instability, rapid metabolism and consequently low and variable bioavailability. These challenges necessitate innovative formulation strategies capable of translating the pharmacological potential of plant bioactives into effective and reproducible therapeutic products. Cyclodextrins (CDs), with their unique hydrophilic exterior and hydrophobic cavity, provide a versatile molecular platform for the complexation and solubilization of poorly water-soluble phytoconstituents. Their integration with nanotechnology has further expanded their potential, enabling the development of cyclodextrin-based nanocarriers with improved drug loading, physicochemical stability, controlled release and enhanced bioavailability. Such systems can facilitate the delivery of diverse phytoconstituents, including polyphenols, flavonoids, terpenoids and other bioactive molecules, while offering opportunities for protection against degradation and optimization of pharmacokinetic performance. Cyclodextrin-driven nanotechnology therefore represents a promising convergence of supramolecular chemistry and nanomedicine for the rational design of next-generation phytopharmaceutical delivery systems. This approach encompasses cyclodextrin inclusion complexes, polymeric and lipidic nanocarriers, nanoemulsions and hybrid nanosystems designed to improve solubility, stability, absorption and therapeutic efficacy. Furthermore, surface engineering and stimulus-responsive approaches may provide opportunities for controlled and site-specific delivery of plant-derived therapeutics. These abstract highlights the emerging role of cyclodextrin-enabled nanotechnology in overcoming the biopharmaceutical limitations of phytoconstituents and discusses its potential to bridge the gap between traditional plant-based therapeutics and modern drug-delivery technologies. Key challenges related to formulation optimization, scale-up, characterization, safety, regulatory considerations and clinical translation are also addressed. The integration of cyclodextrin science with nanotechnology offers a rational and versatile pathway for unlocking the therapeutic potential of plant bioactives and advancing phytopharmaceuticals toward more effective, stable and clinically relevant formulations.

Keywords: *Cyclodextrins, Nanotechnology, Phytopharmaceuticals, Plant bioactive, Inclusion complexes, Nanocarriers.*

P-10/F/001 POSTER · OFFLINE

Toxins and Venoms: Biological Mechanisms and Applications in Drug Discovery

Kanav Singla[1]*, Abhilash Bharadwaj[2]

Department of Pharmacy, ISF College of Pharmacy, Moga, Punjab, India
Email: kanavsingla258@gmail.com

Introduction: Toxins and venoms produced by plants and animals represent highly evolved bioactive molecules that interact with high specificity and potency at ion channels, receptors, and enzymes. While traditionally viewed as harmful, these secretions have emerged as valuable resources for pharmacological research and novel drug development.

Aim & Objectives: To review the biological mechanisms plant- and animal-derived toxins and venoms and to evaluate their pharmacological applications in modern drug discovery, with emphasis on peptide-based therapeutics.

Methods: A literature-based review was conducted using published research and review articles on venom peptide pharmacology, plant-derived toxic peptides, and venom-derived drug development.

Results: Venom-derived peptides such as ziconotide (cone snail), exenatide (Gila monster), and captopril (snake venom-derived) have become approved therapeutics for chronic pain, diabetes, and hypertension. Plant-derived peptides like cyclotides and thionins show comparable stability and bioactivity but remain relatively underexplored as drug leads.

Summary & Conclusion: Both plant and animal toxins offer structurally diverse, highly selective scaffolds for therapeutic development. Animal venom peptides have achieved greater clinical translation, while plant-derived toxic peptides represent a promising but underutilized reservoir for future drug discovery. Toxins and venoms constitute a rich, evolutionary optimized source of bioactive compounds. Continued interdisciplinary research bridging pharmacognosy and pharmacology is essential to unlock their full therapeutic potential.

Keywords: *Toxins, toxin pharmacology, venom evolution, plant toxins, drug discovery.*

P-10/F/002 POSTER · OFFLINE

Exploring the Therapeutic Potential of Ocimum sanctum (Tulsi) Through Phytochemical and Biological Evaluation

Niharika*

ISF College of Pharmacy, Moga, Punjab, India
Email: niharikaa.n33@gmail.com

Introduction: Pharmacognosy provides a scientific basis for studying medicinal plants and their bioactive constituents. Phytopharmaceuticals are standardized plant-derived products with potential for safe, effective and quality-assured healthcare. Ocimum sanctum (Tulsi) is an important medicinal plant rich in diverse phytoconstituents.

Methodology: Healthy leaves of O. sanctum were collected, authenticated and shade dried. Powdered leaves were extracted using ethanol by Soxhlet extraction. Preliminary phytochemical screening was performed for alkaloids, flavonoids, tannins, saponins, terpenoids and glycosides. The extract was evaluated for total phenolic and flavonoid content, antioxidant activity using the DPPH assay, and in vitro anti-inflammatory activity by protein denaturation inhibition.

Results: Phytochemical screening showed positive results for all tested constituents. Total phenolic and flavonoid contents were 118.6 and 74.3 mg GAE/QE per extract, respectively. DPPH antioxidant activity increased with concentration, reaching 91.2% inhibition at 100 µg/mL. Anti-inflammatory activity of the herbal extract showed 72.8% inhibition compared with 84.5% for diclofenac.

Summary and Conclusion: The findings demonstrate that O. sanctum contains important bioactive phytoconstituents with significant antioxidant and anti-inflammatory potential. Standardization and quality control can support the development of safe, effective and reliable phytopharmaceuticals. Further studies and clinical validation are warranted.

Keywords: *Ocimum sanctum, Tulsi, Phytochemicals, Antioxidant, Anti-inflammatory, Phytopharmaceuticals*

P-10/F/003 POSTER · OFFLINE

Development and Evaluation of Colon-Targeted Sulfasalazine–Probiotic Microparticles for Ulcerative Colitis

Nandini*

ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India
Email: nandiniiiii.o35@gmail.com

Ulcerative colitis (UC) is a chronic inflammatory bowel disease marked by mucosal inflammation and epithelial barrier dysfunction. Sulfasalazine, a standard antiinflammatory drug, and probiotics, known for gut microbiota modulation, both have shown efficacy in UC management. However, their combined delivery to the colon remains underexplored. This study aimed to develop a colon-targeted microparticulate formulation containing sulfasalazine and a probiotic strain to enhance anti-inflammatory action and therapeutic effectiveness against UC.Optimized microparticles ensured sustained sulfasalazine release and preserved probiotic viability. In vitro, the formulation improved epithelial barrier function, reduced ROS and proinflammatory cytokines, and suppressed NF-κB expression. In vivo, treated animals showed significant reduction in colitis severity, improved tissue integrity and better histopathological outcomes.

Keywords: *Ulcerative colitis, Sulfasalazine, Probiotics, Colon-targeted delivery, Microparticles, Anti-inflammatory activity.*

P-10/F/004 POSTER · OFFLINE

Role Of Omega-3-Fatty Acid in Cardiovascular Disease

Chand Babu[1]*, Abhilash Bharadwaj[2]

[1]*B. Pharm, ISF College of Pharmacy, Moga, Punjab*
[2]*Department of Pharmacognosy, ISF College of Pharmacy, Moga, Punjab*
Email: 2315714@isfcp.org

Omega-3 fatty acids are essential polyunsaturated fatty acids that play a significant role in human nutrition, growth, development, and disease prevention. The major members include α-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). ALA is obtained from the diet, while EPA and DHA are mainly supplied through fish, fish oils, and selected plant-based sources. These fatty acids are important structural components of cell membranes which influences membrane fluidity, gene expression, cellular signalling, and the production of biologically active mediators. Omega-3 fatty acids contribute substantially to cardiovascular health by decreasing platelet aggregation, reducing serum triglycerides, lowering the tendency toward thrombosis and cardiac arrhythmias, and improving vascular function. Their metabolites also exert anti-inflammatory effects by modulating prostaglandins, cytokines, leukotrienes, and specialized pro-resolving mediators. DHA is particularly concentrated in the brain and retina, where it supports neuronal membrane function, learning, visual development, neurotransmission, and cognitive processes. Adequate omega-3 intake during pregnancy and early life is associated with normal foetal brain and retinal development. Therefore, regular consumption of omega-3-rich foods, including fatty fish, flaxseed, walnuts, and vegetable oils, is important for maintaining physiological balance and overall health. Omega-3-fatty acids thus represent essential nutrients with broad protective and regulatory functions throughout the human life cycle.

Keywords: *Omega-3-Fatty Acids, Linolenic Acid, Eicosapentaenoic Acid, Docosahexaenoic Acid, Cardiovascular Disease.*

P-10/F/005 POSTER · OFFLINE

Cytarabine (Ara-C): A Marine-Derived Anticancer Agent from Nature to Treatment

Navreet Kaur[1]*, Anchal[2]

[1]*Department of Pharmaceutical Sciences, ISF College of Pharmacy & Research, Ghal Kalan – 142048, Moga, Punjab, India*
[2]*Department of Pharmacognosy, ISF College of Pharmacy & Research, Ghal Kalan – 142048, Moga, Punjab, India*
Email: knavreet231@gmail.com

Cytarabine (Ara-C) is a pyrimidine nucleoside analogue and crucial antimetabolite used specifically in the treatment of hematological malignancies, particularly acute myeloid leukemia (AML). It originated from nucleosides isolated from the marine sponge Cryptotethya crypta, highlighting the therapeutic potential of marine natural products. To explore the marine origin, discovery, chemistry, mechanism of action, pharmacological applications, and therapeutic significance of cytarabine. Relevant literature was reviewed regarding marine-derived nucleosides, development of cytarabine, its mechanism of action, therapeutic applications, pharmacokinetics, and adverse effects. Spongothymidine and spongouridine isolated from Cryptotethya crypta provided the structural basis for cytarabine development. Following intracellular phosphorylation, cytarabine forms the active metabolite cytarabine triphosphate (Ara-CTP), which competes with cytidine triphosphate during DNA synthesis. Incorporation into DNA and inhibition of DNA polymerase disrupt DNA replication, producing S-phase arrest and death of rapidly dividing cancer cells. Cytarabine is primarily used in AML and other hematological malignancies. Cytarabine demonstrates the successful conversion of marine-derived natural products into clinically valuable anticancer therapy. Cytarabine represents a landmark example of marine drug discovery and emphasizes the importance of marine biodiversity as a source of novel therapeutic agents.

Keywords: *Cytarabine, Ara-C, Marine sponge, Cryptotethya crypta, Anticancer.*

P-10/F/006 POSTER · OFFLINE

Neuroprotective effect of Urukku Velichenna (Traditionally processed virgin coconut oil) in Parkinson's disease: Bridging ethnopharmacology and experimental validation using in vitro, in vivo, in silico models

Akshita Kumari[1]*, Ved Pal[1]

[1]Department of Pharmacognosy, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: akshitaguleria69@gmail.com

Introduction: Virgin coconut oil (VCO) is usually prepared as Hot-Processed Virgin Coconut Oil (HPVCO), which is produced during special extraction technique that is unique to few localities in Kerala, India. Although HPVCO has traditionally used to treat number of neurodegenerative disorders, however there is less experimental or mechanistic evidence supporting its involvement in Parkinson's disease.

Aim & objectives: The main aim of the current research work is to assess anti-Parkinson's activity of HPVCO in rotenone-induced SH-SY5Y cells, rat model of PD, and in silico models.

Materials and methods: HPVCO components were identified using gas chromatography-mass spectrometry (GC-MS). Neuroprotective activity evaluated in rotenone-stimulated SH-SY5Y cells and a rotenone-induced Parkinson's disease rat model. In vivo, HPVCO (50 µg/mL) was administered to SH-SY5Y after exposure to rotenone (10 µM). Neuroprotection was analysed by measuring dopamine, ROS, IL-6, IL-1β, TNF-α and nitrite levels, Rotenone (2.5 mg/kg/day) and HPVCO (1306.4 mg/kg/day) for 21 days were given to male Wistar rats (200-250 g, 10-12 weeks). After behavioural assessments on days 0,7,14 and 21 histopathology and biochemical evaluation were performed. ADME & network pharmacology examined oxidative stress, lipid metabolism and neuroregulation pathways.

Results: GC-MS identified 26 pharmacologically active compounds with neuroprotective; anti-inflammatory & antioxidant in HPVCO. These constituents increased dopamine level and decreased oxidative stress & neuroinflammation. These effects were supported by in vivo, behavioural & histological findings and network as well as ADME analyses linked oxidative stress.

Conclusion: By lowering oxidative stress & neuroinflammation and boosting dopamine levels, HPVCO shows encouraging neuroprotective & anti- Parkinson's disease.

Keywords: *Dopamine, Hot processed virgin coconut oil, Neuroinflammation, Oxidative stress, Parkinson's disease.*

P-10/F/007 POSTER · OFFLINE

Pharmacognostic Evaluation, Phytochemical Screening and Antioxidant Potential of Withania somnifera (Ashwagandha) Root Extract

Hesham Ahmad[1]*

[1]School of Pharmaceutical Education and Research, Jamia Hamdard, New Delhi, India
Email: hygiahesham@gmail.com

Withania somnifera (Ashwagandha), a well-known Rasayana herb in Ayurveda, is widely used for its adaptogenic, anti-stress and immunomodulatory properties. Despite its extensive traditional use, scientific standardization and detailed phytochemical profiling remain essential for quality control and therapeutic validation. The present study aimed to perform detailed pharmacognostic evaluation, phytochemical screening and assessment of antioxidant potential of Withania somnifera root extract. Macroscopic and microscopic characters of the root were studied. Physicochemical parameters including ash values, extractive values and moisture content were determined as per standard methods. Successive extraction was carried out using solvents of increasing polarity. Preliminary phytochemical screening was performed to detect major secondary metabolites. Total phenolic and flavonoid content were estimated spectrophotometrically. Antioxidant activity was evaluated by DPPH free radical scavenging assay. The study revealed characteristic macroscopic and microscopic features useful for identification. Physicochemical parameters were found within the acceptable limits. Phytochemical screening confirmed the presence of alkaloids, withanolides, flavonoids, tannins and saponins. The methanolic extract showed significant total phenolic and flavonoid content along with potent antioxidant activity in a concentration-dependent manner. The findings provide scientific data for standardization of Withania somnifera roots and support its traditional claims as a potent antioxidant and adaptogenic herb. Further isolation and characterization of bioactive constituents are recommended.

Keywords: *Withania somnifera, Pharmacognostic evaluation, Phytochemical screening, Antioxidant activity, Standardization.*

P-10/F/008 POSTER · OFFLINE

Targeting Lipoxygenase Enzyme by Flavonoids from Tadehagi triquetrum: a Combined In Silico and In Vitro Approach

Isha Chaudhary[1]*, Ved Pal[1]

[1]Department of pharmacognosy, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan- 142001, Moga, Punjab, India
Email: isha20772@gmail.com

Introduction: Tadehagi triquetrum (L.) H. Ohashi is a medicinal plant traditionally used for inflammatory conditions, including asthma. Flavonoids present in this plant may have potential as inhibitors of 5-lipoxygenase (5-LOX), an enzyme involved in leukotriene formation and inflammatory responses.

Aim and Objective: The study aimed to evaluate the potential of the isolated flavonoids baicalein, naringin, and neo-hesperidin against 5-LOX using combined in vitro enzyme inhibition and in silico molecular docking approaches.

Methods: The roots of T. triquetrum were extracted with 50% hydroalcoholic solvent and fractionated. The flavonoids were isolated using column chromatography and preparative thin-layer chromatography and characterized by spectroscopic methods. Their 5-LOX inhibitory activity was evaluated at different concentrations using a spectrophotometric assay. Molecular docking was performed against 5-LOX (PDB ID: 3O8Y) using the Schrödinger Glide XP docking protocol, with dexamethasone as the standard.

Results: Baicalein showed the strongest 5-LOX inhibition, with an IC_{50} of 66.75 µg/mL, followed by naringin (112.25 µg/mL) and neo-hesperidin (136.65 µg/mL). Baicalein showed the highest docking score (−8.02 kcal/mol) and formed hydrogen-bonding and hydrophobic interactions with important active-site residues.

Summary: The in vitro and docking findings demonstrated concentration-dependent 5-LOX inhibition by the isolated flavonoids, with baicalein showing the most prominent activity.

Conclusion: Baicalein from T. triquetrum may serve as a potential lead compound for further investigation as a 5-LOX inhibitor relevant to asthma.

Keywords: *Tadehagi triquetrum, Baicalein, Naringin, Neo-hesperidin, 5-Lipoxygenase, Molecular docking.*

P-10/F/009 POSTER · OFFLINE

Therapeutic Potential of Flavonoids in Ovalbumin Induced Asthma in Mice Model

Jessica*[1], Vedpal Singh[2]

[1,2]Department of Pharmacognosy, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: Jessicagoyal5@gmail.com

Introduction: Asthma is a serious medical condition, and flavonoids have been found to offer positive effects in its management. Desmodium triquetrum DC, which has a traditional role in treating allergies, contains flavonoids that may possess therapeutic properties.

Objective: Desmodium triquetrum DC (Fabaceae), a botanical species, used for the flavonoid management of allergies in Indian traditional medicine. Asthma is a serious disease, with more than 300 million deaths annually, projected to increase to 400 million by 2025. Many plants contain a group of substances called flavonoids that are useful in controlling asthma. Present study was undertaken to evaluate the anti-asthmatic potential of three flavonoids, namely Baicalein, Naringin and Neohesperidin, isolated from Desmodium triquetrum DC.

Methods: Impact of flavonoids on various bronchoalveolar lavage fluid metrics was examined utilizing an ovalbumin-induced aerosolized asthma model, encompassing total differential leukocyte count, nitrite, nitrate, TNF, IL-4, and IL-13. Investigators also measured levels of myeloperoxidase and malondialdehyde in lung tissue.

Results: In ovalbumin-induced airway hyper-responsiveness, concentrations of pro-inflammatory cytokines were significantly elevated. The flavonoids, however, significantly reduced the severity of airway inflammation. Effectiveness of the flavonoids was additionally validated by the histopathological results. These results indicate that flavonoids could act as an alternative therapy for asthma by obstructing the pro-inflammatory pathway.

Conclusions: The results obtained indicate that the isolated compounds, when applied together, were to reduce the levels of the cytokines investigated, increase the number of eosinophils and activated lymphocytes and significantly reduce MPO and MDA. This suggests a possible respiratory mechanism of action for the drugs.

Keywords: *Asthma, Ovalbumin, Flavonoids, Inflammation, Myeloperoxidase.*

P-10/F/010 POSTER · OFFLINE

In vitro Evaluation of Curcumin and Quercetin in Combination on Oxidative Stress

Pooja Nain[1]*, Ved Pal[2]

[1,2]Department of pharmacognosy, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan- 142001, Moga, Punjab, India
Email: poojanain288@gmail.com

Introduction: Oxidative stress occurs when oxidant generation exceeds antioxidant defence, leading to cellular damage and contributing to several pathological conditions. Curcumin and quercetin are naturally occurring flavonoid compounds with established antioxidant properties.

Aim & Objectives: The present study aimed to isolate curcumin and quercetin from Curcuma longa rhizomes and Morinda citrifolia fruits, respectively, and evaluate their individual and combined antioxidant activities against oxidative stress.

Methods: Plant materials were subjected to hydro-alcoholic maceration using ethanol and water (70:30), followed by solvent fractionation, column chromatography and thin-layer chromatography for isolation of the compounds. The isolated compounds were characterized using 1H NMR, 13C NMR and HRMS. Antioxidant activity was evaluated using DPPH and lipid peroxidation (LPO) assays, while cytotoxicity was assessed by MTT assay.

Results: Hydro-alcoholic extract yields were 23.06% for C. longa and 21.08% for M. citrifolia. The DPPH IC_{50} values of quercetin, curcumin and their combination were 5.38, 9.00 and 5.29 µg/mL, respectively. In the LPO assay, corresponding IC_{50} values were 6.64, 5.93 and 5.25 µg/mL. The combination also demonstrated greater cytotoxic potency than individual compounds in SH-SY5Y and HeLa cells.

Summary & Conclusion: The findings indicate that curcumin and quercetin in combination exhibit enhanced antioxidant activity compared with their individual effects, suggesting potential for further investigation in oxidative stress-associated conditions.

Keywords: *Curcumin, Quercetin, Oxidative stress, Antioxidant, DPPH, Lipid peroxidation.*

O-10/N/001 ORAL · ONLINE

LC-MS/MS Metabolomics and Pharmaco-Chemical Characterization of Acacia Arabica (Lam.) Willd Seeds

Bhagya P.M[1]*, Shobha Rani T[1]

[1]Departmernt of Chemistry, Dravidian University, Kuppam-517 425, Chittoor (DT), Andhra Pradesh, India
Email: pmbhagyabhagi@gmail.com

This study reported the metabolomics and physicochemical characterisation of Acacia arabica (Lam.) Willd seeds based on microscopic and proximate analysis, phytochemical assessment, atomic absorption spectroscopy (AAS), UV-vis spectrophotometry, and Fourier Transform Infrared Spectroscopy (FTIR), liquid chromatography and mass spectrometry (LC-MS/MS). Powder microscopy revealed that Arabica seed powder is free from foreign matter, and it contains lignified cell walls. Proximate analysis revealed that the seeds of Arabica contain more carbohydrate (84.48 ± 0.80%) and dry matter (94.0 ± 0.60%) and few amounts of protein (6.80 ± 0.50), fibre (4.40 ± 0.10%), ash (4.32 ± 1.20%) and fat (2.2 ± 0.80%). The preliminary phytochemical screening revealed that methanolic extracts have proteins, phenolics, tannins, flavonoids, glycosides, fat and oils. And the seed powder did not reveal the presence of any heavy metal contamination. A total of twenty chemical constituents were identified with the help of accurate molecular weights, fragmentation pathways. The phyto-steroids are major chemical constituents present in the seed extract. Asparacosin A, Galphimin B, Cabralealactone, Cathasterone, and Stigmastan-4, 22, -diene-6-one are belonging to this group. The chemical compositions of the investigated samples might be responsible for their medicinal values. The computed studies on its molecular structure revealed that most constituents in the methanolic extracts had good drug-likeness and bioavailability for oral administration. Further, these molecules were used to carried out molecular docking studies on two anti-inflammatory (1CVU and 6NCF) and anticancer (10SF and 7TAI) protein targets. Interestingly, the compound, Asparacosin A showed good binding affinity against both anti-inflammatory and anticancer proteins. The binding energy of -11.2 kcal/mol and -10.3 kcal/mol showed against COX-2 and LOX-5 proteins. Similarly, Stigmastan-4, 22, -diene-6-one exhibited highest docking score -11.2 kcal/mol against prostate cancer protein 7TAI. Therefore, this physicochemical profiling can be useful for quality determination as well as for the pharmacological properties of Acacia seeds. Moreover, the information given from the molecular docking study will be helpful for further research and development on acacia seeds.

Keywords: *Arabica seed, Pharmaco-Chemical, Proximate, Heavy Metal, LC/MS, Computational.*

O-10/N/002 ORAL · ONLINE

Bioactive phytochemicals of Glycyrrhizaglabra for topical Anti-aging Applications: Molecular mechanisms, Cosmoeceutical potential and Future perspectives

Anamika Singh[1]*, 2, Anurag Verma[1] and Prashant Kumar[2]

[1]PhD Scholar, Department of Pharmaceutics, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India. & Faculty, Raja Balwant Singh Engineering Technical, Campus, Bich Puri Agra Uttar Pradesh, India

[1]Faculty, Department of Pharmaceutics, Teerthanker Mahaveer College of Pharmacy, TeerthankerMahaveer University, Moradabad, Uttar Pradesh, India.

[2]Faculty, SRM Modinagar College of Pharmacy, SRM Institute of Science and Technology Delhi-NCR Campus, Delhi-Meerut Road, Modinagar, Ghaziabad, Uttar Pradesh, India. Department of Pharmaceutics, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India.

Email: anuarchi2009@gmail.com

India is blessed to have enormous plants having healing capacity which are even Documented in many traditional systems like Ayurveda with examples tulsi, neem, ashwgandha and many others including the research plant named Glycyrrhizaglabra (mulethi). This plant Glycyrrhizaglabra is used in treatment of many health issues like sore throat, stomach ulcers, respiratory health support etc. It contains antioxidants and active compounds like glabridin, glycyrrhizin and licochalconea used by several herbal dermatologists for skin pigmentation and rejuvenation with specific anti-aging for wrinkles. Anti-oxidants like glabridin, glycyrrhizin and licochalconeA follows signaling pathways, reducing oxidative stress and also suppresses inflammation. They inhibit enzymes like 11beta-HSD2 and MAPK signaling. Glabridin stops tyrosinase activity for age related hyper-pigmentation Glycyrrhizin elevate superoxide dismutase (SOD) activity. By utilizing nanotechnology, the scientists these days focusses more on advanced drug pattern, green industrial bio-composites and in in specific nanomedicines. Many innovations are required in targeting drug resistant viral strains and inhibiting cancer cells proliferation.

Keywords: *Glycyrrhiza, photoprotection, respiratory infection, anticancer, pigmentation.*

O-10/N/003 ORAL · ONLINE

Phytochemical Insights and Therapeutic Potential of the Verbena Genus

Ms. Manpreet Kaura*, Jitender Singhb, Monika Guptaa

Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela (Ropar, Punjab)

Rayat Bahra University, Kharar, Mohali, Punjab

Email: manipreet663@gmail.com

The Verbena genus represents a diverse group of plant species long recognized in traditional remedies across cultures for their therapeutic versatility. Increasing scientific interest has focused on elucidating their phytochemical composition and biological relevance. Phytochemical investigations reveal that Verbena plants are rich in secondary metabolites such as flavonoids, iridoids, phenylpropanoids, and essential oils. Extracts derived from Verbena species exhibit diverse pharmacological properties, notably antioxidant, anti-inflammatory, antimicrobial, anti-cancer and neuroprotective activities. These findings provide a scientific basis for their long-standing use in herbal medicine and highlight their potential as natural agents for promoting health and supporting the body's defense mechanisms. Overall, Verbena species represent a promising source of bioactive compounds with broad therapeutic relevance, warranting further exploration in modern pharmacological research.

Keywords: *Verbena Genus, Traditional Remedies, Phytochemicals, Flavonoids, Iridoids.*

O-10/N/004 ORAL · ONLINE

Seasonal Fingerprinting of Chlorophytum borivilianum: Variations in Steroidal Phytoconstituents and Antioxidant Potential

Supriya Agnihotri[1]*, Anoop Agnihotri[2]

[1]*Chandigarh College of Pharmacy, Landran, Mohali, Punjab 140301*
[2]*Aimil Pharmaceuticals, Saini Majra, Nalagarh, Himachal Pradesh, 174101*
Email: dr.supriyagnihotri@gmail.com

Background: Seasonal variation in medicinal plants can significantly influence their phytochemical composition and, consequently, the therapeutic efficacy and consistency of herbal formulations. Establishing a seasonal phytochemical profile is therefore essential for selecting the optimal harvesting period and developing standardized formulations.

Objectives: The present study aimed to investigate seasonal variations in the steroidal phytoconstituents of Chlorophytum borivilianum (Liliaceae), commonly known as Safed musli, and to evaluate their association with antioxidant activity.

Methods: Plant material was collected during different seasons and subjected to preliminary phytochemical investigation. The steroidal phytoconstituents were comparatively evaluated using HPLC-based analysis. Seasonal variations in phytochemical profiles were correlated with the antioxidant potential of the respective samples.

Results: Significant seasonal variations were observed in the steroidal phytoconstituent content of C. borivilianum. The HPLC profiles demonstrated qualitative and quantitative differences among samples collected during different seasons. These variations were further supported by differences in antioxidant activity, indicating a possible relationship between seasonal phytochemical composition and biological potential.

Conclusion: The findings demonstrate that seasonal changes significantly influence the phytochemical profile and antioxidant activity of C. borivilianum. Establishing a seasonal phytochemical fingerprint may facilitate identification of the optimum harvesting period, improve raw-material standardization, and support the development of more consistent and efficacious herbal formulations. The study highlights the importance of considering seasonal variability in the quality control and formulation development of medicinal plants.

Keywords: *Chlorophytum borivilianum, Seasonal variation, Steroidal phytoconstituents, HPLC fingerprinting.*

O-10/N/005 ORAL · ONLINE

Herbal Indicator: The Green Alternative

Anjali Gangurde[1]*

[1]*Department of Pharmacy, Sanjivani College of Pharmaceutical Education and Research, Kopargaon, Maharashtra, India-423601*
Email: gangurdeanjali5@gmail.com

Synthetic acid–base indicators are widely used in analytical chemistry, but some may have limitations related to toxicity, irritancy, cost, biodegradability and environmental impact. Herbal indicators obtained from natural plant sources offer a potential eco-friendly alternative. The present study was undertaken to develop and evaluate herbal indicators prepared from different flowers using a simple extraction method. Flowers were collected and their colouring constituents were extracted by the infusion method, followed by filtration and concentration of the extracts. The prepared herbal extracts were tested with acidic and alkaline solutions to observe their visible colour changes over different pH conditions. The study demonstrated that the prepared herbal indicators exhibited distinct colour responses in acidic and alkaline media. Their natural origin, biodegradability, easy availability and simple preparation indicate their potential usefulness as alternatives to synthetic indicators. Herbal indicators may find applications in acid–base titrations, pharmaceutical and food-related analytical studies, laboratory education and green analytical chemistry. The study supports the exploration of naturally derived indicators as safer and environmentally sustainable alternatives to conventional synthetic indicators.

Keywords: *Herbal indicator, Natural indicator, Acid–base titration, Flower extract, Green chemistry, Biodegradable indicator.*

O-10/N/006 ORAL · ONLINE

Exploration of the Potential Anxiolytic Properties of Madhuca longifolia and Sphagneticola trilobata

Ms. Baljeet Kaur [1]*, Jitender Singh[2], Monika Gupta[1]

Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela (Ropar, Punjab)
Rayat Bahra University, Kharar, Mohali, Punjab
Email: bk3958908@gmail.com

Anxiety disorders are common mental health conditions that can adversely affect emotional and psychological well-being. The limitations and adverse effects associated with conventional anxiolytic medications have increased interest in medicinal plants as potential sources of safer and naturally derived therapeutic agents. Madhuca longifolia and Sphagneticola trilobata are traditionally important medicinal plants containing a diverse range of bioactive phytoconstituents. However, their potential role in the management of anxiety remains comparatively less explored. The present study aims to investigate the potential anxiolytic properties of M. longifolia and S. trilobata through phytochemical investigation and experimental evaluation. The selected plants will be subjected to suitable extraction and preliminary phytochemical screening to identify major classes of bioactive constituents. Further, selected extracts/fractions will be evaluated for their potential anxiolytic activity using appropriate experimental models. The phytochemical profile will subsequently be correlated with the observed pharmacological activity to identify potentially responsible bioactive constituents. The study is expected to provide preliminary scientific evidence regarding the anxiolytic potential of these underexplored medicinal plants and may establish a foundation for their further pharmacological investigation and development as potential natural sources of anxiolytic agents.

Keywords: *Madhuca longifolia, Sphagneticola trilobata, Anxiety, Anxiolytic activity, Phytochemical screening.*

O-10/N/007 ORAL · ONLINE

Reinventing Parthadyarishta Through Precision Fermentation: Integrating Ayurvedic Heritage with Scientific Approaches Towards Commercial Development

Atish. Y. Sahare*

Bajiraoji Karanjekar College of Pharmacy, Sakoli-441802, Maharashtra, India
Email: atish.sahare@gmail.com

Introduction: Parthadyarishta is an Ayurvedic cardiotonic formulation made from specified herbal constituents through naturally yeast-mediated fermentation.

Aim & Objective: Development of Parthadyarishta using an alternative approach by employing isolated yeast and comparing its fermentation rate and quality attributes with the traditional technique.

Method: Precisely 20 yeast strains were isolated from Madhuca indica flowers, and highest alcohol-producing strain was identified as Saccharomyces cerevisiae, which was incorporated in contemporary preparation. To formulate contemporary Parthadyarishta, optimum fermentation settings for temperature, substrate concentration, and inoculum volume were identified using Response Surface Methodology. Subsequent physicochemical and phytochemical investigation, kaempferol and luteolin in the prepared and commercial Parthadyarishta were analysed by HPTLC and biopotentiality was then assessed using in vitro models.

Result & Discussion: The conventional approach accomplished fermentation in 24 days with 7.97% v/v alcohol, while the novel approach limited it to 12 days with strengthened alcohol content of 9.94% v/v, along with analogous physicochemical properties within specified standards. Introducing an isolated yeast minimises fermentation duration and improves alcohol content, which boosts phytochemical extraction and preservation. HPTLC analysis revealed that the kaempferol concentrations in novel, conventional, and commercial formulations were 0.355, 0.341, and 0.228%, while luteolin concentrations were 0.286, 0.1138, and 0.108%, respectively. Such analysis validates the existence and concentration of these compounds, ensuring the therapeutic efficacy. The novel formulation expressed improved biopotentiality towards antioxidant, antihypertensive and anticholesterol activity.

Conclusion: A scientific approach can improve traditional processes while preserving the fundamental principles of Ayurveda and enhancing product quality and efficacy.

Keywords: *Parthadyarishta, Fermentation, Optimisation, HPTLC, Biopotentiality.*

O-10/N/008 ORAL · ONLINE

Extraction, Phytochemical Analysis and Anti- Arthritic Assessment of Citrullus lanatus Extract

Dilip Kumar Tiwari*, Ayushi Deep Patel
Lakshmi Narain College of Pharmacy Bhopal
Email: dilip21k@gmail.com

Millions of people around the world suffer from arthritis. Arthritis is a long-term inflammatory disease. It brings pain, swelling, stiffness and slowly worsens damage. The main kinds of arthritis are gout, septic arthritis, osteoarthritis and rheumatoid arthritis. Arthritis gets worse because of stress, immune system problems, long-lasting inflammation and too many pro-inflammatory cytokines such as TNF-α, IL-1β and IL-6. To evaluate the antiarthritic activity of Citrullus lanatus. The extracts that we obtained through extraction were first examined for their phytochemical content. We then tested the activity by inducing arthritis with formaldehyde and CFA. We measured changes in body weight. Recorded hematological parameters. The results show that Citrullus lanatus protects rats from arthritis caused by formaldehyde and CFA. The changes in body weight and hematological disturbances caused by CFA were preserved. Overall Citrullus lanatus has a protective effect against arthritis induced by formaldehyde and adjuvant in rats. These findings confirm that the present study supports the use of Citrullus lanatus seeds to treat arthritis. The results validate how people have used Citrullus lanatus seeds for arthritis treatment for years.

Keywords: *Arthritis, Antiarthritic activity, Citrullus lanatus seeds.*

O-10/N/009 ORAL · ONLINE

In Vitro Pharmacological Evaluation of Litsea coriacea Bark: Pharmacognostic and Phytochemical Investigations

KR Prasanna*, Rajesh shastri
Research scholar & Associate professor, Hillside College of pharmacy and Sonia College of pharmacy, Karnataka
Associate professor, Sonia college of pharmacy, Karnataka
Email: kavaliprasanna@gmail.com

Litsea coriacea (Heyne ex Meisn.) Hook.f. (Lauraceae), a medicinal plant of the Western Ghats, remains underexplored pharmacologically. Systematic data on its pharmacognostic characteristics, phytochemical profile and biological activities are limited. This study evaluated the in vitro pharmacological potential of L. coriacea bark, established its pharmacognostic characteristics, profiled its phytoconstituents, and assessed antioxidant, anti-inflammatory, hepatoprotective and preliminary cytotoxic activities. Authenticated bark was morphologically and pharmacognostically evaluated, then extracted with aqueous and ethanolic solvents. Preliminary phytochemical screening, HPTLC fingerprinting using β-sitosterol, stigmasterol and quercetin markers, and LC–MS/MS profiling were performed. Antioxidant activity was assessed using DPPH and superoxide radical-scavenging assays, anti-inflammatory activity by HRBC membrane stabilization, and hepatoprotective activity against paracetamol-induced cytotoxicity in THLE-2 cells. Preliminary cytotoxicity was also evaluated. The bark was grayish to light brown, aromatic, slightly bitter, smooth and lenticellate, with shallow longitudinal fissures. HPTLC showed distinct fingerprints, while LC–MS/MS revealed terpenoids, flavonoid derivatives, phytosterols, lignans, polyphenols, tannins and glycosides. Both extracts demonstrated concentration-dependent antioxidant activity, with the ethanolic extract generally more active. In the HRBC assay, ethanolic and aqueous extracts showed IC_{50} values of 358.27 and 388.21 µg/mL, respectively. Hepatoprotective IC_{50} values were 94.28 and 109.41 µg/mL, respectively. Extracts showed preliminary safety at tested concentrations. L. coriacea bark exhibited diverse phytoconstituents and promising in vitro antioxidant, anti-inflammatory and hepatoprotective activities. These findings support further investigation of its bioactive constituents and mechanisms.

Keywords: *Litsea Coriacea, Anti-Inflammatory, Hepatoprotective, HPTLC, LC–MS/MS.*

O-10/N/010 ORAL · ONLINE

Plant Based Colouring Agents: A Green Initiative in Cosmetic Industry

Lokesh Gupta*[1], Prashant Kumar[1], Ved Pal[2]

[1]SRM Modinagar College of Pharmacy, SRM Institute of Science & Technology, Delhi-NCR Campus, Ghaziabad, Uttar Pradesh, India, India.
[2]Department of Pharmacognosy, ISF College of Pharmacy, GT Road, NH-95, Ghall Kalan, Punjab 142001, India.
Email: lokesh_gupta88@yahoo.com

The growing demand for sustainable and eco-friendly solutions in cosmeceuticals has led to an increased interest in natural colourants derived from plant, mineral, and biological sources. Natural colorants have gained significant attention in recent years due to their eco-friendly, non-toxic, and biodegradable properties. The use of these colorants in herbal cleansers aligns with the growing demand for sustainable and chemical-free personal care products. This paper explores the potential of natural colourants in cosmeceuticals, highlighting their advantages, sources, extraction methods, and functional properties. Emphasis is placed on the green chemistry approaches in the extraction and formulation processes, which align with the principles of sustainability and minimal environmental impact. Furthermore, the paper discusses challenges such as stability, regulatory hurdles, and scalability, offering insights into future innovations that could enhance the integration of natural colourants into mainstream cosmeceutical products. especially for coloring herbal cleansers. These natural colorants not only provide aesthetic appeal but also offer additional therapeutic benefits such as antioxidants, antimicrobial, and anti-inflammatory properties. The integration of natural colorants into herbal cleansers can enhance consumer appeal while promoting the use of safe, natural ingredients in the cosmetic industry. This study aims to establish the current advancements and development in the application of natural colorants in herbal cleansers, their stability, safety, and efficacy, and to provide insights into their future prospects in the formulation of eco-conscious skincare products. Ultimately, the use of natural colourants represents a promising step toward greener, safer, and more efficacious cosmetic formulations.

Keywords: *Cleansers, Natural Colourants, Cosmeceuticals, Sustainability, Eco-friendly, Plant-based dyes.*

O-10/N/011 ORAL · ONLINE

Polyacrylamide-Grafted Okra Polysaccharide as a Smart pH-Responsive Biomaterial for Controlled Drug Delivery

Maitrayee Ghosh*, Nitin Sharma

Centre of Pharmaceutics, Amity Institute of Pharmacy, Amity University Uttar Pradesh, Noida, Uttar Pradesh, 201313, India.
Email: Maitrayee0225@gmail.com

Introduction: Natural polysaccharides are used as drug delivery system now a days but, the limited and unpredictable pH responsiveness of raw polysaccharides can restrict their ability to provide controlled and site-specific drug release. Graft polymerization can enhance environmental responsiveness and improve the performance of polysaccharide as drug carrier. In the present study, okra (Abelmoschus esculentus) polysaccharide was chemically modified by acrylamide grafting to enhance its pH sensitivity and swelling behavior.

Aim and Objective: To develop a polyacrylamide-grafted okra polysaccharide with improved pH responsiveness and pH-dependent swelling characteristics for potential applications as a controlled-release drug delivery system.

Methods: Okra polysaccharide was extracted and purified using established procedure. The purified polysaccharide was modified through graft polymerization of acrylamide. Successful grafting was evaluated using Fourier-transform infrared, nuclear magnetic resonance spectroscopy and grafting efficiency. Furthermore, thermal characteristics, pH-dependent pulsatile swelling studies were conducted to investigate pH responsiveness of the grafted polysaccharide. Finally, the safety of the grafted polysaccharide was evaluated by cell viability.

Results: Spectroscopic characterization confirmed the incorporation of polyacrylamide chains into the polysaccharide backbone. The modified polysaccharide demonstrated improved pH sensitivity compared with the raw. The grafted polysaccharide exhibited pronounced pH-dependent swelling, indicating enhanced responsiveness to changes in the medium. Also, it was found safe in L929 cells.

Summary and Conclusion: Polyacrylamide grafting effectively modified the physicochemical and pH-responsive properties of okra polysaccharide. The enhanced pH-dependent swellability suggests that the developed polymer may provide improved controlled drug release and has potential as a pH-responsive biomaterial for site-specific drug delivery.

Keywords: *Polysaccharide, Abelmoschus Esculentus, Polyacrylamide, Grafting Co-Polymerization.*

O-10/N/012 ORAL · ONLINE

AI and Molecular Modelling for the Discovery of Plant-Derived Antimicrobial Agents Against Drug-Resistant Pathogens

Nisha Retrekar[1]*, Manish Kumar[1]

*[*1]Assistant Professor, Indore Institute of Pharmacy, Indore*
*Research Scholar[*1,1]KIET School of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh, India*
Email: nisha.retrekar123@gmail.com

Antimicrobial resistance (AMR) is a significant global health burden, with pathogens like MRSA, carbapenem-resistant Enterobacteriaceae (CRE) and multidrug-resistant Mycobacterium tuberculosis (MDR-TB) becoming more resistant to standard antibiotics. Natural compounds from plants are a promising source of new antimicrobials because of their diversity and proven therapeutic applications. Artificial intelligence (AI) and molecular modelling can help speed up their discovery and optimization. Random forest, support vector machine and deep neural networks are used to predict antimicrobial activity, toxicity and pharmacokinetic properties using machine learning. The molecular docking, molecular dynamics, QSAR modelling, and pharmacophore mapping give insights into ligand–target interactions, binding affinity, and complex stability. Phytochemical compounds targeting enzymes for bacterial cell wall, efflux pumps, and DNA gyrase are identified using AI-assisted virtual screening and high throughput docking (HTD). Generative AI also aids in the formulation of strong derivatives and minimised resistance. While factors like limited experimental data, low bioavailability, uncertainties about predictions, and the absence of standardized workflows present obstacles, the use of AI, molecular modelling, and natural product research is still a promising and sustainable approach to identifying and developing antimicrobials from plant sources for combating drug-resistant pathogens.

Keywords: *Antimicrobial Resistance, Docking, Machine Learning, Virtual Screening, Drug Discovery.*

O-10/N/013 ORAL · ONLINE

Phytochemical Profiling and Bioassay Guided Fractionation of Tabernaemontana divaricata Leaf Extract against an experimental model of Parkinson's Disease

Rajneesh Kumar*

Sri Sai University Palampur, V.p.o. Tarehal Tehsil Baijnath District Kangra, 176063, Himachal Pradesh
Email: rajneeshkumarhp32@gmail.com

Parkinson's disease (PD) is a progressive neurodegenerative disorder marked by the degeneration of dopaminergic neurons in the substantia nigra, primarily due to oxidative stress, mitochondrial dysfunction, and neuroinflammation. Current therapies offer symptomatic relief but fail to address the underlying pathophysiological mechanisms or prevent disease progression. Consequently, there is growing interest in plant-based therapeutics that exhibit multi-target actions with reduced side effects. Tabernaemontana Divaricata, a medicinal plant traditionally used in several Asian countries, is rich in phytoconstituents such as alkaloids, flavonoids, and phenolic compounds, which are known for their antioxidant and anti-inflammatory properties. The present study aimed to evaluate the neuroprotective potential of T. Divaricata leaf extract in an in vitro model of Parkinson's disease using rotenone-induced cytotoxicity in SH-SY5Y neuroblastoma cells. The phytochemical composition of T. Divaricata leaf methanolic extract was characterized using advanced analytical techniques including TLC, HPTLC, HPLC, and UHPLC–QTOF–MS, revealing the presence of 85 bioactive metabolites. Network pharmacology analysis was employed to predict the interactions between these compounds and Parkinson's disease-related gene targets, which were further validated through protein–protein interaction (PPI) network and KEGG pathway enrichment. Key regulatory proteins identified in the network included NFKB1, STAT3, and TLR4, which are involved in inflammation, immune response, and oxidative stress. To validate these findings, various in vitro assays were conducted. TDME demonstrated dose-dependent antioxidant activity through DPPH assay and significantly enhanced cell viability in rotenone-treated SH-SY5Y cells, as measured by MTT assay. Furthermore, TDME effectively reduced intracellular ROS and mitochondrial superoxide levels (assessed by DCFDA and MitoSOX assays, respectively). It also inhibited nitric oxide overproduction (Griess assay) and decreased the secretion of pro-inflammatory cytokines TNF-α and IL-6 (measured via ELISA). Flow cytometric analysis confirmed the downregulation of inflammasome-related markers NLRP3 and IL-1β following TDME treatment. These results collectively suggest that TDME exerts neuroprotective effects through multiple mechanisms, including the mitigation of oxidative stress, suppression of neuroinflammation, and preservation of mitochondrial function. The study provides strong preliminary evidence for the therapeutic potential of T. divaricata in managing Parkinson's disease and highlights the need for further in vivo and clinical investigations to support its application as a plant-based intervention.

Keywords: *Tabernaemontana Divaricata, Parkinson's disease, SH-SY5Y cells, UHPLC QTOF–MS.*

O-10/N/014 ORAL · ONLINE

Experimental Evaluation of the Nephroprotective Activity of Hamelia Patens Against Cisplatin-Induced Renal Damage

Abdul Aahad[1]*, Bhuwanendra Singh[2], Mohd Salman[1], Arvind Kumar[1], Vaishali[1]

[1]*Department of Pharmaceutical Chemistry, S.D. College of Pharmacy & Vocational Studies, Muzaffarnagar, (U.P.) Pin- 251001, India*
[2]*Department of Pharmacognosy, S.D. College of Pharmacy & Vocational Studies, Muzaffarnagar, (U.P.) Pin- 251001, India*
Email: abdulaahad0404@gmail.com

A serious side effect of several medications is nephrotoxicity, which can seriously affect the kidneys' structural and functional integrity. The goal of the current study was to assess Hamelia paten's ability to protect laboratory animals from experimentally induced nephrotoxicity. After the plant material was gathered and verified, the appropriate extraction techniques were applied. A well-known experimental nephrotoxic agent, cisplatin, was administered intravenously to cause nephrotoxicity, and silymarin was utilized as the conventional nephroprotective medication for comparison. To examine the preventive effect of Hamelia patens extract against renal damage caused by cisplatin, animals were divided into suitable experimental groups and given varying doses of the extract. Biochemical evaluation of renal function and oxidative stress markers, such as blood urea nitrogen (BUN), serum creatinine, lactate dehydrogenase (LDH), malondialdehyde (MDA), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and reduced glutathione (GSH), was used to assess the nephroprotective activity. Additionally, kidney tissue was examined histopathologically to evaluate the protective effects of therapy and cellular and structural changes linked to cisplatin administration. The purpose of the research is to ascertain whether Hamelia patens extract can reduce the biochemical, oxidative, and histological alterations brought on by cisplatin. The results could offer scientific proof of Hamelia patens' nephroprotective potential and encourage future research into its therapeutic value and underlying pharmacological mechanisms. The presence of biologically active phytoconstituents with tissue-protective and antioxidant qualities may be responsible for this activity, which may assist preserve renal integrity under chemically induced renal stress.

Keywords: *Antioxidant Activity, Cisplatin, Histopathology, Renal Toxicity, Silymarin.*

O-10/N/015 ORAL · ONLINE

Ability of Anogeissus latifolia to treat diabetes: Evidence from Experimental Studies

Atul Khatiyan[1]*, Fatima Binte Asad[1], Avantika Tyagi[1], Pratiksha Tyagi[1], Ishan Aggarwal[1], Salman[2]

[1]*Department of Pharmacognosy, SD College of Pharmacy & Vocational Studies, Muzaffarnagar*
[2]*Department of Pharmaceutical Chemistry, SD College of Pharmacy & Vocational Studies, Muzaffarnagar*
Email: atulkhatiyan5434535@gmail.com

Anogeissus latifolia (Combretaceae) is a medicinal plant used in India to treat diabetes and weakness. There have been numerous reports that various plant parts may alleviate hyperglycemia and its complications. The current paper intends to review the antidiabetic properties of A. latifolia, in particular those of bark and leaf extracts, based on experimental evidence. In this context, the antihyperglycemic activity of different extracts from bark and leaves of A. latifolia, such as petroleum ether, chloroform and methanolic, has been tested on diabetic rats. The chronic application of methanolic extract from bark resulted in the decrease of blood glucose levels and improvement in altered biochemical and lipid parameters. Additionally, the methanolic extract from leaves also showed significant antihyperglycemic effects on diabetic rats. Moreover, the bark extract of A. latifolia under high-fructose diet model was found to reduce insulin resistance and metabolic dyslipidemia and positively affect the lipid profile and biochemical parameters. These extracts can be attributed to their phytoconstituents, mainly to phenols and flavonoids. All these observations suggest experimental confirmation of the traditional use of A. latifolia to treat diabetes and possible further studies on antidiabetic agents from this plant. We need to look into this further to see how A. latifolia works.

Keywords: *Anogeissus latifolia, Antidiabetic activity, Insulin resistant, Combretaceae.*

O-10/N/016 ORAL · ONLINE

Green Synthesis of Silver Nanoparticles Using Cynodon dactylon L. for Potential Nephroprotective Applications

Avantika Tyagi*[1], Bhuwanendra Singh[1], Mahima[1], Pratiksha Tyagi[1], Arvind Kumar[2], Vaishali[2]

[1]*Department of Pharmacognosy, SD College of Pharmacy & Vocational Studies, Muzaffarnagar, U.P, India-251001*

[2]*Department of Pharmaceutical Chemistry, SD College of Pharmacy & Vocational Studies, Muzaffarnagar, U.P, India-251001*

Email: avantikatyagi26.mzn@gmail.com

Green synthesis of silver nanoparticles (AgNPs) utilize medicinal plants act for an eco-friendly, cost-effective, and sustainable substitute to conventional physical and chemical synthesis methods. Cynodon dactylon L. is a medicinal grass containing flavonoids, phenolic compounds, tannins, alkaloids, terpenoids, and other bioactive constituents. These phytochemicals may minimize silver ions and facilitate the formation, capping, and stabilization of synthesized nanoparticles. Flavonoids such as quercetin and rutin may contribute to the reduction and stabilization process, potentially influencing nanoparticle size, morphology, surface chemistry, and biological properties. The present study targets on the green synthesis of AgNPs using C. dactylon extract and the assessment of their physicochemical characteristics. UV–visible spectroscopy can validate nanoparticle formation through surface plasmon resonance, while Fourier-transform infrared spectroscopy (FTIR) may recognize functional groups implicated in reduction and capping. X-ray diffraction (XRD) can regulate crystallinity, whereas scanning electron microscopy (SEM) and transmission electron microscopy (TEM) can estimate particle morphology, size, and distribution. The synthesized AgNPs may display antioxidant and cytoprotective properties, suggesting potential nephroprotective applications against oxidative stress and renal cellular injury. However, limited research has especially explore C. dactylon-mediated AgNPs for nephroprotective applications. Further in vitro studies are warranted to establish their efficacy, mechanisms of action, biocompatibility, and safety.

Keywords: *Cynodon dactylon L., Green synthesis, Silver nanoparticles, Phytochemicals, Nephroprotection.*

O-10/N/017 ORAL · ONLINE

Pharmacognostical Standardization and In-Silico Anticancer Study of Selected Medicinal Plants Obtained Polyherbal Extract

Pratiksha Tyagi[1]*, Bhuwanendra Singh[1], Mahima[3], Piyush Kumar Singhal[3], Arvind Kumar[2], Vaishali[2]

[1]*Department of Pharmacognosy, SD College of Pharmacy & Vocational Studies, Muzaffarnagar, U.P, India- 251001.*

[2]*Department of Pharmaceutical Chemistry, SD College of Pharmacy & Vocational Studies, Muzaffarnagar, U.P, India- 251001.*

[3]*Department of Pharmacy, SD Institute of Pharmacy, Muzaffarnagar, U.P, India- 251001.*

Email: pratikshatyagibhardwaj@gmail.com

For discovering bio-active components, medicinal plants provide a useful basis. of bioactive compounds for the discovery of possible anticancer mediators. The present study intended to pharmacognostically standardize selected medicinal plants and investigate the anticancer potential of their polyherbal extract. This research comprised seeds of Myristica fragrans, leaves of Nerium oleander & aerial parts of Thuja occidentalis. Crude drugs were authenticated and were subjected to pharmacognostical evaluation. The prepared polyherbal extract was then subjected to high-resolution mass spectrometry (HR-MS) for detection of major phytochemicals. Selected phytochemical compounds were assessed by molecular docking against BCL-2 (PDB ID: 6O0K) and EGFR (PDB ID: 1M17) using MOE 2022. Further, In-vitro antiproliferative activity was assessed by the MTT assay against A375 melanoma and A431 epidermoid carcinoma cell lines. Pharmacognostical standardization reveals the optimum quality of medicinal plants used. HR-MS recognized bioactive constituents which includes afzelin, elemicin, myricitrin, oleandrin, quercetin, and thujone derivatives. Oleandrin (−7.92 kcal/mol) and afzelin (−7.61 kcal/mol) showed favourable binding with EGFR, while myricitrin (−7.04 kcal/mol) and afzelin (−7.03 kcal/mol) showed favourable interactions with BCL-2. The extract displayed concentration-dependent cytotoxicity, with IC_{50} values of nearly 60 µg/mL for A375 and 75 µg/mL for A431 cells. The conclusions determine potential anticancer activity of the polyherbal extract and deliver a scientific foundation for supplementary mechanistic, toxicity, and in-vivo investigations.

Keywords: *Polyherbal extract, Pharmacognostical standardization, Phytochemical screening, Molecular docking, Anticancer activity.*

O-10/N/018 ORAL · ONLINE

Therapeutic potential of Phyllanthus amarus against drug-induced liver injury: A comprehensive review

Fatima Binte Asad[1]*, Atul Khatiyan[1], Bhuwanendra Singh[1], Piyush K. Singhal[2]

[1]*Department of Pharmacognosy, SD College of Pharmacy & Vocational Studies, Muzaffarnagar*
[2]*Department of Pharmaceutical Chemistry SD College of Pharmacy & Vocational Studies, Muzaffarnagar*
Email: fzaidi2510@gmail.com

Drug-induced liver injury is a major global health threat, since xenobiotic hepatotoxicity often involves oxidative stress, excessive free radicals, and disrupted metabolism. The standard treatment for liver diseases is limited because suitable drugs are scarce and side effects are common. Fortunately, many traditional medicinal plants, including Phyllanthus sp., exhibit considerable therapeutic and hepatoprotective potential. P. amarus is notably rich in bioactive polyphenolic derivatives, flavonoids, and lignans; however, its mechanisms and optimal use need clarification for clinical application. This study sought to clarify the molecular mechanisms underlying the hepatoprotective activity of the aqueous extract of P. amarus and to confirm its capacity to treat paracetamol-induced hepatic damage. The findings showed that the extract of this plant species has meaningful therapeutic potential for developing new pharmaceutical preparations. The aqueous extract of P. amarus significantly lowered plasma aminotransferase levels and bilirubin concentration, and it also prevented the histopathological changes caused by paracetamol. Its mechanisms included free radical scavenging, iron chelation, and modulation of hepatic glutathione levels, whereas CYP450 inhibition and promotion of conjugative metabolism, generally viewed hepatoprotective, were absent. Overall, the data suggested that the aqueous extract of P. amarus may be a promising pharmacological agent for treating and preventing liver diseases. This plant species' established antiviral efficacy may be complemented by its antioxidant properties. Thus, this study partly met its aim of reviewing the ethnopharmacological use of P. amarus for liver disease treatment by providing theoretical evidence for the beneficial effects of its aqueous extract.

Keywords: *Hepatoprotective, Oxidative Stress, Glutathione, P. Amarus, Iron Chelation.*

O-10/N/019 ORAL · ONLINE

In Vitro & In Silico Anti-Inflammatory and Antioxidant Studies on Aerial Parts of Altingia excelsa Noronha

Hariom[1], Ajmer Singh Grewal[1], Geeta Deswal[1], Girija[1]*

[1]*Guru Gobind Singh College of Pharmacy, (An Autonomous College), Yamunanagar, 135001, Haryana, India*
Email: girija0812002@gmail.com

The present study was undertaken to evaluate the anti-inflammatory, antioxidant and in silico therapeutic potential of aerial parts of Altingia excelsa Noronha. Different crude extracts were prepared using Soxhlet extraction with different solvents of increasing polarity, namely petroleum ether, chloroform, methanol and water. Preliminary phytochemical screening revealed the presence of flavonoids and tannins in methanol extract, alkaloids, triterpenoids and coumarins in the chloroform extract, proteins and carbohydrates in the aqueous extract and fixed oils in the petroleum ether extract. The anti-inflammatory activity of the extracts was evaluated using the human RBC membrane stabilization method with diclofenac as the standard drug. Antioxidant activity was assessed by the DPPH free radical scavenging assay using rutin as the reference standard. Among all tested extracts, the methanol extract demonstrated the highest anti-inflammatory and antioxidant activities with IC50 values of 43.18 µg/ml and 56.17 µg/ml, respectively. The superior biological activity was attributed to the abundance of flavonoids and phenolic compounds known for their free radical scavenging and anti-inflammatory properties. To further investigate the molecular basis of these activities, phytoconstituents of Altingia excelsa were subjected to molecular docking studies against phosphodiesterase-4 (PDE4) and phosphodiesterase-7 (PDE7) enzymes. Several flavonoids, including quercetin, myricetin, kaempferol, apigenin and galangin exhibited strong binding affinities and stable hydrogen bonding and hydrophobic interactions. The findings suggest that Altingia excelsa is a promising natural source of bioactive compounds with significant therapeutic potential and may serve as a valuable candidate for the development of future anti-inflammatory and antioxidant agents.

Keywords: *Altingia excelsa, Phytochemicals, Molecular Docking, Phosphodiesterase 4, PDE7, HRBC.*

O-10/N/020 ORAL · ONLINE

Herbal Indicator: The Green Alternative

Anjali Gangurde[1]*

[1]*Department of Pharmacy, Sanjivani College of Pharmaceutical Education and Research, Kopargaon, Maharashtra, India-423601*
Email: gangurdeanjali5@gmail.com

Synthetic acid–base indicators are widely used in analytical chemistry, but some may have limitations related to toxicity, irritancy, cost, biodegradability and environmental impact. Herbal indicators obtained from natural plant sources offer a potential eco-friendly alternative. The present study was undertaken to develop and evaluate herbal indicators prepared from different flowers using a simple extraction method. Flowers were collected and their colouring constituents were extracted by the infusion method, followed by filtration and concentration of the extracts. The prepared herbal extracts were tested with acidic and alkaline solutions to observe their visible colour changes over different pH conditions. The study demonstrated that the prepared herbal indicators exhibited distinct colour responses in acidic and alkaline media. Their natural origin, biodegradability, easy availability and simple preparation indicate their potential usefulness as alternatives to synthetic indicators. Herbal indicators may find applications in acid–base titrations, pharmaceutical and food-related analytical studies, laboratory education and green analytical chemistry. The study supports the exploration of naturally derived indicators as safer and environmentally sustainable alternatives to conventional synthetic indicators.

Keywords: *Herbal indicator, Natural indicator, Acid–base titration, Flower extract, Green chemistry, Biodegradable indicator.*

P-10/N/001 POSTER · ONLINE

From Waste to Wellness: Exploring the Therapeutic Potential of Potato Peel Waste

Harmanjot Kaur[1]*, Amanpreet Kaur[1]

[1]*Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy, Bela, Ropar, Punjab*
Email: pharmaceutics23@gmail.com

Introduction: Potato peel is one of the major by-products generated during potato processing and is usually discarded although it contains a wealth of naturally occurring bioactive compounds. It contains phenolic compounds, flavonoids, chlorogenic acid, dietary fiber and other phytoconstituents which have been associated with antioxidants and other biological activities. The aim of the current study is to explore the valorization of potato peel waste as a cheap and sustainable source of bioactive compounds with potential pharmaceutical applications.

Methodology: Potato peels are collected, washed, dried, powdered, and extracted using a suitable solvent to obtain bioactive compounds such as phenols and flavonoids. The extract is then screened for phytochemicals and evaluated for antioxidant and antimicrobial activities to explore its therapeutic potential. Further investigation of the extract for possible use in wound care formulations will be based on its phytochemical and antioxidant properties.

Conclusion: Potato peel is an underused source of many bioactive compounds. Its chemical compounds show antioxidant, antimicrobial and anti-inflammatory effects. Rather than seeing potatoes as a waste we should see it as a potential source of health care. Therefore, this approach aims to convert potato peel waste in valuable resource for future pharmaceutical and nutraceutical development.

Keywords: *Potato Peel, Waste Valorization, Bioactive Compounds, Phenolics, Flavonoids, Antioxidant Activity.*

P-10/N/002 POSTER · ONLINE

Integrated In Vitro and In Silico Evaluation of the Hyaluronidase Inhibitory Potential of Coccinia indica Aerial Parts

Girija[1], Ajmer Singh Grewal[1], Geeta Deswal[1], Hariom[1]*

[1]*Guru Gobind Singh College of Pharmacy, (An Autonomous College), Yamunanagar, 135001, Haryana, India*
Email: rangahariom0@gmail.com

The present study was conducted to evaluate the hyaluronidase inhibitory potential of aerial parts of Coccinia indica through both in vitro and in silico approaches. Successive extraction was carried out using petroleum ether, chloroform, methanol and water in increasing order of polarity. Preliminary phytochemical screening revealed the presence of fixed oils in petroleum ether extracts, steroids and triterpenoids in the chloroform extracts, tannins and flavonoids in methanol extracts and proteins and carbohydrates in aqueous extracts. Hyaluronidase inhibitory activity was assessed using a standardized spectrophotometric method. Among all the extracts, the methanol extract exhibited the highest inhibitory activity, comparable to the standard tannic acid while chloroform extract showed moderate activity. Petroleum ether and aqueous extracts demonstrated negligible effects. Quantitative analysis indicated that the total phenolic content was substantially higher than the total flavonoid content in the methanol extract. A comprehensive phytochemical database of Coccinia indica was further explored for molecular docking studies against hyaluronidase (PDB ID: 2PE4). Molecular docking revealed binding energies ranging from -2.5 to -4.3 kcal/mol, with flavonoids such as quercetin, kaempferol and apigenin exhibiting the strongest binding affinities. These compounds formed stable interactions with amino acid residues, including Arg20, Ser21, Asn280 and Gly423. These findings indicate that flavonoid rich phytoconstituents of Coccinia indica are primarily responsible for its hyaluronidase inhibitory activity and may serve as promising natural candidates for the development of therapeutic agents with potential pharmaceutical application.

Keywords: *Coccinia indica, Phytoconstituents, Hyaluronidase Inhibitory Activity, Methanol Extract, Aerial Parts.*

P-10/N/003 POSTER · ONLINE

Antioxidant Activity of Polyherbal Extract

Mehak Sharma[1]*, Madhukar Garg[2], Pallavi Bassi[3]

[1,2,3]*Chitkara College of Pharmacy, Chitkara University, Rajpura,140401, Punjab, India*
Email: mehak23061.ccp@chitkara.edu.in

Polyherbal Extract are one of the significant remedial measures for the management of diverse number of ailments. They possess less of side and zero adverse effects if optimized appropriately. More than two herba with almost same nature of constituent can be used to formulate the same. Antioxidant activity of polyherbal extract can be assessed by DPPH assay. In our investigation significant results were obtained causing oxidation of free radicals and exhibiting the present of phenolic components in the extract. The prepared extract can be ultililized at industrial and research scale to explore maximum of therapeutic benefits.

Keywords: *Polyherbal, Extract, Phenolic components, Therapeutics.*

CATEGORY 11 | 16 ABSTRACTS

Advancement in Pharmaceutical Education (NEP-2020)



O-11/F/001 ORAL · OFFLINE

National Education Policy (NEP) 2020: Transforming Indian Education through Equity, Skill Development, and Holistic Learning

Ritesh Tiwari*

Department of Pharmacy, Chandra Shekhar Singh College of Pharmacy, GT Road, Koilaha – 212213, Kaushambi, Uttar Pradesh, India
Email: advmphcrtiwari@gmail.com

The National Education Policy (NEP) 2020 presents a New Vision for the Indian education system, aiming to move beyond education as merely a means of acquiring knowledge by integrating skills, innovation, creativity, employability, ethical values, and social responsibility. The policy emphasizes the development of an inclusive, flexible, and multidisciplinary education system aligned with the changing social, economic, technological, and professional needs of the twenty-first century. This study explores the potential of NEP 2020 to promote educational and social transformation, with particular emphasis on higher, professional, and public health education. A qualitative approach was adopted through a review of NEP 2020 and relevant higher-education guidelines and frameworks. Key reforms include multiple entry and exit options, credit-based education, the Academic Bank of Credits, recognition of prior learning, competency-based assessment, digital and online learning, integration of Indian Knowledge Systems, and education in human values and ethics. The integration of skill development and experiential learning can strengthen students' practical competencies, employability, adaptability, and capacity for innovation. Effective implementation of NEP 2020 can contribute to reducing educational disparities, expanding access to quality education, and developing self-reliant, responsible, and socially conscious citizens. Thus, the New Vision of NEP 2020—"Knowledge to Skills, Learning to Innovation, and Education to Empowerment"—represents an important step towards transforming Indian education into a powerful instrument for social and national development.

Keywords: *NEP 2020, New Vision, Educational Transformation, Skill Development, Innovation, Employability, Inclusive Education, Digital Learning, Social Transformation.*

O-11/F/002 ORAL · OFFLINE

Advancing Pharmaceutical Education through Cyclodextrin-Based Learning: An NEP 2020 Framework for Experiential, Interdisciplinary and Research-Oriented Training

Km. Supriya Das*, Preeti Patel

[1]Department of Pharmaceutical Chemistry and Analysis, ISF College of Pharmacy, Moga, Punjab 142001, India
Email: supriyadas@isfcp.org

The National Education Policy (NEP) 2020 envisions a transformation of higher and professional education through multidisciplinary learning, experiential pedagogy, research, innovation, technology integration, and stronger academia–industry linkages. Pharmaceutical education, in particular, requires an approach that moves beyond conventional classroom teaching toward application-oriented and research-driven learning. Cyclodextrin science provides an excellent interdisciplinary platform to achieve these objectives because it integrates pharmaceutical chemistry, pharmaceutics, drug delivery, analytical science, nanotechnology, computational modelling, and biotechnology. This perspective proposes a cyclodextrin-centred educational framework in which students learn through problem-based projects, laboratory demonstrations, molecular modelling, formulation development, analytical characterization, and industry-oriented case studies. Cyclodextrin-based inclusion complexes can be used as teaching models to demonstrate molecular recognition, solubility enhancement, stability improvement, controlled drug release, and bioavailability enhancement. Integration of computational tools, virtual laboratories, digital learning resources, artificial intelligence, and simulation-based activities can further promote active and personalized learning. Such approaches can facilitate the development of research aptitude, critical thinking, innovation, teamwork, and pharmaceutical problem-solving skills. By positioning cyclodextrin technology as an educational bridge between fundamental science and pharmaceutical application, this approach supports the NEP 2020 vision of holistic, multidisciplinary, research-oriented and employability-focused professional education. The model may serve as a scalable framework for modernizing pharmaceutical curricula and preparing future pharmacists and researchers for emerging challenges in drug discovery and advanced drug delivery.

Keywords: *Cyclodextrins, Pharmaceutical Education, NEP 2020, Experiential Learning, Interdisciplinary Research.*

O-11/F/003 ORAL · OFFLINE

Preparing Future Pharmacists for the Era of Precision Medicine: The Role of Pharmacogenomics

Nishtha Arora, Dr. Madhaw Dwivedi*

Department of Pharmacy Practice, ISF College of Pharmacy, 142001, Moga, Punjab, India
Email: 2116962@isfcp.org

Background: Precision medicine aims to optimize therapeutic decisions according to individual patient characteristics, including genetic variation. Pharmacogenomics, the study of how genetic differences influence drug response, has growing relevance to pharmaceutical care. Variations in genes such as CYP2C19, CYP2D6, and TPMT can influence drug metabolism, therapeutic effectiveness, and susceptibility to adverse drug reactions. Preparing pharmacists to interpret and apply pharmacogenomic information is therefore an important consideration in contemporary pharmacy education.

Objective: To explore the clinical relevance of pharmacogenomics and identify educational strategies for preparing future pharmacists to contribute to precision medicine.

Methods: This narrative review is designed to examine published literature on pharmacogenomics education, clinical applications of pharmacogenetic testing, and the integration of genomic competencies into pharmacy curricula. Relevant themes include genetic variation in drug response, genotype-guided therapeutic decisions, interpretation of pharmacogenomic reports, and the educational challenges associated with implementing precision medicine.

Discussion: Pharmacogenomic knowledge can support more individualized medication selection and dosing, improve recognition of genetically influenced adverse drug reactions, and facilitate evidence-informed clinical decision-making. Examples include CYP2C19-guided antiplatelet therapy, TPMT and NUDT15-guided thiopurine treatment, and HLA-B57:01* screening to reduce the risk of abacavir hypersensitivity. However, effective clinical application requires more than theoretical knowledge. Pharmacy curricula should incorporate case-based learning, interpretation of genetic test reports, clinical simulations, ethical considerations, and interprofessional collaboration. Limited access to genomic testing, curriculum constraints, and insufficient faculty training remain important implementation challenges.

Conclusion: Integrating pharmacogenomics into pharmacy education may help prepare future pharmacists for emerging precision-medicine practices. A competency-based educational approach combining foundational genomic knowledge with clinical application could strengthen medication safety and individualized patient care. Further educational research is needed to evaluate effective teaching strategies and their impact on pharmacists' clinical competencies.

Keywords: *Pharmacogenomics, precision medicine, pharmacy education, personalized therapeutics, genomic literacy, medication safety.*

P-11/F/011 POSTER · OFFLINE

Reimagining Pharmacy Practice: Digital Technologies for Smarter Healthcare Delivery

Gaurika*, Romanpreet Kaur[1]

** ISF College of Pharmacy, Ferozepur GT Road, Moga, Punjab 142001*
[1]Department of Pharmacology, ISF College of Pharmacy, Moga, Punjab
Email: viveksh192008@gmail.com

Introduction: Digital revolution is altering healthcare and opening up new prospects for pharmacy practice. Artificial intelligence (AI), telepharmacy, electronic health records, mobile health applications, clinical decision support systems, big data analytics, and automation can all help to improve pharmaceutical care's accessibility, safety, efficiency, and personalization.

Aim & Objectives: the main aim and objective is to explore emerging digital technologies in pharmacy practice and also to assess their role in medication management and patient care

Methods: A literature review examined the integration of artificial intelligence and big data analytics, telepharmacy and mobile health, electronic health records with clinical decision-support systems, automated dispensing with digital inventory systems, and digital medication management alongside pharmacovigilance. It also addressed challenges concerning privacy, cybersecurity, regulation, and digital literacy.

Results: AI and data analytics enhance prescription screening, drug interaction detection, adverse-event prediction, and personalized therapy. Telepharmacy increases access to pharmaceutical services in remote areas. Digital tools improve medication adherence, patient counselling, and pharmacovigilance. Automation enhances workflow efficiency and reduces medication errors. Key challenges include data privacy, cybersecurity, cost, interoperability, regulatory uncertainty, and skill gaps. Responsible AI use demands transparency, accountability, human oversight, and professional judgment.

Summary: Digital transformation is shifting pharmacy practice towards a connected, data-driven, and patient-centered model, necessitating pharmacists to possess both clinical expertise and digital skills to utilize emerging technologies effectively.

Conclusion: Responsible adoption of digital technologies can enhance the role of pharmacists, leading to safer and more personalized healthcare. Essential factors for sustainable digital transformation in pharmacy include strengthening digital education, fostering interdisciplinary collaboration, establishing regulatory frameworks, and ensuring human oversight.

Keywords: *Digital Health; Pharmacy Practice; Artificial Intelligence; Digital Transformation; Pharmacovigilance; Personalized Healthcare*

O-11/N/001 ORAL · ONLINE

Advancing Pharmaceutical Education through NEP-2020: Transforming Pharmacy Learning for Future Healthcare Needs

Sachin Yadav[1]*, Raj Kumar Narang[1], Amandeep Singh[1]

[1]Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India, 142001
Email: sachin08072003@gmail.com

The implementation of India's National Education Policy (NEP)-2020 marks a significant transformation in pharmaceutical education by promoting multidisciplinary learning, innovation, skill development, and outcome-based education. The policy aims to bridge the gap between academic knowledge and industry requirements, thereby preparing pharmacy graduates to address emerging healthcare challenges. NEP-2020 emphasizes flexibility in curriculum design, multiple entry-exit options, academic credit banks, experiential learning, and integration of digital technologies, fostering a student-centric educational ecosystem. In pharmaceutical education, the policy encourages the incorporation of research-oriented learning, entrepreneurship, artificial intelligence, data analytics, and interdisciplinary collaborations with life sciences, biotechnology, and healthcare sectors. The focus on competency-based education enhances critical thinking, problem-solving abilities, and professional ethics among pharmacy students. Furthermore, the promotion of online and blended learning platforms increases accessibility, lifelong learning opportunities, and global academic exposure. The advancement of pharmaceutical education under NEP-2020 also supports innovation-driven research, industry-academia partnerships, and translational healthcare solutions. By strengthening practical training, clinical exposure, and employability skills, the policy aligns pharmacy education with national and international healthcare demands. This transformative approach is expected to produce competent pharmacists, researchers, entrepreneurs, and healthcare professionals capable of contributing to sustainable healthcare development and pharmaceutical innovation. Overall, NEP-2020 serves as a catalyst for modernizing pharmaceutical education and building a future-ready pharmacy workforce in India.

Keywords: *National Education Policy (NEP-2020), Pharmaceutical Education, Competency-Based Learning, Multidisciplinary Education, Digital and Experiential Learning.*

O-11/N/002 ORAL · ONLINE

Transforming Pharmaceutical Education under NEP 2020: Bridging the Gap between Academic Learning, Industry Skills, and Healthcare Needs

Kanchan[1]*, Preeti Patel[2]

[1,2]Department of Pharmaceutical Chemistry, ISF College of Pharmacy, GT Road, NH-95, Ghall Kalan, Punjab 142001, India.
Email: kanchanpal@isfcp.org

The National Education Policy (NEP) 2020 provides a transformative framework for restructuring higher education in India through multidisciplinary learning, competency-based education, research, innovation, and experiential learning. In pharmaceutical education, its implementation offers significant opportunities to develop future-ready pharmacists equipped with scientific knowledge, practical competencies, and professional skills. Recent curriculum reforms emphasize skill-oriented training, flexible learning pathways, specialization, and industry–academia collaboration. However, the effectiveness of these initiatives depends on their translation into meaningful educational outcomes. Challenges such as limited practical exposure, inadequate research infrastructure, faculty development requirements, and disparities in institutional resources may hinder the realization of the policy's objectives. The integration of digital learning platforms, simulation-based teaching, interdisciplinary research, entrepreneurship, and outcome-based assessment can make pharmaceutical education more dynamic, accessible, and practice-oriented. Furthermore, incorporating emerging areas such as artificial intelligence, digital health, pharmacovigilance, and personalized medicine into pharmacy curricula can help students adapt to the evolving pharmaceutical and healthcare landscape. Continuous faculty training, modern laboratory facilities, and stronger partnerships with pharmaceutical industries and healthcare institutions are essential to ensure effective implementation. Evaluating educational reforms through measurable indicators, including competency development, graduate employability, research engagement, and readiness for patient-centred practice, can further support quality improvement. A coordinated approach involving academic institutions, regulatory bodies, industry, and healthcare professionals is essential to bridge the gap between policy objectives and educational implementation. Aligning pharmaceutical education with the broader vision of NEP 2020 can support the development of competent, innovative, ethical, and socially responsible pharmacy professionals who contribute meaningfully to healthcare advancement and pharmaceutical research.

Keywords: *National Education Policy 2020, Pharmaceutical Education, Competency-Based Education, Experiential Learning.*

P-11/N/001 POSTER · ONLINE

From Traditional Practice to Digital Intelligence: Integrating AI, Python & Data Science into Next-Generation Pharmacy Education under NEP 2020

Moksh[1]*, Anchal

[1]ISF College of Pharmacy and Research, Moga, Punjab
Email: Mokshnarula47@gmail.com

The National Education Policy 2020 describes an education system that is holistic, multidisciplinary, adaptable, skill-oriented, scientifically enabled, and centred on critical thinking, research, innovation, and employment. In this context, including Artificial Intelligence, Python coding, and data analysis into pharmacy school might help students prepare for the rapidly evolving digital pharmaceutical industry. This approach provides skill-based and experiential learning using coding labs, actual data sets, case studies, simulations, internships, industry-academia collaboration, and interdisciplinary learning in pharmacy, computer science, and data analytics. Artificial intelligence and Python can help students improve their skills in drug discovery, virtual screening, pharmacovigilance, clinical data analysis, formulation improvement, precision medicine, and evidence-based decision making. While responsible-AI training encourages data protection, fairness, openness, and human oversight, data science education can improve skills in data gathering, cleaning, statistical analysis, presentation, and analysis. The strategy is in line with NEP 2020's focus on lifelong learning, digital literacy, research and creativity, vocational and skill development, and interconnected education. Strategic implementation can enhance employability, research capability, industry preparedness, and innovation, even while barriers including poor infrastructure, insufficient faculty training, curriculum adaption, and unequal access to technology still exist. In the end, NEP 2020-driven digital pharmacy education may develop students into capable, moral, and future-ready digital pharmacists who can successfully advance the advancement of traditional pharmaceuticals and medicine.

Keywords: *NEP 2020, Pharmacy Education, Artificial Intelligence (AI), Python Programming, Data Science, Digital Pharmacy.*

P-11/N/002 POSTER · ONLINE

Probiotics as Promising Therapeutic Targets for Effective Maintenance of Gastrointestinal Health

Sukirti[1]
[1]*Sri Sai college of Pharmacy*
Email: sukirti.sharma6@gmail.com

Probiotics have emerged as promising therapeutic agents for maintaining gut microbiota balance and improving gastrointestinal health; however, their clinical effectiveness is often limited by poor stability and low survival during processing, storage, and passage through the harsh gastrointestinal environment. Cyclodextrins (CDs), owing to their unique cyclic oligosaccharide structure, biocompatibility, and ability to form inclusion complexes, offer a promising platform for improving the protection and controlled delivery of probiotic microorganisms and their bioactive metabolites. The integration of artificial intelligence (AI) with cyclodextrin-based probiotic delivery systems could further accelerate the development of optimized formulations. AI and machine-learning approaches can be used to predict cyclodextrin–probiotic interactions, optimize formulation variables, identify suitable cyclodextrin derivatives, and predict probiotic viability, release behavior, and gastrointestinal stability. Computational models can integrate parameters such as cyclodextrin type and concentration, probiotic strain, encapsulation conditions, particle characteristics, and environmental factors to identify optimal delivery systems with reduced experimental effort. Furthermore, AI-assisted prediction may support personalized probiotic delivery by identifying formulations suited to specific microbiota profiles and therapeutic requirements. Thus, combining AI-driven formulation design with cyclodextrin-based delivery represents an innovative approach for enhancing probiotic stability, targeted release, and therapeutic performance. This interdisciplinary strategy has significant potential for the development of next-generation probiotic delivery systems for applications in gastrointestinal health, disease management, and personalized medicine.

Keywords: *cyclodextrins; oligosaccaride; AI-driven; probiotic.*

P-11/N/003 POSTER · ONLINE

Digital Ecosystems in Pharmacy Education

Sheikh Farhan[1]*
[1]*ISF College of Pharmacy, Moga, Punjab, India-142001*
Email: sfarhaan8171@gmail.com

The National Education Policy 2020 mandates a shift toward multidisciplinary learning and digital integration across higher education in India. Traditional pharmaceutical programs face challenges in rapidly adopting these modern technological competencies. This presentation examines how student-driven digital ecosystems can bridge this educational gap. The primary objective is to evaluate the impact of the ptpic.tech platform, developed by the Pharmacy Tech and Pharmacy Innovation Club, in enhancing digital literacy and technical skills among pharmacy students. The methodology involved designing and deploying this dedicated web platform to serve as an interactive hub for academic resources, digital workflow automation, and collaborative project management. Observational outcomes indicate that students actively engaging with the platform developed a stronger ability to blend pharmaceutical sciences with practical technical tools, including web development and artificial intelligence applications. The platform successfully established a localized digital community that encourages peer collaboration and active skill building. These findings suggest that integrating specialized digital platforms into extracurricular student frameworks directly supports the holistic, skill-oriented vision of the National Education Policy. Cultivating these technical environments equips the next generation of pharmacy professionals with the advanced technological acumen required for modern healthcare innovation.

Keywords: *National Education Policy 2020, Pharmacy Education; Digital Literacy, Student-Driven Learning, ptpic.tech, Artificial Intelligence.*

P-11/N/004 POSTER · ONLINE

Revolutionizing Thalassemia: From Supportive Care to Precision and Curative Therapies Emerging Advances in Diagnosis and Management

Arshdeep Singh[1]*

[1]*ISF College of Pharmacy, Moga, Punjab, India-142001*
Email: arsharora0007@gmail.com

Introduction: Thalassemia is an inherited haemoglobin disorder caused by reduced or absent synthesis of alpha- or beta-globin chains, resulting in ineffective erythropoiesis, chronic haemolytic anaemia, iron overload, and multisystem complications. Despite major improvements in supportive care, severe forms may require lifelong treatment.

Aim and Objectives: This review aims to summarize recent advances in the diagnosis and management of thalassemia, with emphasis on disease-modifying and potentially curative therapies, while highlighting their clinical significance and current limitations.

Methods: Recent clinical guidance, regulatory information, and peer-reviewed literature on thalassemia screening, transfusion therapy, iron chelation, luspatercept, hematopoietic stem-cell transplantation, and gene-based therapies were reviewed and synthesized.

Results: Regular red-cell transfusion with individualized targets remains essential for transfusion-dependent thalassemia, while iron chelation with deferasirox, deferiprone, or deferoxamine reduces iron-related organ damage. MRI-based assessment has improved monitoring of hepatic and cardiac iron overload. Luspatercept can reduce transfusion burden in selected patients with beta-thalassemia. Allogeneic hematopoietic stem-cell transplantation remains an established curative option for eligible patients. Gene-based therapies have transformed treatment: beta beglogene autotemcel provides lentiviral gene addition, while exagamglogene autotemcel uses CRISPR-Cas9 gene editing to increase fatal haemoglobin in eligible patients with transfusion-dependent beta-thalassemia.

Summary: Thalassemia management is shifting from lifelong supportive care toward individualized, disease-modifying, and potentially curative approaches.

Conclusion: Early diagnosis, carrier screening, optimized transfusion and chelation, transplantation, and responsible integration of gene therapy can substantially improve survival and quality of life. However, cost, specialized infrastructure, long-term safety monitoring, and equitable access remain major challenges.

Keywords: *Thalassemia; Beta-thalassemia; Iron chelation; Stem-cell transplantation; Gene therapy; CRISPR-Cas9; Precision medicine.*

P-11/N/006 POSTER · ONLINE

Beyond AI Answers: An Error-Detection and Critical-Appraisal Framework for Competency-Based Pharmaceutical Education under NEP-2020

Komal*, Amandeep Singh

Department of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, 142001, India
Email: Komal@isfcp.org

Introduction: As AI becomes more deeply embedded in the field of pharmaceutical education, it leads to several possibilities for personalized learning, instant access to information and academic assistance. The risks, however, include that AI-generated responses might be inaccurate, incomplete or have outdated information and or inappropriate recommendations, which means readers need to carefully examine and consider responses instead of blindly accepting them. With the implementation of competency-based education under the NEP-2020, it is not enough for pharmaceutical learners to only acquire knowledge, they need to develop their critical thinking, problem-solving and scientific reasoning skills as well as ability to validate information. Hence, an error detection and critical appraisal approach can be employed as a tool to facilitate responsible and effective use of AI in pharmacy education.

Aim & Objectives: To establish a structured approach for recognizing, assessing and critically evaluating errors in AI generated pharmaceutical information with a focus on building competence, scientific reasoning and responsible use of AI in learning in the context of NEP-2020.

Methods: Relevant literature on the Artificial Intelligence in education, competency-based pharmaceutical education, AI-generated misinformation, critical appraisal, scientific reasoning and NEP-2020 educational principles were reviewed. A set of the possible types of AI generated mistakes was recognized, such as factual errors, conceptual errors, numerical errors, citation errors, pharmacological and clinical errors. A systematic approach with an AI generated response, error identification, source verification, evidence comparison and reflective evaluation was suggested.

Results: The suggested framework guides students to think critically about AI-generated answers, methodically flagging possible inaccuracies, cross-referencing with trusted medical or drug information sources, and assessing scientific soundness. Embedding error-detection exercises, source verification, case-based learning, and reflective assessment can enhance skills in critical thinking, evidence-based reasoning, information literacy and responsible usage of AI. The framework can also help teachers create competency-based assessments that test the student's knowledge of identifying and explaining corrections instead of just copying content generated by the AI.

Conclusion: An error-detection and critical-appraisal model can be used alongside AI in pharmaceutical teaching, bringing the learner from being a passive receiver of information to an active assessor of information. It may facilitate scientific reasoning, evidence-based decision-making and responsible use of AI through its integration with the competency-based education system under NEP-2020. More importantly, standardized assessment tools and faculty training and validation across the pharmaceutical education environments must be developed to ensure its wider educational applicability.

Keywords: *Artificial Intelligence, NEP-2020, Competency-Based Education, Pharmaceutical Education, Critical Appraisal, AI Literacy*

P-11/N/007 POSTER · ONLINE

Bridging the Gap Between Pharmaceutical Education and Industry: A NEP 2020 Perspective

Ayush Kumar[1*], Romanpreet Kaur[1]

[1]Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: 2315712@isfcp.org , romanpreetkaur@isfcp.org

Introduction: Pharmaceutical education plays and important role in preparing students for their future careers in the pharmaceutical industry. However, the industry is changing rapidly and now requires students to have practical knowledge along with technical, digital, communication and problem-solving skills. These skills may not always be developed through regular classroom teaching. NEP 2020 focuses on practical, multidisciplinary, skill based and outcome based education, which can help in improving the connection between pharmaceutical education and industry.

Methodology: This study was carried out using published research papers, policy documents and other educational resources related to NEP 2020 and pharmaceutical education. Information related to competency based learning, practical learning, internships and interaction between academic institutions and pharmaceutical industries was studied. the major challenges faced by the pharmacy students in becoming industry ready and the possible ways to overcome them were also discussed.

Result: The review found that the pharmacy students may have limited practical knowledge and insufficient interaction with the pharmaceutical industry. There are also changes in technology and certain gaps in the skills required for employment. NEP 2020 can help address these issues by promoting better industrial internships, practical and experimental learning, industry participation and curriculum development, and digital learning.

Summary and conclusion: Bridging the gap between the pharmaceutical education and industry needs efforts from colleges, pharmaceutical companies and regulatory bodies. Giving students more practical exposures, knowledge of new technologies, professional skills and competency based learning can help them understand the actual requirements of the industry. These approaches can help pharmacy students become more skilled, confident and prepared for their future careers.

Keywords: *NEP-2020; Pharmaceutical education; industry – academia collaboration; experimental learning ; competency- based education; pharmacy graduates.*

P-11/N/008 POSTER · ONLINE

Development of Gel Incorporated with Synthesized Silver Nanoparticle form extract of flowers with Antiaging Potential. Ridge Gourd (*Luffa Actuagula*) and Pumpkin (*Cucurbita Maxima*)

Mr.Ram Naresh Yadav

Ph.D Research Scholar IES University Bhopal
Email: ramnareshyadavkips2020@gmail.com

Skin gaining is a complex biological process driven by both intrinsic genetic timelines and extrinsic environmental factors, most notably ultraviolet (UV) radiation-induced oxidative stress. Conventional Chemical-based anti-aging formulations often present significant challenges, including skin irritation, lack of long-term stability, and chemical toxicity. To overcome the5se ,limitations, this study aimed to develop safe, effective, and environmentally friendly topical herbal nano-gels. The primary objectives focused on the green synthesis of silver nanoparticle (AgNPs) from bioactive floral extracts of ridge gourd and pumpkin, integrating them into a hydrogel matrix, and thoroughly evaluating their physicochemical properties, antioxidant efficiency, in vitro anti-aging cytoprotective potential, and accelerated stability.

Fresh flowers of ridge gourd and pumpkin were collected from authenticated agricultural sources at IES University, Bhopal, cleaned, shade-dried, and pulverized. Extraction was comprehensively executed using organic (methanol, ethanol) and aqueous solvents via the Soxhlet Extraction method. Preliminary phytochemical Screening, Total Phenolic Content (TPC), and Total Flavonoid Content (TFC) assays were Conducted.

This study successfully validates the formulation of an innovative, naturally derived nanocosmeceutical gel framework. The green-synthesized silver nanoparticles exhibit highly potent synergistic antioxidant and cytoprotective capabilities capable of preconditioning and protecting human dermal fibroblasts from extensive photoaging-related matrix stress. Free from hazardous chemical Residues and dermatological irritants, these hydrogels offer a powerful, sustainable, and highly biocompatible alternative for modern anti-aging clinical care and cosmetic dermatology.

Keywords: *Anti-aging, Luffa acutangula, Cucurbita maxiama, Green Synthesis, Silver Nanoparticles (AgNPs), Herbal Hydrogel, Cytoprotection, Dermal Fibroblasts.*

P-11/N/009 POSTER · ONLINE

FROM CREDITS TO CAPABILITIES: A Comparative Analysis of the Earlier and 2026 NEP 2020-Aligned PCI B.Pharm Curricula

Vishal Dey[1]*, Mohammad Azahruddin[2]

[1]Department of Pharmaceutical Science, ISF College of Pharmacy and Research, Rattian road, Ghal kalan, moga, Punjab
[2]Department of Pharmacy, ISF College of Pharmacy and Research, Rattian road, Ghal kalan, moga, Punjab
Email: vishaldeysoume@gmail.com

Introduction: Pharmacy education is changing with advances in artificial intelligence (AI), digital technologies, pharmaceutical research and practice. Pharmacy Council of India (PCI) B. Pharm curriculum as per NEP 2020 for 2026 is more on emerging technologies, research involvement and professional learning.Comparison of the revised curriculum with the previous syllabus and the feedback from the stakeholders may help in identifying the opportunities and challenges of these educational changes.

Purpose and Objective: Comparison between the previous NEP and 2026 NEP PCI as per B. Pharm curricula and assess students and faculty perceptions of curriculum relevance, practical skills development, implementation challenges and potential changes.

Methods: A document-based comparative analysis will be conducted using the earlier and revised PCI B.Pharm syllabus documents. The comparison will focus on subject structure, AI and digital learning, research projects, internships, innovation and professional competencies. In addition, a structured Google Forms questionnaire will be administered to B.Pharm students and pharmacy faculty. Responses will be analysed using descriptive statistics, charts and thematic categorisation of open-ended suggestions to identify common concerns and differences between the two groups.

Result: The study is expected to identify major changes in curriculum structure and emerging skill-based learning, alongside stakeholder perceptions of the revised syllabus. Survey results can highlight priority areas such as practical AI training, faculty development, research support, digital infrastructure, and industry exposure.Moreover, differences in the views of students and faculty may identify aspects that need more attention in the implementation of the curricula.

Summary: The integration of syllabus comparison and stakeholders' feedback may offer a broader insight into curriculum reform.The approach connects the formal educational provisions with the perceived needs of students and teachers, which helps to identify practical opportunities for strengthening pharmacy education.

Conclusion: The comparative study aims to examine how the revised B. Pharm curriculum may support the development of future-ready pharmacy graduates. Stakeholder feedback, together with document-based analysis, can inform recommendations for effective implementation, improved practical learning and stronger integration of pharmaceutical knowledge with emerging technologies. Further evaluation of actual student competencies will be necessary to determine the educational impact of these changes.

Keywords: *B.Pharm curriculum, NEP 2020, artificial intelligence, curriculum reform, stakeholder feedback, pharmacy education.*

P-11/N/010 POSTER · ONLINE

Clinical Pharmacy under NEP 2020: A Shift Towards Patient -Centric and Practice-Oriented Education

Arun Kanti Samanta[1], Romanpreet Kaur[1], Dr.Sourav Kosey[1]

Department Of Pharmacy Practice, ISF College Of Pharmacy, Moga-142001, Punjab, India
Email: 2439579@isfcp.org

Introduction: The National Education Policy (NEP) 2020 has put emphasis on multidisciplinary, skill based, experiential and research-oriented education. In clinical pharmacy these reforms enhance a shift from theory-based education to patient-centred education, training, and evidence-based practice. This study aims to discuss the role of NEP 2020 in the future of clinical pharmacy education and training of future pharmacists in meeting the future challenges in the healthcare sector.

Methodology: Thematic literature reviews were carried out from the documents available at NEP 2020, Pharmacy Council of India (PCC) guidelines, academic sources, government reports, and published literature in recent years. Focusing on curriculum development, clinical skills, experiential learning, use of technology, research, and multidisciplinary education and industry–academy collaborations, the processes were examined and contrasted with traditional methods of pharmacy education.

Results: The review suggests that NEP 2020 encourages a patient-centric approach to learning, skill-based learning, training in hospitals, communication and counselling skills, formation of multidisciplinary teams, and teaching through research. Embedding digital learning, the use of e-health technologies, simulation and flexible curricula can further support practical skills. Professional development and innovation may be available through other means, such as industry–academic cooperation and entrepreneurship education.

Summery and Conclusion: The NEP 2020 is a blue print for shifting the focus of clinical pharmacy education from theoretical education to skill based and practice oriented and patient centric approach. If implemented effectively, this will enhance clinical skills, research work, technological skills and collaboration of healthcare professionals, which will in turn help build competent pharmacists for contemporary healthcare practice.

Keywords: *NEP 2020; Clinical Pharmacy; Patient-Centric care; Skill-Based Education; Experimental Learning; Pharmacy Education*

P-11/N/011 POSTER · ONLINE

From Critical Thinking to Innovation: Integrating Research-Based Experiential Learning under NEP-2020

Romanpreet Kaur[1], Shamsher Singh[1]

[1]Neuropharmacology Division, Department of Pharmacology, ISF College of Pharmacy, Moga-142001, Punjab, India
Email: romanpreetkaur@isfcp.org

Introduction: The National Education Policy (NEP) 2020 emphasizes experiential learning, critical thinking, problem-solving and multidisciplinary education. Integrating authentic research into teaching may help translate these educational priorities into meaningful learning experiences. This abstract proposes a research-based experiential-learning framework using an arbutin-mediated zebrafish traumatic brain injury (TBI) study as a case example.

Methodology: A proposed four-stage learning framework includes Engage, Explore, Explain, and Create and Reflect. This was developed conceptually around the research case. Suggested student activities include formulating research questions, examining experimental design and controls, interpreting verified findings, identifying limitations, and proposing follow-up investigations. The framework connects research-based activities with critical thinking, evidence-based reasoning, collaboration and scientific communication.

Results: The proposed framework outlines a structured approach for incorporating authentic research into pharmaceutical education. It provides opportunities to connect scientific inquiry with problem-solving and innovation. However, the framework has not yet been implemented or evaluated with students; therefore, educational effectiveness and learning outcomes remain to be established.

Summary and Conclusion: The proposed framework offers a potential approach for translating NEP-2020 principles into practice through research-based experiential learning. A future pilot study with structured assessment is required to evaluate its impact on student competencies.

Keywords: *NEP-2020; Experiential Learning; Critical Thinking; Educational Innovation; Research-Based Learning; Pharmaceutical Education*

SAHYADRI ENTERPRISES

ONE STOP SOLUTION FOR ALL LAB NEEDS

From routine laboratory essentials to advanced research equipment- Sahyadri Enterprises brings complete laboratory solutions under one roof.





Laboratory Equipment | Glassware | Chemicals | Consumables | Turnkey Projects

OUR LABORATORY SOLUTIONS

LAB EQUIPMENT
- Temperature-controlled equipment
- Mixing and sample preparation
- Sterilization & clean environment
- Refrigeration
- Centrifugation
- Optical/analytical instruments
- Molecular biology

LAB GLASSWARE
- Borosilicate Glassware
- Laboratory Glass Apparatus
- Customized Glassware

LABORATORY CHEMICALS
- Molecular Biology & Microbiology
- Analytical Grade
- Buffers & Reagents
- Biochemistry & Enzymes

RESEARCH & LIFE SCIENCE
- Molecular Biology
- Microbiology
- Cell Culture
- Biotechnology & Research Applications

CUSTOMIZED LAB SOLUTIONS
- Laboratory Setup
- Equipment Selection
- Application-Based Solutions
- Ongoing Support

AUTHORIZED DISTRIBUTOR / CHANNEL PARTNER FOR LEADING BRANDS

METTLER TOLEDO · iGENE LABSERVE Innovative • Interactive • Intuitive · thermolab group · LABINDIA INSTRUMENTS AIMING FOR THE BEST · Tempo Controlled Temperature Solution · AND MANY MORE TRUSTED BRANDS



MEET US AT THE CONFERENCE

Visit our stall to explore:
- Latest Laboratory Technologies
- Scientific Equipment Solutions
- Laboratory Glassware & Chemicals
- Research & Biotechnology Solutions
- Application-Based Laboratory Solutions

SOLUTIONS FOR
- Microbiology
- Biotechnology
- Molecular Biology
- Pharmaceutical Research
- Clinical Laboratories
- Academic & Research Institutions

LOOKING TO SET UP, UPGRADE OR EXPAND YOUR LAB?
- Talk to Sahyadri Enterprises for the right solution.

+91 96898 04094
sahyadrienterprises786@gmail.com
25, IT Park, Ahilyanagar, Maharashtra

CATEGORY 12 | 46 ABSTRACTS

AI-integrated Innovations, Bio-Medical Devices & Startups

MCE®
MedChemExpress

MedChemExpress Exhibition!



Stop by Our Booth for Special Giveaways!

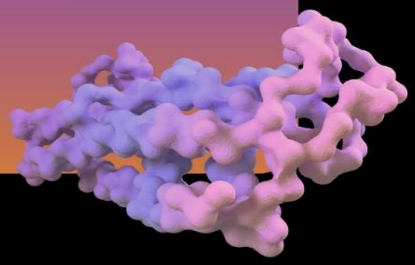
How Can We Accelerate Your Research?

- **150,000+** High Purity Inhibitors & Agnoist
- **60,000+** High Activity Biological Macromolecules
- MCE One-stop Drug Screening Platform
- **400+** High Efficiency Biological Kits
- **Custom Service:** ADC / PROTAC / Peptide / Oligonucleotide / Antibody / Protein / Fluorescent Dye / Small Molecules, etc.

FREE

Free Samples of Recombinant Proteins

- Choose up to **5 free samples** to tailor your research needs
- Superior Bioactivity
- Specificity Guaranteed
- GMP-grade and Animal-free Proteins Available
- High Purity & Low Endotoxin



Scan to Visit our Website and Social Media

MCE Website | MCE Facebook | MCE Linkedin

Master of Bioactive Molecules

www.MedChemExpress.com

O-12/F/004 ORAL · OFFLINE

Artificial Intelligence and Robotic Automation in Modern Drug Discovery: High-Throughput Screening, Automated Synthesis, and Future Perspectives

Aditi sharma

University Institute Of Pharmaceutical Sciences And Research, Faridkot
Email: aditisharma811999@gmail.com

Traditional early-stage drug discovery is severely constrained by prolonged timelines, high candidate attrition, and escalating financial costs associated with manual, labour-intensive workflows. The integration of artificial intelligence (AI) and robotic laboratory automation is revolutionising this domain by enabling closed-loop, data-driven experimental ecosystems. This systematic review evaluates key advances across automated high-throughput screening (HTS), AI-guided assay design, automated parallel and multi-step synthesis, and connected infrastructures such as cloud robotics, Internet of Things (IoT) sensors, and digital twins. By coupling predictive machine-learning architectures—including convolutional, graph, and transformer neural networks—with modular robotic liquid handlers and flow reactors, modern laboratories can autonomously forecast bioactivity, prioritize candidate libraries, and dynamically optimise synthetic reaction parameters. Empirical findings across academic and industrial implementations demonstrate that AI-integrated workflows reduce primary screening timelines by 30% to 50%, lower experimental costs by 20% to 30%, and markedly improve assay reproducibility and hit-to-lead transitions. Furthermore, collaborative robotics (cobots) and human-in-the-loop paradigms allow routine tasks to be automated without eliminating essential human scientific judgment. Although practical challenges remain in synthetic accessibility, model interpretability ("black-box" limitations), data heterogeneity, and regulatory validation, the shift toward self-learning, autonomous laboratories provides an agile and cost-effective foundation for next-generation therapeutic discovery.

P-12/F/001 POSTER · OFFLINE

Cyclodextrin-Based Smart Biomedical Devices: From Drug-Eluting Wound Dressings to Startup-Ready Therapeutic Platforms

Simranpreet Kaur[1]*

[1]*ISF College of Pharmacy and Research, Moga, Punjab, India-142001*
Email: simranpreet.kaur.240732417@gmail.com

Introduction: Cyclodextrins (CDs) are cyclic oligosaccharides with a hydrophilic exterior and hydrophobic cavity that can form inclusion complexes with suitable drug molecules. Their molecular recognition properties provide an opportunity to integrate drug delivery with biomedical-device design. Aim & Objectives: To develop a translational concept for cyclodextrin-based smart biomedical devices, focusing on a drug-eluting wound dressing and its potential startup application. Methods: Relevant literature on CD-based drug delivery, hydrogels, wound dressings and biomedical devices was reviewed to identify functional advantages, design principles and translational challenges. A conceptual CD-Smart Patch platform was formulated by integrating a CD–drug inclusion system with a biocompatible hydrogel matrix. Results: Literature evidence indicates that CD-containing hydrogels can enhance drug incorporation and provide opportunities for localized and controlled release, while hydrogel matrices can maintain a hydrated wound environment. CD-functionalized materials have also demonstrated potential in drug-eluting biomedical applications. The proposed CD-Smart Patch combines these functions into a single therapeutic-device concept with potential antimicrobial, anti-inflammatory and wound-management applications. Summary: Cyclodextrin technology can serve as a molecular bridge between pharmaceutical drug delivery and biomedical-device engineering, while a modular formulation may support future product development. Conclusion: CD-based smart wound dressings represent a promising translational platform, but optimization of drug–CD compatibility, release kinetics, biocompatibility, sterilization, scalability, regulatory requirements and clinical validation is essential before commercialization.

Keywords: *Cyclodextrins, Smart Devices, Wound Dressings, Drug Delivery, Hydrogels, Startups.*

P-12/F/002 POSTER · OFFLINE

MedCell AI: A Smart Blister-Pack System for Unit-Level Tablet Identification and Traceability

Ankit Subhash Walwale*[1]

[1]*Department of Quality Assurance, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan -142001, Moga, Punjab, India*
Email: walwaleankit22@gmail.com

Cutting pharmaceutical blister strips into smaller segments is a common practice during dispensing and medication use; however, segmentation may separate important information such as drug name, strength, batch number, expiry date and storage instructions from the remaining tablets, increasing the risk of medication errors and unidentified medicine use. MedCell AI is proposed as a smart blister-pack system designed to provide unit-level identification and traceability of medicines even after blister-strip segmentation. The proposed system incorporates an individually scannable 2D Data Matrix code for each tablet cavity, enabling a smartphone application to retrieve essential information including generic name, strength, dosage form, batch number, expiry date, manufacturer and storage conditions. An artificial intelligence-assisted module is proposed to compare tablet characteristics such as colour, shape and imprint with the registered product profile. The system can additionally provide batch-recall alerts, identify potential duplicate active ingredients among scanned medicines, maintain an optional personal medication history and generate medication reminders. In cases involving uncertain identification, potential mismatch, expiry or safety concerns, the system can recommend verification by a pharmacist. Thus, MedCell AI represents a patient-oriented approach to extending pharmaceutical traceability from conventional pack-level identification to individual blister-cavity-level identification, with potential applications in medication safety, patient counselling, recall awareness and continuity of medication information.

Keywords: *Blister pack, Tablet identification, Traceability, Data Matrix, Artificial Intelligence, Medication Safety.*

P-12/F/003 POSTER · OFFLINE

AI-Controlled Closed-Loop Neuroprotective Cooling Patch for Personalised Management of Chemotherapy-Induced Peripheral Neuropathy

Isha Bajpai[1]*

1.School of Pharmaceutical Sciences, Jaipur National University, Jaipur, Rajasthan, India
Email: ishabajpai16@gmail.com

Chemotherapy-induced peripheral neuropathy (CIPN) is a frequent issue among patients who are given neurotoxic anti-cancer drugs such as the taxanes and platinum-based agents; it may result in symptoms including numbness, tingling, a burning sensation and pain in the hands and feet. Cooling of the extremities has been investigated as a means of reducing blood flow and decreasing the amount of chemotherapy to which the peripheral tissues are exposed. TO create a concept for a cooling patch that is controlled by artificial intelligence (AI), which monitors the patient's peripheral response and then adjusts the cooling based on this response to help reduce nerve damage caused by chemotherapy. The patch that has been proposed will have skin-temperature and peripheral-perfusion sensors linked to a controlled cooling system. The data gathered will be processed by an AI-based controller, which will either increase, decrease or temporarily halt the cooling, all while keeping within the safety limits, according to the patient's temperature and perfusion response. The device suggested is likely to offer a more controlled and tailored form of cooling compared to conventional methods which involve a fixed temperature. It might also help in preventing excessive cooling and the decrease in peripheral blood flow that could lead to discomfort or tissue injury. It is a wearable system that incorporates real-time sensing, AI-driven decision-making, and controlled cooling. Conclusively, this approach has the potential to offer a personalized way of reducing the risk of CIPN.

Keywords: *Artificial intelligence; CIPN; Neuroprotection; wearable technology; closed-loop system; therapeutic cooling.*

P-12/F/004 POSTER · OFFLINE

Transforming Perinatal Health with AI-Predictive Models in Precision and Digital Innovations for Maternal and Fetal Well-Being: A Systematic Review

Tanishk Wadhawan[1], Shubham Thakur*

[1]Department of Pharmaceutics, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India
Email: tanishkwadhawan@gmail.com

High-risk pregnancies affect nearly 20 million women worldwide and remain a leading cause of maternal and fetal morbidity and mortality. Artificial intelligence (AI) and wearable biomedical devices offer new opportunities for early detection, personalized care, and continuous surveillance of high-risk pregnancies (HRPs). This review aimed to evaluate the effectiveness, safety, and implementation of AI-driven predictive models and wearable digital innovations in improving maternal and fetal outcomes, and to highlight associated regulatory and ethical challenges. PubMed, Scopus, Embase, and Web of Science were searched for studies published between 2015 and 2024; risk of bias and study quality were assessed using PROBAST+AI and TRIPOD+AI, and findings were synthesized narratively. Sixteen studies met inclusion criteria, employing machine-learning models (Decision Tree, Random Forest, ensemble methods) for maternal risk prediction, deep learning (CNNs) for fetal monitoring, and wearable sensors for remote tracking. Deep learning and hybrid models achieved the highest predictive performance (AUC > 0.95), while traditional models such as Decision Tree and Random Forest remained dependable but less accurate; pooled AUCs were 0.77 for deep learning and 0.88 for machine-learning studies. Despite the resultant accuracy in early detection and risk stratification, dataset bias, limited generalizability, and unresolved ethical and regulatory concerns persist. AI and wearable technologies show substantial promise for transforming HRP management by enabling proactive, personalized care, but realizing this potential requires new regulatory frameworks, improved data quality and equity, and validation across diverse populations.

Keywords: *Artificial intelligence; High-risk pregnancy; Maternal health; Fetal health; Wearable devices; Digital health.*

P-12/F/018 POSTER · OFFLINE

Role of Artificial Intelligence in mRNA Vaccine Development

Ravi kant

Department of Regulatory Affairs, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan- 142001, Moga, Punjab, India
Email: kantr1224@gmail.com

Introduction: Artificial Intelligence (AI) is transforming healthcare and drug research by enabling rapid analysis of complex biological information. Messenger RNA (mRNA) vaccines are a major advancement in immunization, providing genetic instructions that enable cells to produce specific viral antigens and stimulate protective immune responses.

Aim & Objectives: To explore the role of AI in mRNA vaccine development and its potential to improve vaccine design and development.

Methods: A review of the provided scientific content was undertaken to examine AI applications in antigen identification, protein structure prediction, mRNA sequence optimization, and analysis of research and clinical data.

Results: AI-based models can analyze viral genetic information, identify potential antigen targets, predict protein structures, and optimize mRNA sequences for improved stability and translation. AI also supports analysis of large datasets, potentially making vaccine development faster and more precise. The COVID-19 mRNA vaccines developed by Pfizer-BioNTech and Moderna demonstrated the potential of this technology for rapid vaccine development.

Summary: Combining AI with mRNA technology offers a promising approach to accelerate vaccine development.

Conclusion: AI-assisted mRNA vaccine development may improve the speed and precision of vaccine design and contribute to preparedness against emerging infectious diseases.

Keywords: *Artificial Intelligence, Messenger RNA, mRNA Vaccine, Machine Learning, Vaccine Development, Lipid Nanoparticles, Bioinformatics*

P-12/F/019 POSTER · OFFLINE

Latest Techniques and Models Used in Robotic Technology in the Field of Surgery

Kajal Gupta, Dr. Vijay Nigam, Mr. Bhan Singh Yadav

Daksh Institute Of Pharmaceutical Sciences, Chhatarpur, (M.P.), Pin: 471001, India
Email: kg200724@gmail.com

The field of surgery is entering a time of great change, spurred on by remarkable recent advances in surgical and computer technology. Only recently have robotic systems made their way into the operating room as dexterity-enhancing surgical assistants and surgical planners, in answer to surgeons' demands for ways overcome the surgical limitations of minimally invasive laparoscopic surgery. The first generation of surgical robots is already being installed in a number of operating rooms around the world. These aren't true autonomous robots, but they are lending a mechanical helping hand to surgeons. Remote control and voice activation are the methods by which these surgical robots are controlled. Robotics is being introduced to medicine because they allow for unprecedented control and precision of surgical instruments in minimally invasive procedures. The ultimate goal of the robotic surgery field is to design a robot that can be used to perform closed-chest, beating-heart surgery. Robots in the field of surgery have dramatically changed the procedures for the better. The most significant advantage to Robotic Surgery to the patient is the decrease in pain and scaring. The smallness of the incisions also causes many other advantages that make Robotic Surgery worth the risk. Besides the obvious rewards to the patient, Robotic Surgery is also very advantageous to the surgeon and hospital

Keywords: *Robots, surgery field, closed-chest, beating-heart surgery, Robotic Surgery, dexterity-enhancing.*

P-12/F/020 POSTER · OFFLINE

Eko CORE 500: Transforming the Traditional Stethoscope with AI-Assisted Cardiac Screening

Talha Aziz*

Department of Pharmacy Practice (Pharm D), ISF College of Pharmacy, Moga-142001 (Punjab), India
Email: talhaaziz404@gmail.com

Standard stethoscope examination is dependent on clinician experience and listening conditions, which often leads to underdetection of cardiovascular disease in primary care. Eko CORE 500 is an AI-enabled digital stethoscope to improve routine cardiac assessment. It digitally captures heart and lung sounds, amplifies and filters the audio to improve quality and connects to a mobile app where you can record and review. The compatible Eko AI software looks at heart-sound and ECG signals to highlight patterns that may be associated with structural murmurs, atrial fibrillation and reduced pumping function of the heart. The instrument maintains the accustomed workflow of the stethoscope, but adds objective signal recording, digital files, and quick decision support. Eko CORE 500 shows how artificial intelligence can enhance, not replace, clinical judgement, allowing earlier referral, better screening consistency and more accessible cardiovascular assessment.

Keywords: *Artificial intelligence; Atrial fibrillation; Cardiovascular screening; Digital stethoscope; Digital health; Heart murmur.*

P-12/F/021 POSTER · OFFLINE

Fewer Injection, Smarter Start: A Predictive Toolkit For Analytical Method Development

Harsh Bhikhubhai Vasani* ,Krunal H. Solanki[1] Dr. Dimal A. Shah[2]

Indukaka Ipcowala College of Pharmacy, The Charutar Vidya Mandal (CVM) University, New V.V. Nagar, Anand, Gujarat, India-388121
Email: harshbvasani@40gmail.com

Introduction: Analytical method development often involves repeated trial-and-error experiments, leading to unnecessary trials and solvent consumption, time and development efforts.

Aim & Objective: To develop a practical predictive toolkit that guides technique selection, estimates suitable chromatographic starting conditions, and minimizes unnecessary experimental trials.

Method: The toolkit combines rule-based technique selection with physicochemical-property-driven prediction for single and multi-component drugs. Molecular descriptors such as molecular weight, LogP, TPSA, hydrogen-bonding features, aromaticity, rotatable bonds, and pKa are used to identify relevant reference compounds and generate initial HPLC conditions. Retention, column efficiency, resolution, and HPTLC optimization concepts further refine the proposed conditions and scouting strategy.

Results: The toolkit provides ranked analytical techniques, suggested mobile-phase composition and pH ranges, stationary-phase selection, retention and resolution estimates, and focused scouting plans. For combinations, it highlights the most challenging analyte pair to prioritize experimental optimization.

Conclusion: The developed toolkit introduces a "Fewer Injection, Smarter Start: A Predictive Toolkit for Analytical Method Development" approach to analytical method development. By converting readily available molecular information into experimentally testable conditions, it has the potential to reduce unnecessary injections, solvent use, instrument time, and development effort. The toolkit serves as a decision-support and hypothesis-generation tool, with experimental verification remaining essential.

Keywords: *Analytical method development; Predictive toolkit; Chromatographic optimization; Physicochemical descriptors; Method scouting; Data-driven development.*

P-12/F/022 POSTER · OFFLINE

Cyclodextrin-Enabled Delivery of Plant Bioactives: From Inclusion Complexes to Advanced Pharmaceutical and Biomedical Systems

Anmol Sah

ISF College of Pharmacy, Moga – 142001, Punjab, India
Email: anmolshah2310@gmail.com

Introduction: Plant-derived bioactive compounds such as curcumin, quercetin, resveratrol, berberine, and catechins are known for their wide range of pharmacological activities. However, their practical use in pharmaceutical formulations is often challenging because of poor water solubility, instability, rapid degradation, and low bioavailability. Cyclodextrins (CDs) can overcome some of these limitations by forming inclusion complexes with suitable bioactive molecules and improving their formulation properties.

Aim & Objectives: The study aims to develop a cyclodextrin-based delivery approach to improve the solubility, stability, bioavailability, and controlled release of selected plant bioactives, while exploring their potential use in modern pharmaceutical and biomedical delivery systems.

Methods: Selected plant bioactives will be complexed with α-, β-, or γ-cyclodextrin and their suitable derivatives using techniques such as kneading, co-precipitation, and freeze-drying. The resulting complexes will be assessed for solubility, stability, complexation efficiency, and in-vitro drug-release behaviour. Selected formulations may further be incorporated into transdermal patches, microneedles, nanocarriers, and biosensor-based delivery systems.

Results: The proposed cyclodextrin complexes are expected to improve the aqueous solubility and stability of plant bioactives and provide more controlled drug release. Their incorporation into biomedical devices may also support localized and sustained delivery, potentially improving their therapeutic utilization.

Summary: Cyclodextrin-based inclusion complexation offers a practical formulation strategy for addressing important delivery limitations associated with plant-derived bioactive compounds.

Conclusion: This approach may support the development of more stable, effective, and controlled plant-bioactive formulations for pharmaceutical and biomedical applications. Further physicochemical, pharmacological, biocompatibility, and in-vivo studies will be necessary to confirm their therapeutic potential.

Keywords: *Cyclodextrins, Plant bioactives, Inclusion complex, Drug delivery, Controlled release, Biomedical devices*

P-12/F/023 POSTER · OFFLINE

AI-Assisted Molecular Docking and Molecular Dynamics Interpretation of Pyrazolopyrimidine–Cyclodextrin Interactions

Vaibhav Chopra[1], Karan Kumar[1], Sahil Mehta[1], Lovish Sharma[1]

[1]*Chitkara School of Pharmacy, Chitkara University, Himachal Pradesh*

Email: chopravaibhav10@gmail.com

Background: Pyrazolopyrimidine derivatives are nitrogen-containing heterocyclic compounds with diverse pharmacological properties and potential applications in medicinal chemistry. Cyclodextrins can form inclusion complexes with suitable guest molecules through non-covalent interactions, potentially influencing their stability and molecular behaviour.

Objective: This study aimed to investigate the molecular recognition, binding orientation and dynamic stability of a pyrazolopyrimidine derivative within a cyclodextrin cavity using molecular docking, molecular dynamics (MD) simulations and artificial intelligence (AI)-assisted interpretation.

Methods: Molecular docking was performed to predict the preferred orientation of the pyrazolopyrimidine derivative within the cyclodextrin cavity. The resulting complex was analysed for hydrogen bonding, hydrophobic contacts and other non-covalent interactions. The predicted inclusion complex was subsequently subjected to MD simulations to evaluate structural stability, conformational behaviour and persistence of host–guest interactions. Trajectory-derived parameters were further interpreted using an AI-assisted computational approach to identify interaction patterns associated with complex stability.

Results: Docking analysis indicated a favourable orientation of the pyrazolopyrimidine derivative within the cyclodextrin cavity, supported by complementary non-covalent interactions. MD simulations provided insights into the stability and conformational behaviour of the inclusion complex under dynamic conditions. AI-assisted interpretation facilitated the identification of interaction patterns and molecular features contributing to host–guest recognition.

Conclusion: The integrated docking, MD and AI-assisted approach provided a computational framework for understanding pyrazolopyrimidine–cyclodextrin interactions. This strategy may support the rational evaluation of cyclodextrins as molecular hosts and contribute to computationally guided inclusion-complex and drug-delivery development.

Keywords: *Pyrazolopyrimidine; Cyclodextrin; Molecular Docking; Molecular Dynamics; Artificial Intelligence; Inclusion Complex.*

P-12/F/024 POSTER · OFFLINE

Beyond the Cyclodextrin Cavity: Engineering Advanced Architectures for Solubilization and Drug Delivery

Surinder*

Department of Pharmaceutical Chemistry, ISF college of Pharmacy (an Autonomous College), GT Road, Ghal Kalan, 142001,Moga,Punjab,India

Email: surinder200517@gmail.com

Cyclodextrins (CDs) are cyclic oligosaccharides composed of glucopyranose units that can form host–guest inclusion complexes with lipophilic molecules. Their ability to enhance the aqueous solubility of poorly water-soluble drugs can be exploited to improve drug entrapment within the aqueous compartments of liposomes. Liposomes are phospholipid vesicles consisting of lipid bilayers that enclose one or more aqueous compartments and are widely investigated as safe and effective delivery systems for both hydrophilic and lipophilic drugs. However, lipophilic drugs incorporated into the lipid bilayer may undergo rapid release, potentially limiting drug retention and therapeutic effectiveness. Combining cyclodextrin complexation with liposomal encapsulation offers a strategy to overcome the limitations associated with each individual delivery system. In this approach, a CD/drug inclusion complex is incorporated into the aqueous compartment of a liposome, thereby maintaining the drug in a pre-solubilized state while the liposomal structure provides an additional protective and delivery barrier. This combined architecture may improve drug entrapment and modulate drug release compared with conventional liposomal formulations. Various systems have been investigated, including conventional liposomes, deformable or elastic liposomes, and double-loaded liposomes, each designed to address specific drug-delivery challenges. This review examines the formulation principles, characteristics, advantages, and limitations of these cyclodextrin–liposome systems. Particular attention is given to how combining the solubilization capacity of cyclodextrins with the carrier properties of liposomes can provide a versatile approach for improving the delivery of poorly soluble drugs. Overall, CD-containing liposomes represent a promising platform for integrating molecular complexation and vesicular drug delivery while potentially enabling controlled drug delivery.

Keywords: *Cyclodextrins, Host–Guest Complexation, Liposomal Drug Delivery, Solubility Enhancement, Poorly Soluble Drugs, Nanocarriers*

P-12/F/025 POSTER · OFFLINE

Organ-on-a-Chip and New Approach Methodologies: Towards Human-Relevant Nonclinical Drug Development

Atul Kushwaha

Department of Regulatory Affairs, ISF College of Pharmacy, Moga- 142001, Punjab, India
Email: atulkushwaha8589@gmail.com

Introduction: Typically used animal models are useful in the development of medicines but do not always exactly mimic human physiology and respond to medical therapies. New Approach Methodologies (NAMs), including organ-on-chip (OoC), organoids, modern in vitro models, and computational methods are available as new human-worthy alternative or supplements.

Aim & Objectives: To evaluate the potential of OoC and NAMs in drug development and examine their scientific, technical, and regulatory challenges.

Methods: Recent scientific literature and regulatory publications were reviewed, focusing on applications, advantages, limitations, validation requirements, and regulatory developments related to OoC and NAMs.

Results: OoC systems are capable of imitating some aspects of human tissue structure, interaction of cells, and functioning of a particular organ. Possible areas of application include drug testing, toxicity testing, modelling of disease, and drug testing. Nevertheless, it should be noted that standardization, reproducibility, scalability, technical complexity, validation, and multi-organ integration are important obstacles. Regulatory organizations are looking for ways of using scientifically grounded NAMs in the process of drug development.

Summary: NAMs provide promising human-relevant approaches, but their application remains context-dependent.

Conclusion: OoC and other NAMs could reduce reliance on animal models, provided robust validation, standardized methodologies, reproducible evidence, and appropriate regulatory frameworks are established.

Keywords: *Organ-on-a-chip; New Approach Methodologies; Drug development; Nonclinical testing; Regulatory science.*

P-12/F/026 POSTER · OFFLINE

Cancer Twin-AI: An AI-Driven Digital Twin Framework for Predicting Personalized Anticancer Drug Response

Shivam Kumar*, Hidul Islam

[1]Department of Pharmaceutical Sciences, ISF College of Pharmacy, Moga, Punjab, India-142001
Email: shivamkrjaiswal280305@gmail.com

Cancer treatment response varies substantially among patients because of complex molecular and cellular heterogeneity. Conventional treatment selection often relies on limited biomarkers and may not adequately capture the dynamic biology of individual tumors. Here, we propose CancerTwin-AI, an AI-integrated digital twin framework designed to support personalized prediction of anticancer treatment response. The proposed platform integrates multi-omics information, including genomic alterations, transcriptomic profiles, proteomic signatures, and clinical characteristics, to construct a patient-specific computational representation of tumor biology. Machine learning and deep learning models can subsequently identify response-associated molecular patterns and predict potential therapeutic vulnerabilities. The framework further incorporates computational drug–target interaction prediction, virtual screening, molecular docking, molecular dynamics simulations, and ADMET assessment to prioritize candidate therapeutic compounds. The resulting system is envisioned as a closed-loop platform connecting patient molecular data → AI-based biomarker identification → therapeutic target prediction → drug prioritization → response prediction. Rather than replacing clinical decision-making, CancerTwin-AI could function as a decision-support and drug-discovery tool for precision oncology. The proposed concept has potential applications in treatment-response prediction, biomarker discovery, drug repurposing, and identification of novel anticancer candidates. Future integration with longitudinal clinical data and experimental validation could enable continuous refinement of patient-specific models and facilitate translation toward clinically useful AI-assisted cancer therapeutics.

Keywords: *Artificial Intelligence; Digital Twin; Multi-Omics; Precision Oncology; Drug Discovery.*

O-12/N/001 ORAL · ONLINE

AI-Enhanced β-Cyclodextrin-Graphene Wearable Biosensor for Predictive Hyperkalemia Monitoring in Chronic Kidney Disease

Praveen Kumar[1]*, Manish Kumar[1]

[1]*KIET School of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh, India*
Email: praveen.harivansh@gmail.com

Chronic kidney disease (CKD) affects roughly 10–13% of the global population and is frequently complicated by hyperkalemia -elevated blood potassium arising from impaired renal excretion, often worsened by RAAS-inhibitor drugs used to slow CKD progression. Hyperkalemia raises hospitalization and mortality risk, yet detection still relies on intermittent serum draws that miss rapid interdialytic fluctuations, with nearly half of CKD patients experiencing at least one hyperkalemic episode in large cohort data. β-Cyclodextrin-functionalized reduced graphene oxide (β-CD-RGO) electrodes have demonstrated selective sweat potassium detection via host–guest molecular recognition, with related β-CD/RGO designs extended to combined pH–potassium sensing. That validation, however, used exercise-induced sweat. Separate physiological evidence shows plasma–sweat potassium correlation is method-dependent pilocarpine iontophoresis reliably tracks plasma potassium, while exercise-induced sweat largely does not and iontophoresis has itself been proposed as a route to indirect plasma potassium assessment specifically in chronic kidney disease. To propose a wearable biosensor combining iontophoresis-driven β-CD-RGO potassium sensing with a machine learning layer for drift correction, baseline modelling, and predictive hyperkalemia alerts. A flexible electrode integrates iontophoretic stimulation with β-CD-RGO sensing, enabling exertion-independent sweat sampling. The signal passes through an on-device ML model correcting artifacts, calibrating individual baselines, and flagging risk trends, relayed via a mobile app. Continuous, exertion-independent potassium surveillance with improved signal fidelity, potentially detecting hyperkalemic risk earlier than scheduled clinic visits. This concept shifts CKD electrolyte management toward continuous, home-based surveillance, with translational relevance to nephrology and dialysis care and commercialization potential as a licensable digital-health module.

Keywords: *Cyclodextrin biosensor, chronic kidney disease, Hyperkalemia monitoring, Iontophoretic sweat sensing, β-CD-graphene electrode, Artificial intelligence in nephrology.*

O-12/N/002 ORAL · ONLINE

A Computational Drug Design Approach for Optimization of PHGDH Inhibitors in Cancer Metabolism

Indra Pal Yadav*[1], Preeti Patel

[1]*Department of Pharmaceutical Chemistry, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan-142001, Moga, Punjab, India.*
Email: indrauip315@gmail.com

Introduction: Phosphoglycerate dehydrogenase (PHGDH), an enzyme, diverts glycolytic intermediates toward serine production and is upregulated in various cancers leading to therapy- resistant disease, underscoring the need for improved PHGDH targeted treatments.

Methods: Reported PHGDH inhibitors were studied by using ligand-based pharmacophore modelling and QSAR analysis to assess correlations among molecular descriptors and the inhibition necessary to inhibit PHGDH. Ten pharmacophore models were then produced and further validated. The ZINC database was screened using the best-performing model to select new hit compounds. Through the studies of molecular docking with PHGDH target (7VA1), the promising hits were further refined. A 500 ns molecular dynamics simulation was used to determine the stability of the ligand-protein interactions. Moreover, the electronic properties and reactivity of the compounds were also studied by using density functional theory (DFT). Lastly, ADMET analysis was conducted to determine the drug-likeness and drug-pharmacokinetic suitability of the discovered compounds.

Results: Combined virtual screening, molecular docking, molecular dynamics simulations and MM-GBSA analysis have determined a number of potential PHGDH inhibitors. A large database was screened using the optimal pharmacophore model (Hypothesis 2), which had ROC value 0.893 resulting in compound 39 and ZINC84927964 being identified as promising hits with acceptable ADMET properties.

Keywords: *PHGDH Inhibitors, Molecular Docking, Molecular Dynamics, Structure-Activity Relationship, ADMET.*

O-12/N/003 ORAL · ONLINE

Printed Prescriptions: The Rise of 3D Pharmacy

Gaurav Kumar[1]*

[1]*Department of Pharmaceutical Sciences, ISF College of Pharmacy, Moga, Punjab-142001*
Email: gauravroyhappy@gmail.com

The advent of 3D printing in pharmaceutical manufacturing has revolutionized drug formulation and delivery by enabling precise, customized medications. This technology facilitates personalized medicine by tailoring drug dosages to individual patient needs, improving therapeutic outcomes and adherence. Additionally, 3D printing allows for the creation of complex, multi-layered drug structures, enhancing controlled and sustained release formulations. It also offers cost-effective, on-demand production, reducing inventory and minimizing drug shortages. However, challenges such as regulatory hurdles, quality control, and material limitations remain. With ongoing advancements, 3D printing holds immense potential to transform drug manufacturing and healthcare worldwide.

Keywords: *3D printing, pharmaceutical manufacturing, personalized medicine, drug formulation, drug delivery, customized medications.*

O-12/N/004 ORAL · ONLINE

Analytical Techniques and Sensor Technology: Advancements, Applications and Future Perspectives

Shaiwal Shaswat Singh[1]*

[1]*Department of Pharmacy, K.R. Mangalam University, Gurugram, Haryana, India*
Email: shaiwalshaswat7@gmail.com

Introduction: Analytical techniques are essential for the identification, characterization, quantification, and quality assessment of chemical and biological substances. Recent developments in sensor technology have further enhanced analytical capabilities by enabling rapid, sensitive, selective, and portable detection.

Aim & Objectives: This presentation aims to provide an overview of major analytical techniques and modern sensor technologies, highlighting their principles, applications, advantages, limitations, and emerging developments.

Methods: A literature-based review was conducted covering conventional analytical techniques, including spectroscopy, chromatography, electroanalytical methods, thermal analysis, and mass spectrometry, along with electrochemical, optical, biosensor, semiconductor, and piezoelectric sensor technologies.

Results: The review demonstrates that techniques such as High-Performance Liquid Chromatography, Ultraviolet-Visible spectroscopy, Fourier Transform Infrared spectroscopy, Nuclear Magnetic Resonance, and mass spectrometry provide reliable qualitative and quantitative analysis. Sensor-based approaches offer rapid response, high sensitivity, selectivity, miniaturization, portability, and potential for real-time monitoring.

Summary: Integration of advanced analytical methods with sensor technology has expanded the scope of analytical measurements across pharmaceutical, biomedical, environmental, food, and industrial applications.

Conclusion: Continued development of sensitive, miniaturized, and cost-effective analytical and sensor platforms can improve the speed, reliability, and accessibility of analytical testing.

Keywords: *Analytical techniques, Sensors, Biosensors, Spectroscopy, Chromatography, Detection.*

O-12/N/005 ORAL · ONLINE

Development of a Smart Theranostic System Combining Targeted Drug Delivery and Real Time Biosensing for Improved Breast Cancer Management

Jagpreet Kour[1]*, Dr Manish Kumar[1], Dev Kashyap[2]

[1]KIET School of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Delhi-NCR, Uttar Pradesh, India
[2]Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, PCTE Group of Institutes, Baddowal, Ludhiana, 142021, Punjab, India
Email: kaurjagpreet72@gmail.com

The proposed research focuses on developing advanced nanotechnology-driven therapeutic and diagnostic platforms for the management of complex diseases, with particular emphasis on cancer, dermatological disorders, fungal infections, metabolic diseases, and precision medicine. The research integrates pharmaceutical nanotechnology, biomaterials, targeted drug delivery, immunotherapy, biosensing, chrono-therapeutics, and regenerative medicine to overcome the limitations of conventional treatment strategies, including poor bioavailability, limited target specificity, systemic toxicity, and inadequate therapeutic outcomes. The work explores innovative lipid-based nanocarriers such as liposomes, invasomes, ufasomes, dendrimers, nanostructured lipid carriers, and stimuli-responsive microneedle systems for enhanced drug delivery and disease management. In parallel, emerging technologies including liquid biopsy, immunogenomics, machine learning, tissue engineering, and nanomaterial-based biosensors are investigated to enable early diagnosis, personalized therapy, and real-time therapeutic monitoring. Additionally, chrono-genetic drug delivery systems are explored to optimize treatment according to circadian rhythms and improve therapeutic efficacy. This multidisciplinary research aims to bridge the gap between pharmaceutical formulation, diagnostics, and personalized healthcare by designing safe, effective, and patient-specific therapeutic platforms. The overall objective is to translate nanotechnology-enabled innovations from bench to bedside, contributing to next-generation precision medicine and improved clinical outcomes across diverse therapeutic areas.

Keywords: *Nanotechnology, Targeted Drug Delivery, Liposomes, Ufasomes, Invasomes, Tissue Engineering, Biosensors, Precision Medicine.*

O-12/N/006 ORAL · ONLINE

Machine Learning-Enabled Microneedle Patch for Personalized Health Monitoring

Ashish Ranjan[1]*, Dr. Sanchi Gupta[1]

[1]Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab, India
Email: ashishishwar1234@gmail.com

Introduction: Personalized healthcare requires continuous and reliable monitoring of physiological changes. Conventional blood-based tests are invasive and provide information only at specific time points. Microneedle-based wearable biosensors offer a minimally invasive approach for real-time monitoring of biomarkers in interstitial fluid. The study developed an electronic multiplexed microneedle-based biosensor patch (eMPatch) for personalized health monitoring.

Aim and Objective: To develop a flexible, wearable microneedle biosensor patch capable of continuously monitoring multiple metabolic biomarkers and to integrate machine learning for quantitative and predictive assessment of metabolic health.

Methodology: The eMPatch was designed with microneedles that collect information from dermal interstitial fluid while causing minimal tissue damage. The patch simultaneously measured six biomarkers: glucose, uric acid, cholesterol, sodium, potassium, and pH. A flexible SIS-based substrate was incorporated to improve skin adhesion, flexibility, mechanical stability, and signal reliability. A wireless electronic system enabled real-time data collection and transmission. The biosensor signals were processed using an integrated machine-learning model and evaluated in animal experiments under different metabolic conditions. The model classified normal and diet-induced metabolic disorders and quantitatively assessed the degree of metabolic changes.

Result and Discussion: The eMPatch successfully monitored multiple metabolic biomarkers in real time. The machine-learning model achieved 99.6% classification accuracy for distinguishing normal conditions from diet-induced metabolic disorders and an R^2 value of 0.977 for evaluating metabolic changes. These findings indicate that combining microneedle technology, multiplexed biosensing, flexible electronics, and machine learning can provide reliable and personalized health monitoring.

Conclusion: The study demonstrates that the eMPatch can provide continuous, minimally invasive, and multiplexed monitoring of metabolic biomarkers. Integration of machine learning improved the classification and quantitative assessment of metabolic changes, highlighting the potential of this platform for personalized and home-based healthcare and early identification of metabolic abnormalities.

Keywords: *Microneedle patch; Wearable biosensor; Personalized healthcare; Interstitial fluid; Metabolic biomarkers.*

O-12/N/007 ORAL · ONLINE

AI-Powered Formulation Development: Machine Learning for Predicting Drug–Cyclodextrin Compatibility and Optimizing Drug Delivery

Aanandita Thakur[1]*, Amit Chaudhary[1], Rajnish Srivastava[1], Nitin Verma[1]

[1]*Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, 174103, India*

Email: aananditathakur1@gmail.com

Introduction: Poor aqueous solubility remains a major challenge in the development of many drug candidates and can limit their dissolution and bioavailability. Cyclodextrins are widely explored as complexing agents to improve the aqueous solubility and performance of poorly soluble drugs. However, selecting the most suitable cyclodextrin and formulation conditions often involves extensive experimental trials. Machine learning (ML) offers an opportunity to support this process through data-driven prediction and formulation optimization.

Aim & Objectives: The present work aims to explore an ML-assisted approach for predicting drug–cyclodextrin compatibility and identifying formulation conditions that can enhance drug solubility and delivery performance.

Methods: Relevant scientific literature and reported drug–cyclodextrin systems were reviewed to identify important formulation and molecular descriptors. An ML-based workflow was proposed using drug properties, cyclodextrin characteristics and formulation variables as inputs for predicting complexation performance and solubility enhancement.

Results: The reviewed evidence indicates that ML can help identify relationships between molecular characteristics and drug–cyclodextrin complexation behaviour. Such predictive modelling may assist in selecting suitable cyclodextrins and reducing unnecessary formulation trials, while supporting systematic optimization of drug delivery systems.

Summary & Conclusion: Integration of ML with cyclodextrin based formulation development can provide a more efficient and rational approach to formulation screening and optimization. This strategy has potential to reduce experimental effort and support faster development of effective drug delivery systems.

Keywords: *Artificial Intelligence, Machine Learning, Cyclodextrins, Drug Delivery, Formulation Development, Solubility Enhancement*

O-12/N/008 ORAL · ONLINE

Ai-Enabled Delivery of Phytochemicals: Cyclodextrins, Nanocarriers and Intelligent Formulation Design

Debajyoti Roy[a]*, Niyati Acharya[a]

Department of Pharmacognosy, Institute of Pharmacy, Nirma University, Ahmedabad, Gujarat, India

Email: droy4896@gmail.com

Introduction: Phytochemicals have a wide range of pharmacological properties; however, these compounds often exhibit poor solubility, instability, low permeability, and poor absorption, which hinder their use in pharmaceuticals. Cyclodextrins and nanocarriers can be used to circumvent these problems, and AI can also be used in drug delivery development.

Aim and Objectives: To analyse in-depth the application of artificial intelligence in the implementation of phytochemistry, especially cyclodextrins, nanocarriers, and smart formulation design, and to find out current possibilities and limitations of such integrated implementation.

Methods: The information spanning phytochemical characterisation, carrier selection, cyclodextrin delivery, nanocarriers, AI/machine learning, and Quality-by-Design (QbD), as well as translation obstacles, was critically synthesised from the literature in PubMed, Scopus, Web of Science, and ScienceDirect.

Results: Evidence in the literature indicates the feasibility of cyclodextrin complexation, modelling, and various nanocarrier systems for enhancing the physicochemical and biopharmaceutical properties of phytochemicals. The strength of machine learning utilisation in formulation optimisation for lipid nanoparticles has been demonstrated, although the use of AI to select cyclodextrins for phytochemicals needs more evidence. Other difficulties mentioned in the literature include data heterogeneity, plant variability, external validation of results, interpretability of outputs, and regulatory acceptance of outcomes.

Summary and Conclusion: AI, molecular modelling, and QbD can link stages of phytopharmaceutical development that are currently unconnected, from carrier selection to formulation development and translation. Their integration should complement, rather than substitute for, experimental and pharmaceutical knowledge.

Keywords: *Artificial intelligence; Cyclodextrins; Machine learning; Nanocarriers; Phytochemicals; Quality-by-Design*

O-12/N/009 ORAL · ONLINE

Network Pharmacology-Based Exploration of the Therapeutic Potential of Malkangni (*Celastrus paniculatus*) Against Depression"

Shashank Singh[1], Dr. Praveen Kumar Dixit[2],

[1]Department of Pharmacy, KIET School of Pharmacy Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Uttar Pradesh, India
[2]Associate Professor, Department of Pharmacy, Krishna Institute of Engineering & Technology (KIET), Ghaziabad, Uttar Pradesh, India
Email: praveen.dixit@kiet.edu

Background: Depression is a complex psychiatric disorder associated with disturbances in monoaminergic signalling, neuroinflammation and HPA-axis dysregulation. Although currently available antidepressant drugs are widely used, many patients show only a partial response. Malkangni (*Celastrus paniculatus* Willd), and Ayurvedic brain tonic, has shown antidepressant-like effects in experimental studies. However, its potential mechanism of actions at the network level remains unclear. Objective: To explore the potential therapeutic targets and molecular pathways involved in the antidepressant effects of *Celastrus paniculatus* using a network pharmacology approach. Methodology: The reported constituents *C. paniculatus* were collected from PubChem and IMPPAT databases. The selected compounds were evaluated for drug likeness using Swiss ADME, followed by target prediction. Depression-related genes were obtained from GeneCards and common target between the predicted compound targets and depression associated genes identified using Venn analysis. The common targets were further analysed using the STRING database to construct a protein-protein interaction (PPI) network. Network analysis was performed using Cytoscape, and hub targets were identified using MCC, MNC, betweenness, closeness, and degree. Functional and pathway enrichment analysis were performed to identify the biological pathways associated with the common targets. Results: TNF, PPARG, PTGS2, EGFR and BCL2 consistently emerged as important hub targets across all five topological measures. Enrichment analysis indicated involvement of serotonergic, dopaminergic, cholinergic, glutamatergic, and GABAergic synapses, neuroactive ligand receptor interactions, cAMP, calcium, neurotrophin and NF-κB signaling pathways. Conclusion: The findings suggest that C. paniculatus may exert its potential antidepressant effects through multiple targets and pathways associated with inflammation, apoptosis and neuronal signalling. These findings provide a network-level basis for understanding the possible mechanism of Malkangni in depression. However, the predicted interactions require further validation through molecular docking and in vitro and in vivo studies.

Keywords: *C. paniculatus; Malkangni; network pharmacology; depression; hub targets; molecular pathways.*

O-12/N/010 ORAL · ONLINE

Biosensor-Enabled Portable TLC Chamber

Khushbu[1], Kritika[1], Kalicharan Sharma[1]*

School of Pharmacy, Graphic Era Hill University, Dehradun, Uttarakhand, India
Email: sannahrwt2004@gmail.com

Background: Thin-layer chromatography (TLC) is widely used for reaction monitoring, purity checks, phytochemical screening and quality control of pharmaceuticals. Conventional TLC still depends on bulky developing tanks, a separate UV cabinet for visualization and manual measurement of spot and solvent-front distances. These steps are time-consuming and subjective, and they introduce variability in R_f values. The setup is also hard to use in the field or in resource-limited laboratories.

Objective: To design and fabricate a compact, battery-operated TLC chamber that integrates development, UV visualization and automated R_f calculation in a single portable unit.

Methods: The chamber combines a solvent development compartment with built-in short-wavelength (254 nm) and long-wavelength (365 nm) UV sources, so both fluorescence quenching and fluorescent spots can be observed without moving the plate. A biosensor module detects the analyte spots and the solvent front on the developed plate. A microcontroller-based unit converts these signals into distances and automatically computes the R_f value (distance travelled by the spot ÷ distance travelled by the solvent front). Results appear on an integrated display. A rechargeable battery powers the UV lamps, the sensor and the electronics, so the device works independently of a mains supply. The prototype was tested with [standard compounds / plant extracts / drug samples] in [mobile phase], and its Rf values were compared with those from manual measurement.

Results: The prototype gave clear visualization under both UV wavelengths and automatic Rf values that agreed with manual readings [add % deviation / reproducibility data]. Battery life supported [x] TLC runs per charge, and the total weight of the unit was [x] g.

Conclusion: The biosensor-enabled portable TLC chamber removes manual measurement error, saves time and combines development, UV detection and Rf calculation in one low-cost, easy-to-carry device. It has potential for teaching laboratories, field-based herbal and drug screening, and quick quality checks in small laboratories.

Keywords: *Thin-layer chromatography, portable TLC chamber, biosensor, automatic Rf calculation, UV visualization, battery-operated device*

P-12/N/001 POSTER · ONLINE

Discovery of Novel Hydroxamic Acid Derivatives as ASM Inhibitors for the Treatment of Depression

Raj Gupta[1]*

[1]*Department of Pharmaceutical Chemistry, ISF College of Pharmacy, Moga, Punjab, India*
Email: rajgupta09@gmail.com

In the present work we performed a computational study on hydroxamic acid containing compounds as sphingomyelinase (ASM) inhibitors. The study starts from the development of 3D-QSAR and pharmacophore models which further taken as a source for the enumeration and virtual screening study. The 3D-QSAR results showed the best statistical model with Q2, R2, and R2 scrambling values of 0.7175, 0.9019 and 0.7128, respectively. The pharmacophore hypothesis generated one of the best hypotheses including five features such as 2 aromatic rings, 2 hydrogen bond donor and 1 hydrogen bond acceptor. The enumeration study paved the path in the discovery of novel compounds where pharmacophore hypothesis and 3D QSAR study data used for the identification of novel compounds. Compound 9f_20 showed good docking score -11.399 and binding interactions with amino acids HIP317, ASN316, GLH386, Zn701, Zn702, HIP317, HIP280 required for ASM inhibitory activity. The virtual screening study was performed on the basis of developed pharmacophore ADDRR_1 where ZINC000013941849 showed good binding interactions with receptor including amino acids Zn701, Zn702, HIP280, LYS103, HIP317, ASN316, ILE487. ZINC000013941849 with docking score -13.101. The screened compounds may be taken for the further development of novel antidepressant agents.

Keywords: *hydroxamic acid; ZINC; Enumeration; Docking; Virtual screening.*

P-12/N/002 POSTER · ONLINE

AI-Integrated Smart Wound Dressings for Real-Time Monitoring and Personalised Wound Management

Janvi Tiwari[1]*

[1]*Department of Pharmacy Practice, ISF College of Pharmacy, Moga, Punjab-142001.*
Email: janvitiwari1227@gmail.com

Chronic wounds create numerous medical issues due to chronic infections, slow healing, development of antibiotic resistance, frequent complications and expensive treatment. Conventional wound dressings can be passive and are unable to monitor the state of the wound and adjust the treatment for an individual. The development of smart wound dressings for real-time monitoring and tailoring treatment to the individual has been enabled by advances in biomaterial science, wearable sensors, artificial intelligence (AI), electrospun nanofibers and conductive hydrogels. Modern intelligent wound dressings include biosensors that enable the detection of various wound markers, including pH, temperature, oxygen level, moisture, blood glucose level, inflammatory molecules, and bacterial metabolites. The integration of those sensing features with AI and machine learning algorithms enables a better understanding of complex wound data, forecasting of wound healing patterns, identification of potential complications such as infection, and tailoring treatment strategies to individual patients. Besides these developments in tissue engineering and biomaterial sciences, extracellular matrix (ECM)-like scaffolds for the proliferation of cells, the regeneration of tissues and the controlled and responsive drug release are now available. The use of conductive biomaterials and hydrogels can also be beneficial for electrical stimulation. This poster provides an insight into the biological principles of wound healing and conventional wound dressings, and describes the recent advances in intelligent wound dressings integrated with AI. The spotlight is on biosensors, conductive biomaterials, tissue-engineering scaffolds, drug delivery, Internet of Medical Things (IoMT), cloud monitoring, and machine learning solutions for remote wound management. Overall, the integration of AI, biosensors, and advanced biomaterials holds significant potential to transform wound management toward predictive, responsive, and personalized care.

Keywords: *Biosensors, Artificial Intelligence, Drug Delivery, IoMT.*

P-12/N/003 POSTER · ONLINE

Role of AI in 3D Printed dosage forms in Pharmaceutical Production

Rajat Kumar Sharma [1]*, Navjot Kaur Sandhu[1]

[1]*Department of Pharmaceutical Quality Assurance, ISF College of Pharmacy, Moga, Punjab*
Email: 2507011@isfcp.org

The invention of 3D printing involves the generation of a 3D model of the desired product, using a computer-aided design software program, and the manufacturing of the object by printing each layer of the model. This is a relatively new technology adopted in the pharmaceutical industry. 3D printing is poised to be a major asset in drug research and development in formulations and delivery. The growth of the 3D printed Pharmaceuticals started when the FDA (Food and Drug Administration) approved a 3D printed tablet named SPRITAM® (levetiracetam). There are multiple technologies being used to support pharmaceutical manufacturing, all of which are powered by 3-D printing technologies such as powder bed fusion, binder jetting, material jetting, and vat photopolymerization. The combination of artificial intelligence (AI) along with 3D printing has the potential to quickly change the way we receive medications in the future. Currently, achieving the exact mix of materials for a 3D-printed pills take a lot of trial and error; but by integrating AI in the 3D printing process, we can easily predict the right ratio of materials and print settings before the printer even turns on. AI algorithms can be used to quickly analyze the health records, genetics and other similar parameters to design a tablet which is specifically tailored for patient. During the actual printing process, AI can act as a continuous quality control system by evaluating the parameters in real time to ensure that overall quality of the final formulation. The AI system adjusts printer settings immediately, such as extrusion speed and bed temperature, to prevent structural defects and ensure your final dosage form meets strict regulatory standards. By combining machine learning with 3D printing, you can safely produce personalized, highly effective dosage forms on demand.

Keywords: *3D Printing, Applications, SPRITAM, Artificial Intelligence, Personalized Dosage Form.*

P-12/N/004 POSTER · ONLINE

Digital Transformation of Regulatory Affairs: From eCTD to Regulatory Intelligence Systems

Shilpa Dogra [1]*, Navjot Kaur Sandhu

[1]*Department of Regulatory Affairs, ISF College of Pharmacy, Moga, Punjab*
Email: 2510013@isfcp.org

The pharmaceutical industry is experiencing significant digital transformation driven by increasing regulatory complexity, global harmonisation and the exponential growth of scientific data. Although the electronic common technical document has standardized electronic submissions and significantly improved regulatory efficiency, today's regulatory environment demands intelligent, data-driven systems capable of supporting faster and more informed decision-making. Emerging technologies, including Artificial intelligence, Natural language processing and robotic process automation are reshaping Regulatory Affairs by enabling transition from document-centric workflows to Regulatory Intelligence Systems. This work explores the evolution of regulatory affairs from traditional paper-based submission and eCTD to AI- enabled regulatory intelligence systems. It highlights the application of AI in regulatory intelligence, dossier authoring, automated document validation, submission planning, compliance monitoring, labelling review, and better global regulatory compliance. It also discusses key implementation challenges, including data integrity, cybersecurity, AI validation, ethical considerations, evolving regulatory expectations and the continued importance of human oversight in regulatory-decision making. The transition to AI supported regulatory intelligence system represents a paradigm shift in pharmaceutical regulation, enabling smarter, more proactive and evidence-based regulatory processes. As digital technologies continue to evolve, their responsible integration has the potential to strengthen safe and effective medicines and define the future of global regulatory affairs.

Keywords: *Artificial Intelligence, Regulatory Affairs, Regulatory Intelligence Systems, Regulatory Compliance, Digital Transformation.*

P-12/N/005 POSTER · ONLINE

Beyond Protein Structures: AlphaFold 3 and the AI Revolution in Molecular Interaction Prediction

Ayush Sharma[1], Hidul Islam [1]*

[1]ISF College of Pharmacy, Moga, Punjab, India
Email: ayushsharma03@gmail.com

Accurate prediction of biomolecular structure and molecular interactions is a fundamental challenge in modern drug discovery. Conventional experimental and computational approaches for characterizing protein–ligand, protein–protein, and protein–nucleic acid interactions can be time-consuming and computationally demanding. The emergence of artificial intelligence (AI)-driven structure prediction has transformed this landscape, with AlphaFold 3 representing a major advancement beyond traditional protein structure prediction. Unlike earlier approaches focused primarily on individual protein structures, AlphaFold 3 predict the three-dimensional structures of biomolecular complexes involving proteins, nucleic acids, small molecules, ions, and other molecular components. This capability provides new opportunities for understanding molecular recognition, binding interactions, and mechanisms underlying biological function.

The present poster explores the principles, workflow, and pharmaceutical applications of AlphaFold 3 in structure-guided drug discovery. Particular emphasis is placed on its potential to predict protein–ligand interactions, characterize binding interfaces, support target identification and validation, and accelerate virtual screening and lead optimization. Integration of AlphaFold 3-derived structural insights with molecular docking, molecular dynamics simulations, free-energy calculations, and experimental validation may establish a powerful computational framework for accelerating the identification and optimization of therapeutic candidates. Despite its transformative potential, challenges including prediction accuracy for specific interaction types, conformational flexibility, ligand representation, uncertainty assessment, and experimental validation remain important considerations. Overall, AlphaFold 3 marks a significant shift from predicting proteins to modelling biological systems, highlighting the growing role of AI in decoding molecular interactions and reshaping the future of structure-based drug discovery.

Keywords: *AlphaFold 3; artificial intelligence; molecular interaction prediction; protein–ligand interactions; drug discovery; structural biology; computational drug design.*

P-12/N/006 POSTER · ONLINE

Digital Twins in Clinical Trials: Transforming Personalized Drug Development through AI Driven Patient Modelling

Maninder Kaur[1]*, Sankushdeep Singh

[1]ISF College of Pharmacy and Research, Moga, Punjab, India-142001
Email: maninderkaursandhu47@gmail.com

In clinical trials, digital twins are showing promise as a more individualized and effective method of assessing medications and therapies. Clinical records, medical history, test results, imaging data, genetic information, and real-time health data are all used to build a digital twin, which is a virtual replica of a patient. These virtual patient models can be used in clinical trials to forecast a patient's potential response to a certain medication or therapy prior to its administration. This can help with therapy result prediction, safety evaluation, dosage optimization, and patient selection. Researchers may reduce needless exposure to unsuccessful medicines and perhaps increase trial efficiency while saving time and money by utilizing digital twins in conjunction with traditional clinical trials. In chronic and complicated illnesses where people react differently to the same treatment, the technology may be especially helpful. However, prior to widespread clinical use, issues such data quality, patient privacy, interoperability, model accuracy, ethical concerns, and regulatory approval must be resolved. All things considered, digital twins are a promising move toward more patient-centered clinical research, with the potential to improve drug development decision-making while making clinical trials safer, quicker, and more customized.

Keywords: *Digital Twins, Clinical Trials, Drug Development, Patients, Healthcare Technology, Artificial Intelligence.*

P-12/N/007 POSTER · ONLINE

Digital Twins in Precision Medicine: Revolutionizing Personalized Drug Therapy

Dhanisha Pathania[1], Hidul Islam*

[1]*ISF College of Pharmacy, Moga, Punjab, India-142001*

Email: 2315717@isfcp.org

Digital twin (DT) technology is revolutionizing clinical practice by integrating diverse epidemiological data sources to create dynamic, patient-specific simulations. By leveraging data from genomics, proteomics, imaging, sociodemographic, and real-world behaviours, DTs provide a computational framework to model disease progression, optimize treatments, and personalize health care interventions. Through artificial intelligence (AI) and mathematical modelling, DTs facilitate predictive analytics for disease risk assessment, early diagnosis, and treatment response forecasting. This viewpoint explores the mathematical foundations of DTs, including differential equations for health trajectory modelling, Bayesian networks for multiomics integration, Markov models for disease progression, and reinforcement learning for treatment optimization. In addition, machine learning techniques such as recurrent neural networks and transformers enhance the predictive power of DTs by analyzing time-series clinical data and predicting future health events. The potential applications of DTs extend beyond individual patient care to public health surveillance, hospital resource management, and epidemiological modelling. However, several challenges persist, including data privacy concerns, computational infrastructure requirements, validation of predictive models, and regulatory compliance. Addressing these limitations requires interdisciplinary collaboration among health care providers, data scientists, and policy makers. With advancements in AI, wearable technology, and multiomics data integration, DTs are poised to reshape precision medicine. Future research should focus on refining computational efficiency, standardizing data interoperability, and ensuring ethical AI-driven decision-making. The continued evolution of DTs offers a transformative approach to proactive and personalized health care, reducing disease burden and enhancing patient outcomes.

Keywords: *Digital Twins; Multiomics; Computational infrastructure; Artificial intelligence.*

P-12/N/008 POSTER · ONLINE

Deep Learning–Based Classification of Chest X-Ray Images and Cardiac Disorders Using ECG Signals

Sagar Malik[1]*

[1]*ISF College of Pharmacy & Research, Moga (Punjab), India-142001*

Email: sagarmalik0710@gmail.com

Accurate and timely identification of cardiovascular disorders remains essential for effective clinical diagnosis and patient management. Conventional diagnostic approaches frequently rely on multiple complementary investigations, including electrocardiography (ECG) for the assessment of cardiac electrical activity and chest X-ray imaging for the evaluation of structural and cardiopulmonary abnormalities. However, manual interpretation of these data can be resource-intensive and subject to inter-observer variability. This study presents a deep learning framework for multi-class cardiac disorder classification, with an emphasis on integrating information obtained from ECG signals and chest X-ray images. ECG preprocessing included signal normalization and preparation of multi-lead recordings prior to model training. The ECG model achieved a Macro AUROC of 0.9312, with class-wise AUROC values of 0.9503 for NORM, 0.9283 for MI, 0.9284 for STTC, 0.9150 for HYP, and 0.9338 for CD. In addition to ECG-based analysis, chest X-ray imaging represents a complementary modality capable of providing structural and cardiopulmonary information relevant to cardiovascular disease. The findings demonstrate the strong capability of residual deep learning architectures for automated multi-class cardiac disorder classification from ECG signals and provide a foundation for future multimodal systems integrating ECG and chest X-ray data.

Keywords: *Deep Learning, Residual Network, Electrocardiogram (ECG), Chest X-Ray, Cardiac Disorders, Medical Image Analysis.*

P-12/N/009 POSTER · ONLINE

HEALPREDICT AI: AN AI-BASED PERSONALIZED WOUND HEALING PREDICTION SYSTEM

Himanshu[1]*

[1]*Department of Pharmaceutical Quality Assurance, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: himanshukumar60874@gmail.com

Wound healing is a dynamic biological process influenced by several factors, including wound characteristics, patient condition, infection, inflammation and tissue regeneration. Conventional wound assessment primarily relies on periodic clinical examination and visual evaluation, which may provide limited information about the future healing trajectory. HealPredict AI is a proposed Artificial Intelligence (AI)-based personalized system designed to predict wound healing progression and identify deviations from the expected healing pattern. The proposed approach utilizes serial wound images along with relevant clinical parameters and previous healing information to generate an individualized healing profile. AI-based image analysis and predictive algorithms can evaluate changes in wound size, appearance and healing progression over time. The system compares observed healing patterns with the predicted trajectory and generates an early warning when significant deviation is detected. A digital platform can present the healing trend in a simple graphical format for healthcare professionals, supporting timely clinical assessment and personalized wound management. Unlike conventional monitoring approaches that primarily focus on the present condition of a wound, Heal Predict AI emphasizes prediction of future healing progression. The proposed system may contribute to early identification of delayed healing, improved monitoring, reduced unnecessary follow-up visits and more personalized wound-care strategies. Further development, dataset validation, clinical studies, safety assessment and regulatory evaluation are required to establish its effectiveness and practical applicability.

Keywords: *Artificial Intelligence; Wound Healing; Predictive Analytics; Medical Imaging; Personalized Medicine; Digital Health.*

P-12/N/010 POSTER · ONLINE

Dual-Modal Smart Stethoscope: Real-Time AI for Early Cardiovascular Screening

Dhananjay Singh[1], Aman Kumar*

[1]*Division of Pharmaceutics, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan – 142001, Moga, Punjab, India*
Email: dramankumar960@gmail.com

Cardiovascular diseases remain a leading cause of global mortality, yet traditional physical auscultation is limited by subjective interpretation and an inability to capture concurrent electrical cardiac activity. Although standalone digital stethoscopes improve acoustic clarity, early clinical screening remains restricted by the lack of integrated, real-time diagnostic analytical tools. A dual-modal smart stethoscope framework offers an advanced diagnostic matrix by combining acoustic transducers with chest-contact electrodes for synchronized phonocardiogram and single-lead electrocardiogram (ECG) acquisition. This engineering framework aims to integrate ultrasonic array and bio impedance sensors, Bluetooth transmission, and in built AI powered software to enable rapid, real-time cardiovascular screening at the point of care. The system architecture processes physical acoustic vibrations and electrical impulses generated during cardiac depolarization and repolarization simultaneously. In real-time evaluations, cloud-based and onboard AI algorithms analyze acoustic waveforms for abnormal murmurs while simultaneously calculating R-R interval variability and identifying missing P-waves on the ECG trace to flag arrhythmias. Conceptual and analytical models demonstrate that this dual-modal strategies enables non-invasive detection of asymptomatic atrial fibrillation, heart failure, and valvular heart disease within 15 seconds, facilitating timely stroke prevention and seamless telemedicine integration. Conclusively, this presentation highlights how integrating dual-modal sensing with artificial intelligence effectively bridges traditional auscultation and digital diagnostics, establishing a frontline nanomedicine and digital health strategy to early cardiovascular screening.

Keywords: *Smart Stethoscope; Dual-Modal Sensing; Phonocardiogram; Electrocardiogram; Artificial Intelligence; Early Cardiovascular Screening.*

P-12/N/011 POSTER · ONLINE

Quantitative Standardization in Microneedle Biosensors: Current Gaps and Emerging Solutions

Prianshu Aggarwal[2], Navneesh[1]*

[1]*Department of Pharmaceutical Chemistry and Analysis, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan -142001, Moga, Punjab, India*
[2]*B. Pharm, ISF College of Pharmacy (An Autonomous College), GT Road, Ghal Kalan -142001, Moga, Punjab, India*
Email: prianshuagg.1970@gmail.com

Microneedle (MN) technologies have progressed rapidly as platforms for interstitial fluid biosensing and transdermal drug delivery. However, their clinical translation remains disproportionately slow relative to their technical maturity. This review aims to identify the underrecognized barrier limiting MN clinical translation, examining the hypothesis that it stems from a lack of standardized quantitative frameworks across three interdependent domains: biosensor signal reporting, drug-delivery dosing accuracy, and complication/safety assessment. Literature across these domains was synthesized, evaluating unit and range consistency in biosensing outputs, batch-to-batch variability in drug-delivery metrics, grading criteria for complications, documented commercial failures, and cross-jurisdictional regulatory classification. Biosensing studies reported identical analytes using inconsistent units and dynamic ranges, with predominantly qualitative outputs and inconsistently documented insertion force, swelling kinetics, drift, and biofouling resistance. Drug-delivery studies showed variability in coating thickness and hydrogel swelling that undermined pharmacokinetic reproducibility, while complications like tip fracture, incomplete pore closure, and immune response lacked standardized grading. Zosano's Qtrypta and Radius Health's Abaloparatide-sMTS were discontinued due to unresolved dose variability and bioequivalence issues, not lack of efficacy, and regulatory classification remained inconsistent across jurisdictions. Emerging solutions included comparator-based validation, minimum reporting checklists, standardized applicators, and AI-assisted calibration. Across all three domains, absent shared quantitative standards-not technical immaturity-consistently limited comparability and regulatory readiness, addressing this standardization gap, rather than focusing solely on sensing or delivery chemistry advances, is the critical next step for MN systems to achieve reliable, comparable, regulator-ready clinical translation.

Keywords: *Microneedle, Biosensing, Transdermal drug delivery, Clinical translation, Interstitial fluid biosensing, Dosing accuracy.*

P-12/N/012 POSTER · ONLINE

Ai Powered Prediction of Solubility Enhancement By Cyclodextrin Complexation- A Predictive Approach for Faster And Smarter Pharmaceutical Formulation Development

Gunjan Sharma[1]*

[1]*Sri Sai college of pharmacy Badhani, Pathankot*
Email: gunjansharmacyb@gmail.com

Poor aqueous solubility is a major challenge in pharmaceutical formulation development, often resulting in inadequate dissolution, variable bioavailability, and reduced therapeutic performance. Cyclodextrins (CDs), owing to their hydrophilic outer surface and hydrophobic cavity, can form inclusion complexes with poorly water-soluble drugs and thereby improve their apparent solubility, dissolution, stability, and bioavailability. However, conventional drug–CD screening largely depends on experimental trial-and-error approaches, which can be time-consuming, resource-intensive, and require extensive laboratory investigations. Saokham et al. highlighted the importance of cyclodextrin complexation in improving drug solubility and understanding drug–CD interactions. Furthermore, Zhao et al. demonstrated the potential of integrating molecular modeling and machine learning (ML) for predicting CD–guest complexation, while Ma et al. reported ML-based strategies for efficient prediction and screening of cyclodextrin inclusion complexes. Sarabia-Vallejo et al. further emphasized the pharmaceutical significance of CD inclusion complexes for improving drug performance.

The present work proposes an AI/ML-assisted predictive framework to predict the probability and magnitude of solubility enhancement resulting from drug–CD complexation. The proposed framework integrates drug molecular descriptors such as molecular weight, logP, TPSA, hydrogen-bonding properties, molecular volume, and structural features with cyclodextrin characteristics and formulation variables including pH, temperature, drug-to-CD ratio, and excipient composition. Machine-learning approaches such as Random Forest, Support Vector Machine, Artificial Neural Network, LightGBM, and XGBoost can be evaluated using suitable performance parameters including R^2, RMSE, and MAE. The predicted outcomes can subsequently be validated experimentally and used to identify promising drug–CD combinations.

Keywords: *Artificial Intelligence, Machine Learning, Cyclodextrins, Inclusion Complex, Solubility Enhancement, Molecular Descriptors, Predictive Modeling.*

P-12/N/013 POSTER · ONLINE

From QbD to Explainable AI: Random Forest-Based Design Space Analysis of Voriconazole-β-Cyclodextrin Inclusion Complexes

Garima Kumari[1]*, Niladri Shekhar Dey, Dibyendu Shil, Saumendu Deb Roy

[1]Mata Gujri College of Pharmacy, Kishanganj, Bihar-855107, India
Email: garimajaiswal2300@gmail.com

Voriconazole has poor aqueous solubility, which limits dissolution performance. A published Quality by Design (QbD) study optimized voriconazole–β-cyclodextrin inclusion complexes using a 13-run central composite design, but localized nonlinear behaviour may not be fully captured by a polynomial response surface. This study performed an explainable QbD-artificial intelligence (AI) secondary reanalysis using Random Forest (RF), Descriptor-Augmented RF, Explainable Artificial Intelligence (XAI), and symbolic surrogate modelling. Factor-response data for β-cyclodextrin amount, grinding time, solubility, and cumulative drug release were reanalysed. RF-based models were evaluated by leave-one-out cross-validation and compared with original QbD/Response Surface Methodology (RSM) predictions at the optimized checkpoint of 600 mg β-cyclodextrin and 30 min grinding. Shapley Additive explanations (SHAP), permutation feature importance, Partial Dependence Plots (PDP), Individual Conditional Expectation (ICE), and Local Interpretable Model-agnostic Explanations (LIME) were used for XAI. QbD/RSM remained the strongest global model, while Descriptor-Augmented RF improved prediction and Hybrid QbD + Descriptor-Augmented RF further improved RF-based performance. At the optimized checkpoint, Descriptor-Augmented RF showed closer local calibration. XAI identified β-cyclodextrin amount as the dominant contributor, with grinding time as an important process variable. Symbolic regression provided compact surrogate approximations. Explainable AI augmented QbD/RSM by improving nonlinear response interrogation, local calibration assessment, and factor-level interpretation.

Keywords: *Voriconazole, β-cyclodextrin, Quality by Design, Random Forest, Explainable AI.*

P-12/N/014 POSTER · ONLINE

Artificial Intelligence and Emerging Digital Technologies in Pharmaceutical Quality Assurance: Applications, Challenges and Future Perspectives

Sakshi Aniket Shaha[1]*

[1]Rasiklal M. Dhariwal College of Pharmaceutical Education and Research, Pune, Maharashtra, India.
Email: sakshishaha0310@gmail.com

Pharmaceutical quality assurance is undergoing a significant transformation from conventional batch-end testing toward integrated, data-driven and lifecycle-based quality management. Emerging technologies such as artificial intelligence (AI), machine learning (ML), process analytical technology (PAT), digital twins, computer vision, laboratory automation, blockchain and natural language processing are increasingly being explored to enhance pharmaceutical manufacturing and quality control. AI and ML can facilitate real-time process monitoring, predictive maintenance, anomaly detection, automated visual inspection and data-driven decision-making. Their integration with Quality by Design (QbD), PAT and continuous manufacturing can support improved process understanding and consistent product quality. Among these technologies, PAT-based monitoring, real-time release testing, automated inspection and digital quality management systems have demonstrated considerable potential for practical implementation. However, widespread adoption remains challenging due to data quality, legacy infrastructure, model transparency, cybersecurity, calibration transfer, validation requirements and evolving regulatory expectations. Successful implementation requires reliable data pipelines, calibrated sensors, explainable models, appropriate lifecycle validation and robust governance frameworks. The integration of AI with pharmaceutical quality systems therefore represents an important step toward predictive, proactive and continuously monitored quality assurance while maintaining compliance with Good Manufacturing Practices (GMP).

Keywords: *Artificial Intelligence, Machine Learning, Pharmaceutical Quality Assurance, Process Analytical Technology, Quality by Design, Digital Twins.*

P-12/N/015 POSTER · ONLINE

Generative Artificial Intelligence in Smart Medical Devices: Emerging Applications, Challenges and Future Prospects

Nitish Kumar[1]*

[1]*ISF College of Pharmacy, Moga, Punjab, India-142001*
Email: 2315759@isfcp.org

Generative artificial intelligence (GenAI) is emerging as a transformative technology for smart medical devices, creating new opportunities for personalized healthcare, intelligent monitoring and real-time clinical decision-making. Unlike conventional artificial intelligence systems that primarily analyse existing datasets, GenAI can generate clinically relevant content, predictions, synthetic data and adaptive recommendations using advanced models such as large language models and generative neural networks. Its integration with wearable health monitors, AI-enabled diagnostic systems, remote patient monitoring devices, smart biosensors, medical imaging platforms and intelligent drug-delivery systems may enable continuous health assessment, early disease detection and automated interpretation of complex biomedical information. GenAI can also support personalized patient communication and improve clinical workflows. However, several challenges must be addressed before widespread implementation, including data privacy and security, algorithmic bias, hallucinations, reliability, explainability, interoperability, computational requirements and regulatory approval. Emerging approaches such as edge AI, federated learning, multimodal GenAI and human–AI collaboration may improve the safety, efficiency and adaptability of these technologies. Future developments are expected to focus on autonomous, adaptive and patient-centred medical devices that provide personalized healthcare while maintaining clinical safety and regulatory compliance. Overall, the convergence of GenAI and smart medical devices could contribute to the transition toward predictive, preventive and personalized healthcare.

Keywords: *Generative Artificial Intelligence; Smart Medical Devices; Wearable Technology; Personalized Healthcare; Digital Health; Smart Biosensors.*

P-12/N/016 POSTER · ONLINE

AI-Driven Pharmacovigilance: From Adverse Event Detection to Predicting Safety Signals

Simranpreet Kaur[1]*

[1]*ISF College of Pharmacy and Research, Moga, Punjab, India-142001*
Email: simranpreet.kaur.240732417@gmail.com

Pharmacovigilance is essential for ensuring the safety of medicines through the detection, assessment, understanding, and prevention of adverse drug reactions (ADRs). However, the rapid expansion of pharmacovigilance data from spontaneous ADR reports, electronic health records, clinical trial databases, medical literature, social media, patient registries, drug utilization data, and regulatory safety databases presents significant challenges for conventional pharmacovigilance systems. Large data volumes, extensive manual review, delayed signal identification, and the possibility of missed safety signals highlight the need for advanced and efficient approaches. Artificial Intelligence (AI) is emerging as a valuable approach for transforming pharmacovigilance by supporting automated data processing and safety signal identification. Technologies including Natural Language Processing (NLP), machine learning, deep learning, large language models (LLMs), knowledge graphs, and generative AI can facilitate the extraction, classification, and analysis of adverse event information. NLP can extract ADR information from unstructured text, while machine learning and deep learning can support signal detection, classification, and recognition of complex patterns. LLMs and generative AI can further assist with information extraction, case summarization, and case-processing activities. An AI-driven pharmacovigilance workflow may involve data collection, cleaning and standardization, AI-based information processing, ADR identification, duplicate detection, case classification, signal detection and prioritization, predictive risk assessment, human expert validation, regulatory action, and continuous safety monitoring. AI-based signal detection can identify patterns involving drugs, adverse effects, patient populations, frequency, severity, and other characteristics that may not be readily apparent through conventional approaches. Despite its potential, challenges and limitations must be addressed before widespread implementation. The future of pharmacovigilance therefore lies in a human–AI collaborative approach, where AI detects, prioritizes, and predicts potential safety signals, while human experts review, validate, and make informed decisions. Such integration can enhance the efficiency, timeliness, and predictive capabilities of pharmacovigilance and contribute to continuous monitoring of medicine safety.

Keywords: *Pharmacovigillance; Ai-driven; LLMs; NLP.*

P-12/N/017 POSTER · ONLINE

AI-Driven Pharmacovigilance: From Adverse Event Detection to Predicting Safety Signals

Ritika Rani[1]*

[1]*ISF College of Pharmacy and Research, Moga, Punjab, India-142001*
Email: 240732409@isfcp.org

Pharmacovigilance is essential for ensuring the safety of medicines through the detection, assessment, understanding, and prevention of adverse drug reactions (ADRs). However, the rapid expansion of pharmacovigilance data from spontaneous ADR reports, electronic health records, clinical trial databases, medical literature, social media, patient registries, drug utilization data, and regulatory safety databases presents significant challenges for conventional pharmacovigilance systems. Large data volumes, extensive manual review, delayed signal identification, and the possibility of missed safety signals highlight the need for advanced and efficient approaches. Artificial Intelligence (AI) is emerging as a valuable approach for transforming pharmacovigilance by supporting automated data processing and safety signal identification. Technologies including Natural Language Processing (NLP), machine learning, deep learning, large language models (LLMs), knowledge graphs, and generative AI can facilitate the extraction, classification, and analysis of adverse event information. NLP can extract ADR information from unstructured text, while machine learning and deep learning can support signal detection, classification, and recognition of complex patterns. An AI-driven pharmacovigilance workflow may involve data collection, cleaning and standardization, AI-based signal detection can identify patterns involving drugs, adverse effects, patient populations, frequency, severity, and other characteristics that may not be readily apparent through conventional approaches. Despite its potential, challenges and limitations must be addressed before widespread implementation. The future of pharmacovigilance therefore lies in a human–AI collaborative approach, where AI detects, prioritizes, and predicts potential safety signals, while human experts review, validate, and make informed decisions. Such integration can enhance the efficiency, timeliness, and predictive capabilities of pharmacovigilance and contribute to continuous monitoring of medicine safety.

Keywords: *Natural Language Processing, Large Language Models, Pharmacovigilance, Machine Learning.*

P-12/N/018 POSTER · ONLINE

Machine Learning-Based Prediction of Pharmaceutical Cocrystals to Accelerate Drug Development

Arvinder Kaur[1]*, Nidhi kumari[2]

[1]*Department of Pharmaceutical sciences, G.H.G Khalsa College of Pharmacy, Gurusar Sadhar, Ludhiana, Punjab-141104, India*
[2]*Chitkara School of Pharmacy, Chitkara University, Rajpura, Punjab-140401, India*
Email: arvinderpharma@gmail.com

Many active pharmaceutical ingredients (APIs) have low bioavailability and poor water solubility, which continue to be major obstacles in therapeutic development. A successful crystal engineering technique for enhancing physicochemical characteristics without changing the drug's pharmacological action is pharmaceutical co-crystallization. Nevertheless, traditional co-crystal screening is time-consuming, labour-intensive, and necessitates numerous experimental attempts. The promise of machine learning (ML) as a revolutionary tool for forecasting appropriate API–co-former combinations and speeding up co-crystal discovery is highlighted in this research. In addition to molecular descriptors, hydrogen-bonding propensity, crystal structure databases, and cheminformatics tools for virtual screening, the paper outlines recent developments in machine learning methods, such as Random Forest, Support Vector Machine, Artificial Neural Networks, and Deep Learning. According to published studies, ML-assisted prediction dramatically increases the success rate of finding stable pharmaceutical co-crystals while lowering research expenses, development time, and experimental workload. Moreover, co-crystal formulations with improved solubility, dissolving rate, stability, manufacturability, and bioavailability may be quickly optimized thanks to the combination of computational chemistry and artificial intelligence. By fusing data science with crystal engineering, machine learning-driven cocrystal prediction offers a promising paradigm for the development of next-generation pharmaceutical formulations. Precision drug design and tailored treatment are anticipated to be made easier by the future combination of explainable AI, high-throughput experimentation, and digital pharmaceutical platforms. This multidisciplinary strategy provides an effective way to improve the quality and performance of pharmaceutical goods while speeding up medication discovery and regulatory translation.

Keywords: *- Machine Learning, Pharmaceutical Co-crystals, Artificial Intelligence, Crystal Engineering, Drug Development, Bioavailability.*

P-12/N/019 POSTER · ONLINE

AI-Enabled Smart Medication Management System for Preventing Medication Errors

Dhruv[1], Rachna Mehta*

[1]*Department of Pharmaceuticals (Regulatory Affairs), JCDM College of Pharmacy, Sirsa.*
Email: Work2dhruv@gmail.com

Medication errors are a major cause of preventable patient harm and can occur at different stages of medication use, including prescribing, dispensing, administration, and monitoring. Common errors include inappropriate drug selection, incorrect dosing, drug-drug interactions, contraindications, therapeutic duplication, overlooked allergies, and failure to consider patient-specific clinical factors. This study proposes an Artificial Intelligence (AI)-enabled smart medication management system designed to support the early identification and prevention of potential medication errors through personalized clinical decision support. The proposed framework integrates patient demographics, medication history, prescribed drugs and doses, allergies, comorbidities, laboratory parameters, renal and hepatic function, and previous adverse drug reactions. An AI-based analytical layer evaluates these multidimensional data to identify potential dosing errors, interactions, contraindications, medication duplication, and other patient-specific safety risks. Identified risks are assigned individualized risk scores and stratified into low, moderate, or high-risk categories to support prioritization of clinically significant alerts. Explainable AI techniques are incorporated to provide healthcare professionals with understandable reasons and contributing factors behind each generated alert. The system also incorporates clinician-in-the-loop review to ensure that AI recommendations support rather than replace professional clinical judgment. By combining intelligent medication review, personalized risk assessment, explainability, and alert prioritization, the proposed system may reduce unnecessary alerts, facilitate timely clinical intervention, and improve medication safety. This framework demonstrates the potential of AI-enabled medication management as a responsible digital-health innovation for reducing preventable medication errors and enhancing patient-centered clinical decision- making.

Keywords: *Artificial Intelligence, Medication Errors, Smart Medication Management, Patient Safety, Clinical Decision Support.*

P-12/N/020 POSTER · ONLINE

Trustworthy Artificial Intelligence in Pharmaceutical Decision Support: A Python-Based Framework for Security, Data Integrity and Error Detection

Vineet Pratap Singh*, Anubhuti Mishra

Shiv Bali Singh Group of Educational and Training Institute, College of Pharmacy, Malwan, Fatehpur, Uttar Pradesh, India
Email: ci.vps@proton.me

Artificial intelligence (AI) is increasingly used in pharmaceutical data analysis, molecular modeling and decision support. However, AI can give wrong or false-positive results and be affected by unsafe inputs, tampered data or loss of data integrity. This work aims to build a Python-based prototype showing security, data-integrity and reliability problems in an AI-assisted pharmaceutical workflow, and to test simple ways of flagging unreliable results. The prototype will run locally using Python, SQLite and open-source machine-learning libraries, with cyclodextrin-drug inclusion complex data, a machine-learning model, database security controls, integrity checks and an output-validation layer. Tests will introduce Structured Query Language (SQL) injection, poisoned solubility data, false-positive predictions and wrong outputs. Validation rules will flag suspicious results for review. A clear difference is expected between a workflow without checks and one with security, integrity and validation controls. The study should show when cyclodextrin binding predictions become unreliable and whether the validation layer can catch them. In conclusion, AI outputs in pharmaceutical research should not be trusted blindly; they need security controls, data validation, integrity checks and human review.

Keywords: *Artificial Intelligence; Pharmaceutical Decision Support; Cybersecurity; Data Integrity; Machine Learning; Cyclodextrins*

P-12/N/021 POSTER · ONLINE

AI-Driven 3D Printing for Personalized Medicines: From Formulation Design to Patient-Specific Drug Delivery

Palvinder Singh *, Sakshi Thakur , Tanish Jaiswal

Chandigarh College of Pharmacy, Chandigarh Group of Colleges, Landran, Mohali, Punjab, 140307.
Email: sinpalvinder@gmail.com

Personalized medicine aims to deliver individualized therapy based on differences in patients' disease condition, therapeutic requirements, and drug response. The convergence of artificial intelligence (AI) and 3D printing is a promising tool that can be used for the production of patient-specific pharmaceutical dosage forms. AI and machine learning can analyze the composition and process variables, predict critical quality attributes, and aid the development of dosage forms with desirable drug loading, excipients, mechanical properties, and drug-release profiles. The identified parameters can then be used to manufacture 3D printed tablets with individualized or patient-tailored doses, geometry, drug-release properties, and combinations of drugs.

The technologies of 3D printing, such as fused deposition modeling, stereolithography, and inkjet-based printing, have been investigated for the computer-aided design and fabrication of pharmaceutical compounds and patient-centric drug delivery systems with high complexity. AI-assisted process optimization would allow the enhanced accuracy, reliability, and quality of 3D printed dosage forms, reduce the time of formulation development, and shorten the number of experiments. The described AI-driven platform would be capable of designing individualized tablets, polypills, implants, and other complex systems for pharmaceutics.

Nevertheless, several key challenges and concerns should be addressed, including regulatory, data, printability, scalability, process validation, material, and quality aspects. The integration of AI and 3D printing would offer a major leap in developing flexible and efficient pharmaceutical manufacturing and is likely to play a critical role in promoting the personalized approach to drug delivery. The convergence of AI and 3D printing would help address the complex challenges of pharmaceutics, such as the design and fabrication of individualized pharmaceutical dosage forms.

Keywords: *Artificial Intelligence, 3D Printing, Personalized Medicine, Drug Delivery, Machine Learning, Pharmaceutical Formulation*

P-12/N/022 POSTER · ONLINE

AI-Designed drugs: Artificial Intelligence Discovering Medicines faster than Humans

Mohneet Kaur

ISF college of Pharmacy, Moga-142001, Pinjab, India
Email: dhotmohneet03@gmail.com

Artificial intelligence (AI) is being increasingly applied to pharmaceutical chemistry to discover new drug molecules. Drug discovery is a time- and resource-intensive process, and only a small percentage of compounds that enter the pipeline actually reach the market. AI and machine learning can analyze huge amounts of data and help medicinal chemists in the process of developing new drugs and finding new active substances. The purpose of this study is to explore the application of artificial intelligence in medicinal chemistry. The areas of application include quantitative structure-activity relationship (QSAR) analysis, structure-activity relationship (SAR), molecular docking, virtual screening, de novo design of bioactive molecules, generative AI, and ADMET prediction. AI can predict biological activity and physicochemical properties of compounds, find hits and lead molecules, design new molecules, and help in the optimization of lead compounds by reducing costly and time-consuming trial-and-error iterations. However, there are some challenges and limitations of applying AI in medicinal chemistry, such as the quality of data, validity of models, synthetic accessibility, accuracy of predictions, and experimental verification. Thus, AI is not expected to replace medicinal chemists but rather to serve as an efficient assistant. Therefore, AI can be a valuable addition to the existing methods in pharmaceutical chemistry, helping to find the most promising molecules with desired properties and reducing the time and cost of drug discovery.

Keywords: *medicinal chemistry, drug design, QSAR, structure activity relationship, molecular docking, de novo drug design, lead optimization.*

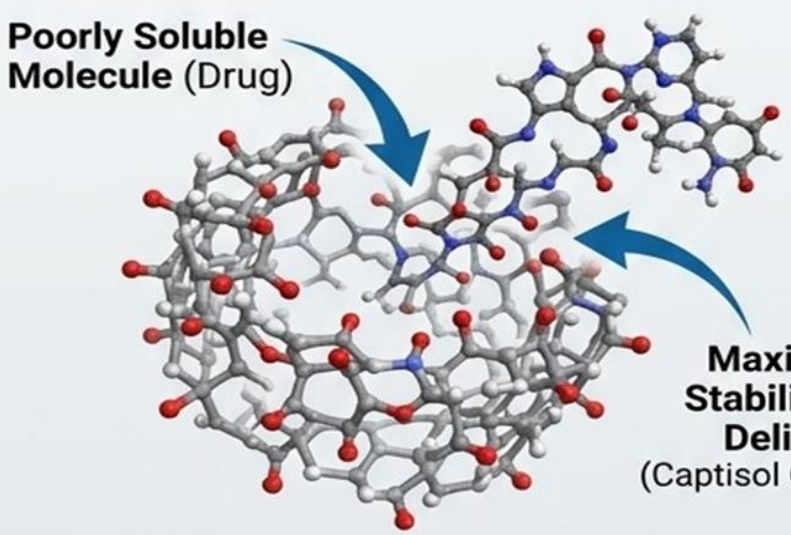
CAPTISOL®

CAPTISOL®
A Ligand Company

UNLOCK COMPLEX MOLECULES WITH THE INDUSTRY LEADER

Captisol® | The Leading Pharmaceutical-Grade Sulfobutylether Beta-Cyclodextrin **(SBECD)**

Developed by: CyDex Pharmaceuticals







PROVEN SUCCESS AT COMMERCIAL SCALE

1. **Market Validated:** Trusted in 18 FDA-approved products.
   VEKLURY® KYPROLIS®
2. **Formulation Versatility:** Parenteral, Subcutaneous, Oral, Ophthalmic, & more.
3. **Expanding Frontiers:** Consumer Health, Dietary Supplements, Personal Care.

COMPREHENSIVE DRUG DEVELOPMENT SUPPORT

Pre-Formulation & Feasibility	Solubility & Stability Evaluation	Regulatory & Clinical Consultation

ACCELERATED TESTING: THE CAPTISOL® FAST PROGRAM

Request a Free Sample: Assess with a free 20g sample or 10 mL vial.

Seamless Preclinical Transition: Discounted GMP, DMF, & LOA Access.

GET STARTED

Accelerate Your Formulation Strategy

Official Portal: captisol.com

(820) 645-7777
captisolnf@email

The Society of Cyclodextrins, Japan



The Cyclodextrin Society of Japan takes the initiative
in cyclodextrin research around the world by presenting achievements,
exchanging information,
and fostering intercommunication with researchers and engineers
from various fields in Japan and overseas.

Best Compliments from

The Society of Cyclodextrins, Japan

Biozenta
human helping human

biozenta®
human helping human

Biozenta Oncolix
human helping human

One of the leading and fastest growing pharmaceutical group of companies with its presence in multiple **therapy segment** like

Oncology/Cytotoxic and Critical Care/lifesaving medicines.

Biozenta plant are equipped with state of art, **WHO cGMP Certified, PIC/S Approved, EU GMP USFDA Approvable** facilities

Our Manufacturing Facilities

- Oncology Formulations Facility
- General Formulations Facility
- Hormone Facility
- API Manufacturing Facility (Oncology)

Major Dosage Forms

- Liquid Injectables
- Lyophilized Injectables
- Pre-filled Syringes (PFS)
- Tablets • Capsules
- Softgel Capsules • Oral Liquids



MERA BHARAT • MERA API • MERA R&D • MERA FORMULATION

Biozenta Global
human helping human

VISION 2030

EMPOWERING LIFE TOGETHER

PROPOSED INTEGRATED PHARMACEUTICAL MANUFACTURING & R&D CAMPUS

Bharat Beyond Borders

US FDA-APPROVED	50+	10+	100+	INTEGRATED	STRATAGIC FOCUS
ONCOLOGY & HORMONE MANUFACTURING CAMPUS	ONCOLOGY PRODUCTS FOR REGULATED MARKETS	BIOSIMILARS ON MAB'S IN DEVELOPMENT	COUNTRIES GLOBAL PRESENCE	API - FINISHED DOSAGE - US MARKET	ON INNOVATION AFFORDABILITY & PATIENTS ACCESS

GLOBAL ACCREDITATIONS

WHO · PIC/S · EDQM · IFDA · Republic of Iraq – Ministry of Health · Republic of Kenya Pharmacy and Poisons Board · Department of Drugs and Food Essential Drugs Bureau (Indonesia) · PMRA · LMHRA · TMDA · FDA Philippines · EFDA · National Medicines Regulatory Authority Jamaica

AWAITED ACCREDITATIONS

Federal Drugs Control Bureau of Russia · ANVISA · DIGEMID · invima · Ecuadorian Economic Zone (ZEDE)



Biozenta Lifescience Pvt. Ltd.

Formulation Unit-I (Oncology): Khasra No. 59, 60 & 61, Bela Bathri, Una, (HP) 174301, India.

API Unit-II: Plot No. 2A & 2B, Ph-1 & 2, Ind. Area, Tahliwal, Distt. UNA, (HP) 177201, India.

Admin Office: Plot E-177, Ind. Ph-VII, Mohali, SAS Nagar, (PB) 160055, India.

Regd. Office: 7/54, Anand Nagar, Sahayog Co OP HSG Soc Ltd. Building N0-7, Nehru Road, Anand Nagar, Santacruz East Mumbai - 400055, India.

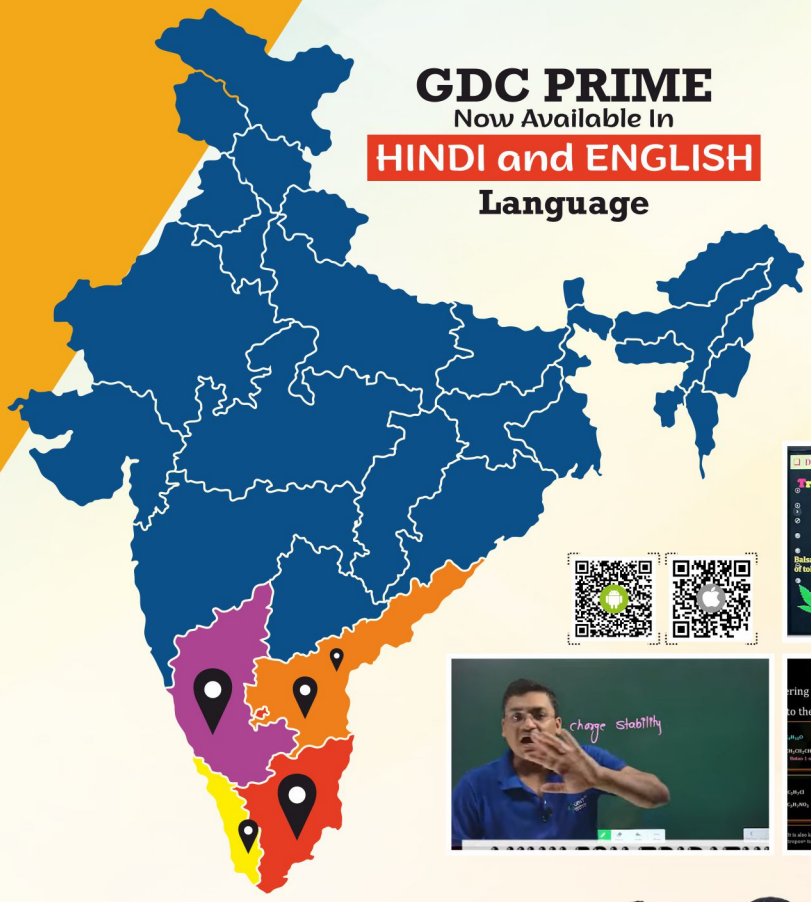
Biozenta Pharmaceuticals FZCO - 4W4-301-21, Third Floor, 4West A, DAFZ, UAE, Dubai.

dnsharma@biozenta.com | biozenta@gmail.com

Website: www.biozenta.com

+91 - 981 610 2847, +971 552 612847

GPAT DISCUSSION CENTER



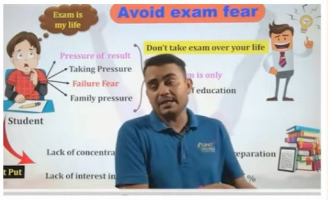
GDC PRIME
Now Available In
HINDI and ENGLISH
Language

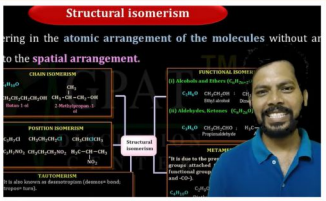
GDCprime
A Revolutionary way to Achieve

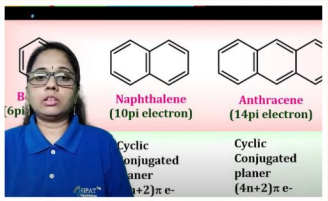
Start Your Preparation With
India's No.1 Pharma Institute

Classes by **EXPERT FACULTIES**











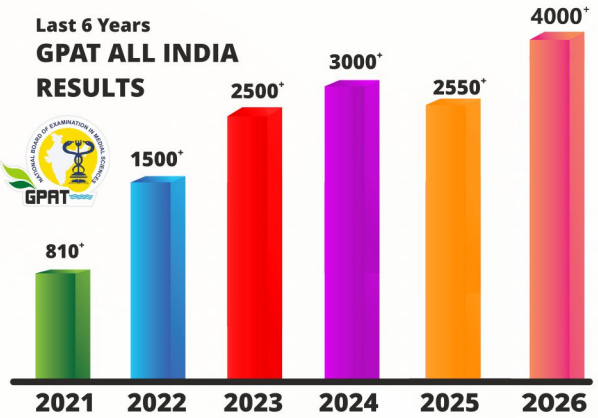
WHEN IT COMES TO YOUR CAREER

Your Success is Our Aim

RANKED NO. 1
Institute In Pharma Education

India's Best
Pharma Exam
Preparation Institute

Consistent Progress!



GDCprime
A Revolutionary way to Achieve
GPAT-2026

Selection in GPAT-2026 from GDC
4000+
8 Students in Top 10 Rank
79 Students in Top 100 Rank





RESULTS THAT SPEAK FOR THEMSELVES
सफलता की नई पहचान

For Help & Support Call 6263936320, 9343674693, 8810619859, 8602227444
3rd Floor, Shiv Hari Tower, Ashok Nagar, Sarkanda, Bilaspur, Pin : 495001
gdcgpat037@gmail.com | gdclive037@gmail.com www.gdclasses.com