

International Conference

ON
Embracing



In Pharma World

Theme:

*Redefining Education, Research & Industry
through Intelligent Innovation*

14th – 15th

November, 2025



SOUVENIR-CUM- ABSTRACT BOOK

Organized by

LLOYD INSTITUTE OF MANAGEMENT & TECHNOLOGY

Knowledge Park-II, Greater Noida, Uttar Pradesh, India-201306



ABOUT LLOYD

Established in 2004, Lloyd Institute of Management & Technology offers Diploma, Bachelor, and Master programs in Pharmacy, specializing in Pharmaceutics, Pharmaceutical Quality Assurance, and Pharmacology. Recognized for its quality education and student-centered approach, the Institute is approved by the Pharmacy Council of India (PCI) and affiliated to Dr. APJ Abdul Kalam Technical University (AKTU) and the Board of Technical Education, Uttar Pradesh.

Lloyd's B.Pharm. program is accredited by the NBA since 2018 and ranks in the 101-125 band in NIRF India Rankings-2025 for Pharmacy. The Institute was awarded "Best Pharmacy College in Uttar Pradesh-2021" by the Centre for Education Growth and Research (CEGR) for its outstanding contributions to education, skill development, and research. It has also achieved Diamond Band (Grade-A+) in Outcome-Based Education (OBE) and in Research Excellence Rankings in 2023 and was awarded Gold Band in Employability and Startup Ecosystem Excellence. In addition, Lloyd is recognized as a Scientific and Industrial Research Organization (SIRO) by the Department of Scientific and Industrial Research, Government of India, and is an approved Research Centre for AKTU.

The Institute emphasizes holistic education through initiatives like Community Pharmacy Division, Personality Development Program, Corporate Readiness Classes, and industry-based training. Lloyd offers hands-on learning experiences, including expert talks, industrial visits, and skill-development activities. A dedicated placement team ensures job opportunities for students, including an annual Job Fest that attracts participants from across India.

"The Lloyd Group also provides programs in Engineering, Management, Law, and Education and regularly hosts national and international conferences to bridge academia and industry:

ABOUT CONFERENCE

The pharmaceutical industry stands at the cusp of a transformative era, where Artificial Intelligence (AI) is no longer a distant concept but **an essential driver of innovation, efficiency, and precision. From accelerating drug discovery and optimizing clinical trials to enhancing manufacturing processes and strengthening pharmacovigilance, AI is redefining the boundaries of what is possible in healthcare.**

This conference will bridge the gap between academia, industry, technology innovators, and policymakers. It will create an engaging platform for knowledge exchange, collaborative ideation, Innovation showcase and skill enhancement in this rapidly evolving field.

CONFERENCE OBJECTIVES

- ◆ Explore the advancements in AI applications across the pharmaceutical value chain.
- ◆ Foster collaboration between academia, industry, and technology providers to accelerate innovation.
- ◆ Enhance academic curricula by integrating AI literacy and practical exposure for pharma faculty and students.
- ◆ Promote responsible AI adoption ensuring ethical, transparent, and regulatory-compliant practices.
- ◆ Create a knowledge repository for sustainable AI-driven solutions in drug discovery, diagnostics, manufacturing, and safety.
- ◆ To encourage dialogue and networking among researchers, industry experts, policymakers, and academicians.

CONFERENCE HIGHLIGHTS

- ◆ **Plenary Sessions by Global Experts on Cutting-Edge AI Applications:** Showcasing real-world use cases in drug discovery/ clinical trials/ pharmacovigilance/ supply chain/ patient-centric care/Digital twins / Watson.
- ◆ **Preconference Interactive Workshops:** Hands-on training on AI tools, machine learning algorithms, and data analytics platforms for pharma professionals.
- ◆ **Panel Discussions by Academicians & Industry Experts:** Insightful sessions by leading AI researchers, pharmaceutical scientists, regulatory authorities, and industry pioneers.
- ◆ **Networking Opportunities:** Meet and collaborate with delegates from academia, industry, healthcare, and government bodies.
- ◆ **Scientific Sessions:** Invited talks/Oral/ Poster Presentations– Platform for researchers and students to present innovative AI-pharma projects and get expert feedback.



MESSAGES

Anandiben Patel
Governor, Uttar Pradesh



Raj Bhavan
Lucknow - 226 027

12 November, 2025



MESSAGE

I am pleased to learn that Lloyd Institute of Management and Technology, Greater Noida, is organizing an International Conference on "Embracing AI in Pharma World" on 15th November 2025. The theme, "Redefining Education, Research, and Industry through Intelligent Innovation," is both timely and significant in today's rapidly advancing technological landscape.

Conferences like this play a vital role in fostering collaboration among academicians, researchers, professionals, and industry leaders to explore emerging possibilities and translate knowledge into meaningful societal outcomes. I am confident that the deliberations of this conference will generate valuable insights and innovative approaches, contributing to the nation's vision of Viksit Bharat through progress in science, technology, and healthcare.

I extend my best wishes to the organizers, delegates, and participants for the grand success of the conference and for their continued pursuit of academic and professional excellence.

Anandiben Patel
(**Anandiben Patel**)



अनुप्रिया पटेल
ANUPRIYA PATEL



राज्य मंत्री
स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक
भारत सरकार
MINISTER OF STATE
HEALTH & FAMILY WELFARE
AND CHEMICALS & FERTILISERS
GOVERNMENT OF INDIA



MESSAGE

It gives me immense pleasure to know that Lloyd Institute of Management and Technology is organizing an International Conference on the theme "Embracing AI in Pharma World", on November 15, 2025, at its campus in Greater Noida, Uttar Pradesh.

I am sure the event will provide a unique opportunity for the convergence of national and international researchers, scientists, and specialists from various research and development domains. It will serve as a platform for experts from around the globe to engage in comprehensive discussions on the integration of artificial intelligence in the pharmaceutical and healthcare sectors, and its far-reaching impact on innovation and global health.

I anticipate that distinguished speakers will address this theme from a variety of perspectives, offering critical insights and exploring potential solutions to some of the most pressing challenges facing the healthcare and pharmaceutical industries today.

I am honored to assert that this conference will contribute significantly to the ongoing efforts toward technological advancement, sustainable development, and improved healthcare outcomes.

My best wishes go out for the resounding success of this event.

Warm Regards,

Anupriya Patel

आशीष पटेल मंत्री

प्राविधिक शिक्षा एवं उपभोक्ता मामले
उत्तर प्रदेश



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विधान भवन, मुख्य भवन, कक्ष सं. 86, 87
दूरभाष : कार्यालय : 0522-2238124
आवास : 0522-2235211
आवास : 1-ए, माल एवेन्यू, लखनऊ
दिनांक : 10.11.2025



MESSAGE

I am pleased to extend my warm greetings and best wishes for the 5th International Conference on “**Embracing AI in Pharma World,**” being organized on 15th November 2025 at Lloyd Institute, Greater Noida.

This conference serves as a commendable platform for knowledge sharing and thought leadership at the intersection of artificial intelligence and the pharmaceutical industry. The theme, “**Embracing AI in Pharma World,**” aptly underscores the transformative potential of AI in advancing healthcare innovation, promoting sustainable growth, and shaping the future of medical sciences.

I am confident that the deliberations at this conference will lead to valuable insights, foster meaningful collaborations, and contribute significantly to strengthening research, education, and industrial practices in the pharma and healthcare sectors.

I convey my best wishes to the organizers and participants for a successful, enriching, and inspiring conference.

(Ashish Patel)



प्रो. टी. जी. सीताराम
अध्यक्ष

Prof. T. G. Sitharam

FNAE, DGE, FASCE, FICE (UK)
Ph.D. (Univ of Waterloo, Canada), D.Sc
Post Doc (Univ of Texas, @Austin USA)

Chairman



सत्यमेव जयते

अखिल भारतीय तकनीकी शिक्षा परिषद्

(भारत सरकार का एक सांविधिक निकाय)

(शिक्षा मंत्रालय, भारत सरकार)

नेल्सन मंडेला मार्ग, वसंत कुंज, नई दिल्ली-110070

दूरभाष : 011-26131498

ई-मेल : chairman@aicte-india.org

ALL INDIA COUNCIL FOR TECHNICAL EDUCATION

(A STATUTORY BODY OF THE GOVT. OF INDIA)

(Ministry of Education, Govt. of India)

Nelson Mandela Marg, Vasant Kunj, New Delhi-110070

Phone : 011-26131498

E-mail : chairman@aicte-india.org

Message

It gives me immense pleasure to learn that Lloyd Institute of Management and Technology, Greater Noida, is organizing an International Conference on the theme "Embracing AI in Pharma World" in collaboration with IBM Career Education and the Indian Pharmaceutical Association-Delhi State Branch.

Artificial Intelligence has emerged as a transformative force across disciplines, and the pharmaceutical sector is no exception. From accelerating drug discovery and optimizing clinical trials to enhancing patient care and supply chain management, AI holds the potential to revolutionize the healthcare ecosystem. The integration of AI with pharmaceutical sciences not only improves efficiency but also ensures greater accessibility and affordability of healthcare solutions, ultimately benefiting society at large.

I am delighted to note that this conference aims to bring together distinguished academicians, researchers, industry leaders, and innovators to deliberate on the opportunities and challenges that AI brings to the pharma world. Such dialogues are essential to fostering interdisciplinary collaboration, nurturing innovation, and preparing a future-ready workforce capable of leveraging technology for human welfare.

I extend my heartfelt congratulations to the organizers for conceptualizing this timely and relevant event. I am confident that the discussions and outcomes of the conference will contribute significantly to the advancement of pharmaceutical education, research, and practice in India and beyond.

I wish the conference grand success and all participants fruitful deliberations.

Warm regards.


(Prof. T.G. Sitharam)

टाटा सामाजिक विज्ञान संस्थान
TATA INSTITUTE OF SOCIAL SCIENCES

मानित विश्वविद्यालय / A Deemed to be University
शिक्षा मंत्रालय, भारत सरकार के अधीन एक अनुदान प्राप्त संस्थान
A Grant-in-Aid Institute under Ministry of Education, Govt of India



प्रोफेसर धीरेन्द्र पाल सिंह

Professor D. P. Singh

कुलाधिपति / Chancellor

पूर्व अध्यक्ष, विश्वविद्यालय अनुदान आयोग

Former Chairman, UGC



Date: 11th Nov. 2025

MESSAGE

I am delighted to extend my wholehearted congratulations to Lloyd Institute of Management and Technology for their commendable initiative in organizing the International Conference titled “Embracing AI in Pharma World”, scheduled for 15th November 2025, at their prestigious campus in Greater Noida, Uttar Pradesh, India.

This conference is a testament to the institute’s vision and dedication to advancing knowledge and fostering innovation in the pharmaceutical and healthcare sectors. By focusing on the transformative potential of artificial intelligence, the event underscores the vital role of emerging technologies in addressing global health challenges and shaping a smarter, more sustainable future.

Bringing together scholars, industry leaders, researchers, and innovators, this conference provides an invaluable platform for the exchange of pioneering ideas, collaborative learning, and forward-thinking solutions. I am confident that the deliberations and outcomes of this event will pave the way for impactful advancements in research, practice, and policy.

I extend my best wishes for the grand success of this conference. May it inspire transformative ideas, strengthen cross-sectoral partnerships, and contribute meaningfully to the sustainable growth of the pharmaceutical and healthcare landscape.

Prof. D. P. Singh

वी.एन. पुरव मार्ग, देवनार, मुम्बई 400088

V.N. Purav Marg, Deonar, Mumbai 400088

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Dr. G.N. Singh
Advisor
to Hon'ble CM, UP &
Former-DCGI



Office : Room No. 501-502
Lal Bhadur Shastri Bhawan,
Lucknow
☎ 0522-2215514
email:advisorfsda@gmail.com



I am pleased to learn that Lloyd Institute of Management and Technology is organizing the International Conference titled, “Embracing AI in Pharma World”, on 15th November 2025, at Lloyd Institute, Greater Noida, Uttar Pradesh, India.

This conference is a commendable initiative that highlights the institute's commitment to advancing research, innovation, and sustainable development. The chosen theme is both timely and crucial, addressing the integration of artificial intelligence and innovation to revolutionize the pharmaceutical and healthcare sectors.

Such events provide a vital platform for academicians, researchers, and industry leaders to exchange ideas, share knowledge, and collaborate toward solving the pressing challenges of our time. I am confident that this conference will foster meaningful discussions and generate valuable insights that contribute to a sustainable future.

My best wishes to the organizing team, participants, and speakers for a successful and impactful conference. May it serve as a source of inspiration and a catalyst for transformative progress in these critical fields.

Warm Regards,


(Dr G N Singh)

प्रो० जय प्रकाश पाण्डेय
कुलपति
Prof. Jai Prakash Pandey
Vice Chancellor



डॉ० ए०पी०जे० अब्दुल कलाम प्राविधिक विश्वविद्यालय
उत्तर प्रदेश, लखनऊ
Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
Uttar Pradesh, Lucknow



Date: 16.10.2025

MESSAGE

I am delighted to know that the Lloyd Institute of Management and Technology, Greater Noida, is organizing International Conference on "Embracing AI in Pharma World", to be held on 15th November 2025

The theme of this conference aligns seamlessly with the evolving priorities of modern education and research, emphasizing the synergy between cutting-edge technology, innovation, and sustainable development. I am confident that this event will make a meaningful contribution to interdisciplinary progress and inspire forward-thinking initiatives across academia, industry, and policy.

This conference offers a dynamic platform for scholars, researchers, and industry experts from around the world to come together, share insights, and engage in transformative dialogue. Such collaborative exchanges are essential for reimagining how we integrate technology in education and healthcare to meet the complex challenges of our era. I firmly believe that the knowledge, perspectives, and innovative ideas shared during this event will not only enrich academic discourse but also shape future research directions and policy decisions.

May this International Conference ignite new ideas, forge lasting collaborations, and contribute significantly to the global advancement of education, research, healthcare, and sustainable technologies.

(Prof. Jai Prakash Pandey)
Vice Chancellor

भारतीय भेषज संहिता आयोग

स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार
सैक्टर - २३, राज नगर,
गाजियाबाद - २०१ ००२, उत्तर प्रदेश, भारत



INDIAN PHARMACOPOEIA COMMISSION

Ministry of Health & Family Welfare, Government of India
Sector - 23, Raj Nagar
Ghaziabad-201 002 (U.P.), INDIA

डॉ. वी. कलईसेल्वन

सचिव-सह-वैज्ञानिक निदेशक

F.No.IPC/1010/2025-26



Dr. V. Kalaiselvan,

Secretary-cum-Scientific Director

Dated 17th October, 2025

MESSAGE

It is with great pleasure that I extend my warm greetings and best wishes for the International Conference on "Embracing AI in Pharma World" being organized at Lloyd Institute, Greater Noida, on 15th November 2025.

Artificial Intelligence is no longer at the periphery of pharmaceutical sciences-it is rapidly becoming central to how we discover drugs, ensure quality, and deliver healthcare. This timely conference addresses a critical imperative: to understand, adopt, and responsibly integrate AI into every facet of pharmaceutical practice while upholding the rigorous standards that safeguard public health.

At the Indian Pharmacopoeia Commission, our mission is to establish and maintain standards that guarantee the quality and safety of medicines. As AI technologies evolve, we recognize tremendous opportunities-from predictive analytics in quality control to AI-assisted formulation development, from automated pharmacovigilance to intelligent regulatory documentation. Yet, with these opportunities comes profound responsibility. We must ensure that innovation enhances, rather than compromises, the rigorous standards that protect public health.

I commend Lloyd Institute for convening this significant conference that brings together diverse stakeholders-academicians, researchers, industry leaders, and students to collectively explore how AI can transform pharmaceutical education, research, and manufacturing while upholding the highest standards of quality and patient safety.

The knowledge shared and partnerships forged during this conference will contribute significantly to shaping a future where cutting-edge technology and pharmaceutical excellence work in harmony. As we embrace AI in the pharma world, let us remain steadfast in our commitment to making quality medicines accessible, affordable, and available to every citizen of our nation.

May this conference inspire fresh thinking, forge lasting partnerships, and contribute meaningfully to a healthier, more innovative future for pharmaceutical sciences and healthcare.

Best Wishes!

(Dr. V. Kalaiselvan)

INDIAN PHARMACOPOEIA
(IP)
Official Book of Drug Standards
in India

IP REFERENCE SUBSTANCES
(IPRS) AND IMPURITIES
Official Physical Standards for
Assessing the Quality of Drugs

NATIONAL FORMULARY OF INDIA
(NFI)
Reference Book to Promote Rational
Use of Generic Medicines

PHARMACOVIGILANCE PROGRAMME OF INDIA
(PvPI)
 WHO Collaborating Centre for Pharmacovigilance
in Public Health Programmes and Regulatory
Services

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ASSOCIATION OF PHARMACEUTICAL TEACHERS OF INDIA (NATIONAL BODY)

Head Quarter: Bengaluru.

Secretariat/Communication Address:

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Bangalore – 560035, Karnataka state, India

Email: aptienquiry@gmail.com & aptipresident1@gmail.com **Website:** <http://www.aptiindia.org>

MESSAGE

Dear Esteemed Colleagues and Participants,

Greetings...!

With great pleasure and sincere appreciation, I extend my heartfelt congratulations and best wishes for the success of the International Conference on “**Embracing AI in Pharma World,**” scheduled for 15th November 2025 at the **Lloyd Institute of Management and Technology, Greater Noida.**



The convergence of artificial intelligence and pharmaceutical innovation marks a transformative era in healthcare. The theme of this conference is both timely and significant, reflecting a forward-looking vision that embraces technological advancement while prioritizing sustainable development. It is commendable that this forum not only fosters high-level academic and industry discourse but also supports capacity-building for educators and researchers—empowering them to integrate AI-driven approaches into curriculum design, scientific exploration, and problem-solving.

This gathering of leading experts, scholars, and professionals offers a unique platform for interdisciplinary collaboration and knowledge exchange. Such engagement is essential to addressing complex global challenges, driving research excellence, and shaping the future of healthcare education and practice. The conference's outcomes will undoubtedly contribute to strengthening institutional frameworks, inspiring innovation, and guiding policy direction in the pharmaceutical and healthcare sectors.

I am confident that the insights generated during this event will spark meaningful progress and enduring impact across academia, research, and industry. Wishing the organizers, participants, and collaborators a highly successful and impactful conference.

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.

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THE INDIAN PHARMACEUTICAL ASSOCIATION (DELHI STATE BRANCH)

(2025 – 2027)

Secretarial Office: 575, Mandakini Enclave Colony, Alaknanda, New Delhi-110 019

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Date: 01st November 2025

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Dr. Ankur Kaul

Dr. Kailash C. Petkar

Mr. K. Sreekumar

MESSAGE

It gives me immense pleasure to extend my best wishes for the grand success of the 5th International Conference on “Embracing AI in Pharma World,” scheduled to be held on 15th November 2025 at Lloyd Institute, Greater Noida.

The conference theme underscores the transformative potential of artificial intelligence and innovation in tackling the pressing challenges faced by the pharmaceutical and healthcare sectors. It embodies a visionary approach that resonates with the global imperative for sustainable development, emphasizing the critical role of advanced technologies in improving healthcare outcomes while promoting responsible and sustainable practices.

As the President, Indian Pharmaceutical Association (Delhi State Branch), I sincerely commend the Lloyd Institute for Management and Technology for their commitment to organizing such a vital and timely event. This conference offers a distinguished platform for academicians, industry pioneers, and researchers to share insights, foster meaningful collaborations, and chart innovative pathways toward a healthier and more sustainable future.

I am confident that this initiative will have a profound and lasting impact by inspiring cutting-edge research, encouraging interdisciplinary cooperation, and strengthening the nexus between education, technology, and healthcare. My heartfelt congratulations go to the organizers, speakers, and participants for their dedication and passion toward advancing this noble cause.

Wishing the conference every success and a lasting legacy in the pharmaceutical and healthcare domains.

Warm regards,

Dr. Saurabh Arora

President, Indian Pharmaceutical Association (Delhi State Branch)

Email: saurabharora@arbropharma.com

MESSAGE FROM PRESIDENT

I am happy to extend my heartfelt congratulations and best wishes for the resounding success of the 5th International Conference on “Embracing AI in Pharma World,” scheduled for 15th November 2025 at the Lloyd Institute, Greater Noida. This prestigious event stands as a vital forum for pioneering dialogue on the integration of artificial intelligence within the pharmaceutical and healthcare sectors, heralding a new era of innovation and sustainable development.



The conference brings together an esteemed assembly of global experts, distinguished thought leaders, and leading researchers, creating a unique confluence of knowledge, expertise, and visionary perspectives. Such a gathering is essential for advancing interdisciplinary collaborations that drive cutting-edge solutions addressing complex challenges in drug discovery, patient care, and healthcare delivery systems.

As we stand at the cusp of transformative change fueled by AI and technological advancements, this conference promises to catalyze groundbreaking ideas that will shape the future trajectory of pharmaceutical sciences and healthcare innovation. The rich exchange of insights and experiences shared here will undoubtedly contribute to the evolution of academic research, industry best practices, and policy frameworks, ultimately fostering sustainable and inclusive growth across the sector.

I extend my best wishes to the organizers, speakers, and participants for a highly productive and inspiring conference. May this event serve as a beacon for innovation, collaboration, and progress, creating enduring impacts that propel the pharmaceutical and healthcare industries towards a smarter, more efficient, and patient-centric future.

Manohar Thairani
President,
Lloyd Group of Institutions

MESSAGE FROM GROUP DIRECTOR

It is with great pleasure and excitement that I extend a warm welcome to all participants of the International Conference on “Embracing AI in Pharma World”, scheduled for the 14th and 15th of November 2025, at the Lloyd Institute of Management and Technology.

As the Chief Strategy Officer and Head of Growth at Lloyd Group of Institutions, I am thrilled to witness this extraordinary convergence of visionary minds, pioneering researchers, industry leaders, and aspiring professionals all united by a shared commitment to exploring how Artificial Intelligence is transforming the landscape of the pharmaceutical and healthcare industries.

This conference serves as a vibrant platform for collaboration, knowledge exchange, and innovation. The integration of AI into the pharma world holds the potential to revolutionize drug discovery, clinical research, personalized medicine, and patient care. By bringing together academia, industry, and policy experts, we aim to foster dialogue that not only celebrates technological advancements but also emphasizes ethical, sustainable, and human-centered applications of AI.

I am confident that the deliberations over these two days will inspire new ideas, spark collaborations, and lay the groundwork for impactful innovations that can shape the future of global healthcare.

On behalf of the Lloyd Group of Institutions, I extend my heartfelt appreciation to all keynote speakers, delegates, organizers, sponsors, and participants for being part of this important event. Your engagement and insights will undoubtedly make this conference a remarkable success.

Welcome once again to “Embracing AI in Pharma World” let us learn, innovate, and lead together toward a smarter and healthier tomorrow.

Prof. Vandana Arora Sethi

Chief Strategy Officer &
Head of Growth,
Lloyd Group of Institutions



**EMINENT GUESTS
&
SPEAKERS**



Prof. D. P. Singh is a distinguished academic leader and educationist who has made transformative contributions to Indian higher education over a career spanning nearly four decades. He served as Chairman of the University Grants Commission (UGC) from 2018 to 2021, steering national policies and reforms to strengthen quality, access, and equity in higher education. Prior to this, he held several prestigious leadership positions, including Vice-Chancellor of three universities and Director of the National Assessment and Accreditation Council (NAAC), Bangalore, where he played a pivotal role in institutional quality assurance and accreditation frameworks. Prof. Singh has also served as an ex-officio member of key national bodies such as the Central Advisory Board of Education (CABE), the Indian Council for Cultural Relations (ICCR), the Indian National Commission for Cooperation with UNESCO, and the Implementation Committee of the National Education Policy (NEP) 2020, contributing significantly to shaping education policy and governance at the national and international levels. In recognition of his visionary leadership and enduring service to academia, Prof. Singh has been honoured with numerous awards, including the Environment Leadership Award, the Nation Builder Award, and the Raja Balwant Singh Shiksha Samman, among others.

PROF. D.P. SINGH

Education Advisor to Hon'ble Chief Minister,
Govt. of Uttar Pradesh &
Chancellor, Tata Institute of Social Sciences



Dr. G. N. Singh, a distinguished pharmaceutical scientist and regulatory expert, currently serves as Advisor to the Hon'ble Chief Minister of Uttar Pradesh and is the Former Drugs Controller General of India (DCGI). He earned his Ph.D. in Pharmaceutical Sciences from Banaras Hindu University in 1987 and an MBA from the University of Hull, U.K. in 1997. Dr. Singh was the first Secretary-cum-Scientific Director of the Indian Pharmacopoeia Commission (IPC) and held the additional charge of Drugs Controller General (India) under the Ministry of Health and Family Welfare until 2018. Throughout his illustrious career, he has served on numerous national and international committees, including the Drugs Technical Advisory Board, Drugs Consultative Committee, Expert Core Committee for the National List of Essential Medicines, and the Pharmacy Council of India (PCI), among others. He also contributes his expertise as a member of advisory boards in various academic institutions. Dr. Singh's vision is to establish a robust, independent, and globally respected Indian Drug Regulatory System, driven by his unwavering commitment to ensuring the availability of high-quality, safe, and effective drugs and medical devices for the global community.

DR. G.N. SINGH

Advisor to Hon'ble Chief Minister,
Govt. of Uttar Pradesh &
Former Drugs Controller General of India (DCGI),
Govt. of India





Mr. Vipul comes with more than 20 years of robust experience in various domains of Regulatory and Corporate Affairs in various Pharmaceutical companies. He has varied experience in Policy Advocacy, Expedited Regulatory Approvals, Regulatory strategies, operations, and compliance for India and Emerging markets. He is an experienced Professional in Policy advocacy and represented on various policy issues like Orphan drug Regulations in India, OTC regulations etc. Mr. Vipul has worked for companies like Takeda, Roche, Cipla, Glenmark, Baxter, Ranbaxy and Novartis in the past. He is currently working with Cipla, Vice President & Head-Corporate Affairs & Policy based in New Delhi

MR. VIPUL GUPTA

Vice President & Head-Corporate Affairs & Policy,
Cipla Limited



Professor Ramesh K. Goyal is a distinguished academician and researcher with over 46 years of experience in teaching, research, and academic leadership. He has served as Vice Chancellor of Delhi Pharmaceutical Sciences and Research University (2016–2024) and The Maharaja Sayajirao University of Baroda (2008–2011), and held key roles at institutions including NMIMS University, Ahmedabad University, and ITM-SLS University. A post-doctoral scholar from the University of British Columbia and University of Manitoba, Canada, he has also been honored as Honorary Professor at Stavropol State Medical University, Russia, and Distinguished Professor at UCSI University, Malaysia. Prof. Goyal has authored over 450 research papers (h-index 52), 45 books and book chapters, holds six patents, and has guided 50 Ph.D. and over 220 postgraduate students. Listed among the world's top 2% scientists by Stanford University–PLOS, he has delivered more than 370 invited lectures worldwide. He led the discovery of a COVID-19 formulation approved by the Government of India and has received over 80 national and international awards. Prof. Goyal has served as President of several professional societies including the Indian Pharmacological Society and Society of Pharmacovigilance, India. He is currently President of the International Academy of Cardiovascular Sciences (India Section). He has also contributed as expert member and chair in national scientific bodies such as ICMR, IPC, CDSCO, AICTE, NBA, and NAAC. Presently, he serves as Chairman of the Scientific Advisory Group of the National Dope Testing Laboratory, Sports Authority of India

PROF. RAMESH K. GOYAL

Former Vice Chancellor,
Delhi Pharmaceutical Sciences and
Research University (DPSRU), New Delhi





Prof. R.K. Khar is a distinguished academician and research scientist currently serving as the Director at B.S. Anangpuria Institute of Pharmacy. He earned his B.Pharm and M.Pharm degrees from Dr. Hari Singh Gour Vishwavidyalaya. His academic journey includes a Ph.D. fellowship under the Indo-Bulgaria cultural exchange programme. Prof. Khar dedicated 37 years to Jamia Hamdard as Dean and HOD of the Faculty of Pharmacy, Dean Students Welfare, Placement officer, and Proctor. His extensive academic contributions include supervising 72 Ph.D. and 110 M. Pharm thesis and publishing over 301 research papers in international and national journals. Prof. Khar holds 14 Indian and 2 US patents and has authored 10 textbooks and 2 reference chapters. Elected as a Fellow of the Indian Pharmaceutical Association, Prof. Khar received the "Teacher of the Year Award in 2002" from the Indian Pharmaceutical Teachers Association. Additionally, he has been honored with the Best Cited Paper Award in 2011 and 2012 by the European Journal of Pharmaceutics and Biopharmaceutics.

PROF. ROOP KRISHEN KHAR

Emeritus Professor and Advisor, Anangpuria Group of Institutions,
Faridabad, Haryana &
Former Dean and HOD, Jamia Hamdard, New Delhi



Dr. Arun Nanda is a graduate and post graduate in Pharmacy from Delhi University, Delhi, Doctorate from Jamia Hamdard, Delhi, and has also graduated in Law (LL.B), from M.D. University, Rohtak. Dr. Nanda has been into teaching right after his M. Pharm., and has served a number of Universities and private colleges in various capacities, with more than 35 years of teaching experience. He has written two books, six book chapters, authored 156 papers in national and international journals and has widely delivered lectures on various topics in Pharmacy. He has successfully supervised 17 Ph.D. scholars in the areas of Novel Drug Delivery Systems and Drug Regulatory Affairs. He was Principal Investigator in UGC SAP Programme at M.D. University, Rohtak. He is a Registered Scientific Advisor under Patents Rules, 2003, in Pharmaceuticals, with Government of India. Prof. Nanda had been Chairman, IAEC; Director, Aryabhata Central Instrumentation Laboratory, Dean R & D, member, Executive Council, and member of various academic / administrative bodies, at M.D. University, Rohtak. He has been associated with several Universities, as member of the Board of Studies / Selection Committee / Research Committee, and also at UGC, New Delhi, AICTE, New Delhi, PCI, New Delhi, CSIR, National Board of Accreditation (NBA), New Delhi, National Assessment and Accreditation Council (NAAC), Delhi, etc. Prof. Nanda is a life member of various professional bodies, such as IPA, IPGA, APTI and IHPA, in India. He has been on the panel (as Referee) of various national and international journals of repute, in Pharmacy and allied disciplines. Prof. Nanda retired as Senior Professor from M.D. University, Rohtak, in Dec. 2024 and is presently re-employed as a Professor in Department of Pharmaceutical Sciences, M.D. University, Rohtak.



PROF. ARUN NANDA

Professor, Department of Pharmaceutical Sciences,
Maharshi Dayanand University, Rohtak, Haryana



Dr. Vandana B. Patravale, fellow of Indian National Science academy (INSA), National academy of Sciences, India (NASI) and Indian National academy of engineers (INAE); is currently a Professor of Pharmaceutics at the Institute of Chemical Technology, Mumbai, India. She has more than 30 years of teaching and research experience. She has over 200 refereed publications and is listed consecutively in top 2% of World Scientist's in Pharmacy from the list published by Stanford University. Her areas of research include development of nanocarriers with major emphasis on infectious diseases, cancer and neurodegenerative disorders; medical device development, nanodiagnostics and nanovaccines. She is a recipient of several awards. Dr. Vandana is actively collaborating with researchers as well as industries within country and abroad and has completed Indo-Swiss, Indo-Ireland, Indo-Japan, Indo-UK projects. She is executing all major grants from Indian Government focusing on product development besides projects from USA and Europe being currently undertaken. She has transferred about 20+ technologies to industry including drug eluting stents being marketed in more than 65 countries.

PROF. VANDANA B. PATRAVALE

Professor, Dept. of Pharmaceutical Sciences and Technology,
Institute of Chemical Technology (Deemed University),
Mumbai, Maharashtra



Farhan Jalees Ahmad, PhD, is an internationally known researcher. He has 30 years experience in Research and Teaching. The focus of his group is in Nanomedicine and many of his nano products have been transferred to the Defense Services. He has been granted projects worth rupees 5.5 crores (DBT, CCRUM, AYUSH, UGC, DST and International agencies like FIP and OPCW). He has more than 650 publications, 20 Book chapters, 23 books and has a US patent, three PCTs and 24 Indian patents. With a total Citations of 24500, H-Index of 77 and i-10 index of 395. He has supervised 43 PhD scholars. He has earned many accolades including Scientist of the Year-2005 from NESa, UGC Research Award 2011, Bharat Jyoti Award 2011, Pharma Ratan 2017, ABAP Senior Scientist Award 2017 and Fellow of the Islamic World Academy of Sciences, Fellow of Indian Pharmaceutical Association 2022. He is member of bodies like IPA, APTI, NESa, MAAS, IPGA, IHPA, CRS and ICA. He has served IPA as President for two terms. He has also served as General Secretary for SPDS, North chapter.

PROF. FARHAN J. AHMAD

Professor, Dept. of Pharmaceutics & Former Dean,
School of Pharmaceutical Education & Research,
Jamia Hamdard, New Delhi





Professor Sanju Nanda, Former HOD, Dean, and Chairman of the Faculty of Pharmaceutical Sciences at Maharshi Dayanand University, Rohtak, holds a B.Pharm and M.Pharm from Dr. Hari Singh Gour Vishwavidyalaya, Sagar, a Ph.D. from IIT Delhi, and an LLB (Hons.) from MDU, Rohtak. With over 30 years of teaching and 19 years of research experience, she has guided numerous scholars, published over 110 papers, and authored six books, including the renowned Cosmetic Technology. Her research focuses on bioorganic molecules for cosmeceutical use, plant-based dosage forms, and regulatory affairs. She has held several administrative positions and served on elite academic and regulatory committees such as NBA, NAAC, AICTE, and PCI. A distinguished speaker with over 125 talks worldwide, including at the Government of South Korea's International Conference, she has received multiple awards, including the Illustrious Alumnus Award, recognition on the "Women in Science" Desk Calendar (2019), and inclusion in Stanford University's 2024 list of the world's Top 2% scientists.

PROF. SANJU NANDA

Former Dean & HOD,
Faculty of Pharmaceutical Sciences,
Maharshi Dayanand University, Rohtak, Haryana



Prof. Harvinder Popli is a distinguished academician and industry leader with over 35 years of experience in the pharmaceutical sector. She serves as a Professor at the Delhi Pharmaceutical Sciences and Research Institute (DPSRU) and is Incharge of the DPSRU Innovation and International Affairs. Beginning her career in academia in 1991 and later contributing significantly to Ranbaxy Laboratories in strategic management and global collaborations, she has seamlessly bridged industry and academia. As a mentor and innovator, she has guided over 30 startups and facilitated 14 product launches, demonstrating her commitment to entrepreneurship and research. Her leadership roles, including Dean of Research & Innovation and President of various professional bodies, reflect her dedication to advancing pharmaceutical education and industry partnerships. Widely recognized for her contributions, she has received numerous national and international awards, authored books and patents, and is regarded among the top global professionals in life sciences business development.

PROF. HARVINDER POPLI

Former Dean, Research Innovation & International Affairs,
Delhi Pharmaceutical Sciences and
Research University (DPSRU), New Delhi





Dr. Jai Prakash serves as the Senior Principal Scientific Officer at the Indian Pharmacopoeia Commission (IPC), Ghaziabad, India, where he plays a key role in maintaining and promoting high-quality standards for pharmaceuticals. His contributions are integral to the commission's mission of ensuring the safety, efficacy, and quality of drugs included in the Indian Pharmacopoeia. Through his active involvement in seminars and initiatives focused on IP standards and the collaboration between regulatory bodies and academia, Dr. Prakash works to strengthen the scientific and regulatory framework that supports the pharmaceutical industry in India.

DR. JAI PRAKASH

Senior Principal Scientific Officer,
Indian Pharmacopoeia Commission (IPC),
Ministry of Health & Family Welfare, Govt. of India



After completing his post-graduation in Pharmaceutical Sciences in 1996, Mr. Bhausahab Patil began his professional journey in the emerging field of clinical research in India. Over the years, he has built an impressive career marked by leadership and innovation in the global pharmaceutical sector. He currently serves as the Senior Director of Strategic Operations at IQVIA, United Kingdom, where he plays a pivotal role in driving clinical and strategic initiatives. In addition to his corporate responsibilities, Mr. Patil contributes to academia and social development as an Advisor to BSCER, a non-profit organization in Pune, India, and as a Member of the Board of Studies at KIET Group of Institutions, Ghaziabad, and Krishna Institute of Pharmacy, Karad. Committed to inspiring the next generation of scientists, he actively participates in the STEM Ambassador Program in collaboration with the UK Government, promoting science and technology education by introducing STEM role models into schools. His career exemplifies dedication to advancing pharmaceutical research, education, and global collaboration.

MR. BHAUSAHEB PATIL

Sr. Director Strategic Operations - IQVIA,
United Kingdom





Dr. Rahul Singh is the CEO of the Centre for Medical Innovation (CMI) at GIMS, Greater Noida, India's first public hospital-based incubator under the Government of Uttar Pradesh. A clinician, innovator, and healthcare strategist, he combines a background in Maxillofacial Surgery and Dentistry with a PhD in Healthcare Management (mentored by AIIMS faculty) and an MBA from FMS, Delhi University. Dr. Singh leads flagship programs like Startup OPD, NIRMAL Super 20, and India Design, connecting innovators with real clinical problems. His mission is to bridge the gap between innovation and patient-centric healthcare, making public hospitals the new hubs of MedTech innovation in India

DR. RAHUL SINGH AMRITRAJ

CEO, Centre for Medical Innovation (CMI),
Government Institute of Medical Sciences (GIMS),
Greater Noida



Dr. Sastri's research focuses on nanotechnology-aided drug carrier systems and the genetic mechanisms underlying autoimmune disorders. His work involves the design and development of nucleic acid and small-molecule delivery systems, as well as exosome-mediated carriers targeting central nervous system and oncology-related conditions. He possesses a strong command of ethical research standards, good laboratory practices, and experimental protocols, ensuring scientific rigor in all his projects. Dr. Trivedi has made significant scholarly contributions through numerous research publications, book chapters, and patents. His core expertise lies in nano-carrier systems for nucleic acid delivery and the application of computational modeling techniques for the design and optimization of advanced drug delivery systems, bridging the gap between experimental research and translational therapeutics

DR. K. TRIDEVA SASTRI

Assistant Professor, Dept. of Pharmaceutics,
JSS College of Pharmaceutics,
JSS Academy of Higher Education & Research, Mysuru





With a teaching and research experience of more than 34 years, Prof. Kamla Pathak has served as Dean and Professor, Faculty of Pharmacy, Uttar Pradesh University of Medical Sciences, Etawah, India. She is actively engaged in research on oral controlled /modulated/targeted and topical drug delivery systems has over 300 publications in journals of international and national repute. Mam has handled various research projects and is a recipient of several awards. She is also associated to Indian pharmaceutical industry in the capacity of scientific consultant. Prof. Pathak has been enlisted in the top 2% Indian scientists in 2020, 2021, 2022 and 2023, 2024, 2025.

PROF. KAMLA PATHAK

Former Dean & Professor, Faculty of Pharmacy,
Uttar Pradesh University of Medical Sciences,
Saifai, Etawah, Uttar Pradesh



Ms. Meenal Bhat is a strategic leader with over 22 years of experience across consulting, commercialization, and transformation, with a proven track record of advising Fortune 500 companies, start-ups, governments, and global institutions. As the Managing Director at Kraftland Consults, she has led high-impact engagements for multinational and Indian clients in pharma, MedTech, and consumer health, as well as organizations such as WHO and the National Health Authority. As an SME partner for the Andhra MedTech Zone (AMTZ), she evaluates and mentors health-tech innovators, contributing to the growth and acceleration of India's medical technology ecosystem

MS. MEENAL BHAT

Managing Director,
Kraftland Consults Pvt. Ltd.





Dr. Saurabh Arora, CEO of the Arbro Group, is a visionary leader and entrepreneur with over 20 years of experience in building an integrated Health & Wellness enterprise encompassing R&D, testing, clinical research, manufacturing, and consumer brands. A Ph.D. in Pharmaceuticals from Jamia Hamdard, he is the innovator behind SNEC30, the world's first US-patented self-nano-emulsifying curcumin technology, and co-creator of the Ningen phyto-cosmeceutical brand. Under his leadership, the Group operates six accredited laboratories and two GMP-compliant facilities, serving over 10,000 clients globally. A pioneer in AI-driven digital transformation, he continues to inspire innovation aligned with the UN Sustainable Development Goals for good health and decent work.

DR. SAURABH ARORA

CEO, Arbro Pharmaceuticals Pvt. Ltd. and
President, Indian Pharmaceutical Association,
Delhi State Branch (IPA-DSB)



Dr. Khalid Raza is an Associate Professor at the Department of Computer Science, Jamia Millia Islamia, India, and an Honorary Adjunct Professor at UCSI University, Malaysia. He has over 14 years of teaching and research experience and previously served as an ICCR Chair Visiting Professor at Ain Shams University, Egypt. Dr. Raza has published more than 160 peer-reviewed papers (cumulative impact factor 300+) and authored/edited over 17 books with Springer, Elsevier, and CRC Press. He serves as Academic Editor of PLoS ONE, BMC Artificial Intelligence, and Guest Editor of npj Precision Oncology, Journal of Visual Experiment (JoVE), Natural Product Communications, Mini-Reviews in Medicinal Chemistry, and several other journals. He has an active collaboration with scientists from leading institutions in India and abroad. He has received grants for several research projects and worked as a Principal Investigator. Recently, Dr. Raza has received research grants from ICMR and ANRF. Dr. Raza has received Clarivate's (Web of Science) India Research Excellence – Citation Award 2025 and has been consistently featured in the World's Top 2% Scientists list from 2022 to 2025. He has also delivered several invited talks at international conferences and workshops (AICTE-ATAL, UGC-HRDC Centres, etc) and inspired thousands of students and young faculty members. His research focuses on Artificial Intelligence, Bioinformatics, and Health Informatics, with an emphasis on developing intelligent computational models for biomedical discovery and precision medicine.



DR. KHALID RAZA

Associate Professor, Department of Computer Science
Jamia Millia Islamia, New Delhi



Ms. Geetanjali Pankaj Bector is the Vice President and Head of Regulatory Affairs Shared Services Centre (RA SSC) at Fresenius Kabi Business Services India Pvt. Ltd., with over 25 years of experience in the pharmaceutical and healthcare industry. She has been associated with Fresenius Kabi for more than 17 years, where she has led diverse functions including Regulatory Affairs, Business Development, and API Portfolio Management. Prior to this, she held key positions at Dabur Research Foundation, Modi-Mundipharma, and USV Ltd. Ms. Bector holds a Bachelor's and Master's degree in Pharmacy from Delhi University and has completed executive programs in Strategic Management from XLRI Jamshedpur and Artificial Intelligence for Leaders from The University of Texas at Austin.

MS. GEETANJALI PANKAJ BECTOR

Vice President-RA SSC,
Fresenius Kabi Business Services India Pvt. Ltd.



Prof. Bhalla is an alumnus of Delhi University. He has a rich experience of working with Swiss multinational NOVARTIS India Limited for approx. 18 years in various capacities before joining academics. Prof Bhalla has more than 10 years of expertise as Faculty member with Dr A K Abdul Kalam Technical University Affiliated Educational Institutions and Eight years rich experience in developing all five departments at SGT College of Pharmacy besides chair of various monitoring committees of SGT University. He is the recipient of the K.C. Chatterjee Memorial Award (2023), is a distinguished academic leader and National Treasurer of IPGA. He pioneered Pharma SKILLuticals and virtual industrial visits. A recipient of multiple excellence awards, he has chaired and organized numerous national conferences and received several research grants.

PROF. VIJAY BHALLA

Dean, Industry Collaborations & Internship Affairs,
SGT University, Gurugram, Haryana





He holds a Ph.D. in Pharmaceutical Sciences from Subharti University, an M. Pharm from Jamia Hamdard, and a B. Pharm from Mysore University. His expertise spans NDDS product development, technology transfer, and regulatory studies for domestic and International markets. Dr. Agrawal has successfully developed around 13 modified oral dosage forms, completed 9 product tech transfers, and holds 1 PCT and 2 Indian patents, with several others filed. He has published numerous scientific articles and is a life member of the Indian Pharmaceutical Association, actively contributing as a reviewer, speaker, and mentor in the pharmaceutical research community.

DR. RAJESH AGRAWAL

General Manager-R & D,
Modi-Mundi Pharma Pvt. Ltd. &
EC Member, Indian Pharmaceutical Association,
Delhi State Branch (IPA-DSB)



Mr. Gurmeet Singh is a seasoned pharmaceutical industry professional with over three decades of experience spanning global sourcing, business development, and supply chain leadership. He currently serves as Business Development Manager – Asia at AppChem (Spain), where he drives strategic alliances, supplier networks, and sustainable value chains. His rich career includes leadership roles at Ranbaxy, Wockhardt, Orchid Pharma, Midas Pharma GmbH, and Alfa Pharma GmbH, contributing significantly to global procurement and strategic partnerships. Mr. Singh is also the Director of Pharma Networks, focusing on enhancing collaboration across the pharmaceutical ecosystem. A recognized thought leader, he has been an invited speaker at multiple international pharma conferences.

MR. GURMEET SINGH

Director,
Pharma Networks, New Delhi and
Business Development Manager Asia, AppChem



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NANOTECHNOLOGY IN TARGETED DRUG DELIVERY SYSTEMS: ADVANCES AND FUTURE PERSPECTIVES

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ABSTRACT

The emergence of nanotechnology has revolutionized the field of drug delivery by enabling precise, controlled, and site-specific therapeutic interventions. Targeted drug delivery systems (TDDS) based on nanotechnology have the potential to overcome limitations of conventional therapies, including poor solubility, systemic toxicity, rapid clearance, and lack of selectivity. Nanocarriers such as liposomes, polymeric nanoparticles, dendrimers, metallic nanoparticles, micelles, and lipid-based systems offer unique physicochemical properties that facilitate enhanced permeability, retention, and controlled drug release. Recent advances highlight the application of targeted nanocarriers in oncology, infectious diseases, neurological disorders, and cardiovascular conditions, demonstrating their broad therapeutic potential. This review provides a comprehensive overview of nanotechnology based targeted drug delivery systems, discussing their design, mechanisms, applications, challenges, and future prospects. By integrating recent advances with clinical translation strategies, it emphasizes the transformative potential of nanomedicine in achieving precision therapy and improving patient outcomes.

Keywords: Nanotechnology, Targeted drug delivery, Nanocarriers, Controlled release, Stimuli-responsive systems.

ETHICAL AND MANAGERIAL CHALLENGES IN IMPLEMENTING PERSONALIZED HEALTH MONITORING SYSTEMS: A STUDY ON RESPONSIBLE INNOVATION IN HEALTHCARE MANAGEMENT

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ABSTRACT

Personalized Health Monitoring Systems (PHMS) showcase a transformative innovation in present day healthcare, leveraging modern wearable technologies, mobile health applications, and artificial intelligence monitored equipment to provide continuous, real-time insights into patient health. This paper explores the ethical dilemmas and management strategies surrounding PHMS adoption, emphasizing the need for a responsible, human-centered approach to healthcare digitization. Using a mixed-method approach—combining literature analysis, stakeholder interviews, and policy review—the study identifies key ethical risks, including patient data misuse, inequitable access, and loss of autonomy, and analyzes how healthcare managers can mitigate them through governance frameworks and policy compliance. The research concludes with a proposed ethical management model integrating data protection, transparency, and stakeholder engagement, ensuring sustainable and trustworthy digital healthcare practices.

Keywords: Personalized Health Monitoring Systems, Artificial intelligence, Data protection.

**ARTIFICIAL INTELLIGENCE AS A CATALYST FOR INNOVATION IN BREAST
CANCER DETECTION AND PRECISION TREATMENT**

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ABSTRACT

Breast cancer is the most prevalent malignancy among women worldwide and represents a major public health challenge due to its molecular heterogeneity and complex pathophysiology. Early detection, molecular characterization, and individualized treatment selection remain pivotal in improving patient survival and quality of life. The integration of Artificial Intelligence (AI) into oncology has markedly transformed breast cancer management by enhancing diagnostic accuracy, prognostic assessment, and therapeutic decision-making. AI-enabled imaging modalities, including deep convolutional neural networks (CNNs) and transformer-based architectures, have significantly improved mammographic and tomosynthetic interpretation. Systems such as Google’s DeepMind mammography model and Lunit INSIGHT MMG achieve radiologist-level sensitivity and specificity, enabling earlier detection of microcalcifications and architectural distortions while reducing false-positive and false-negative rates. Integration of these models with radiomics and clinical decision support systems (CDSS) allows quantitative extraction of imaging biomarkers predictive of tumor aggressiveness and recurrence risk. From a therapeutic standpoint, AI facilitates precision treatment planning through tools like IBM Watson for Oncology, which utilizes natural language processing (NLP) and knowledge graph algorithms to recommend evidence-based regimens by mining clinical trial data, guidelines, and electronic health records (EHRs). In nanomedicine, AI contributes to the computational optimization of nanoparticle drug delivery systems by predicting physicochemical parameters (size, zeta potential, surface charge, and release kinetics) that influence biodistribution and tumor targeting. Reinforcement learning and Bayesian optimization frameworks are being employed to design multi-functional nanocarriers capable of co-delivering chemotherapeutic agents and immunomodulators with high spatiotemporal precision and minimal systemic toxicity. The convergence of AI with imaging and therapeutic sciences is accelerating the transition toward data-driven, precision-guided oncology. These advancements promise enhanced diagnostic sensitivity, optimized treatment selection, and equitable healthcare delivery.

Keywords: Breast Cancer, Artificial Intelligence (AI), Personalized Therapy, AI-Driven Drug Discovery, Precision Oncology, Nanomedicine.

ARTIFICIAL INTELLIGENCE IN DRUG REPURPOSING IN CANCER

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ABSTRACT

Drug repurposing has proven to be an efficient solution to cancer treatment with the advantage of being less time and cost-consuming, as they use drugs with a safety history. Non-oncology drugs have also exhibited potential anticancer effects in targeting main cancer hallmarks. Recent advances in Artificial Intelligence (AI) have transformed the field of drug repurposing by providing rapid analysis of large amounts of patient data, evaluate pharmacological profiles, and cancer biomarker detection. Integrating AI with nanotechnology further enhances targeted drug delivery and therapeutic precision. Nanoparticle-mediated drug delivery and the integration of AI can enhance localized drug delivery systems capable of biomarker sensing. Diagnostic assays using nanoparticles enable biomarker identification by accumulating in the specific cancer sites and ensuring accurate drug delivery planning. Although challenges like tumor heterogeneity and limited clinical translation persists, the convergence of AI, nanotechnology, and drug repurposing offers a transformative approach for cancer treatment. This review highlights how AI-driven strategies and drug repurposing, when combined with nanotechnology, can target cancer hallmarks and accelerate the development of therapeutic solutions for cancer.

Keywords: Cancer disease, Drug repurposing, Nanotechnology, Artificial Intelligence.

FORMULATION AND EVALUATION OF MULTIPARTICULATE SYSTEM TO ENHANCE FORMULATION EFFICACY

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ABSTRACT

Multiparticulate drug delivery systems represent an advanced and versatile approach for achieving both immediate and controlled drug release. These systems offer significant advantages in the development of formulations with enhanced therapeutic efficacy and minimized side effects. Multilayer multiparticulate formulations are particularly valuable in overcoming chemical incompatibilities among active pharmaceutical ingredients (APIs) and facilitating the design of dosage forms with distinct release profiles. The growing interest within the pharmaceutical industry toward multiparticulate dosage forms is driven by their ability to enable sequential delivery of two or more drugs, ensure separation of incompatible substances, and sustain therapeutic drug levels through controlled-release mechanisms. In such systems, the immediate-release layer serves as an initial dose to achieve rapid onset of action, while the subsequent sustained-release layer maintains the desired plasma concentration over an extended duration. However, challenges such as low yield, interlayer cross-contamination, inadequate hardness, non-uniform layer weight distribution, and layer separation persist during manufacturing. To address these issues, advanced compaction technologies and polymer press systems specifically engineered for multiparticulate fabrication under Good Manufacturing Practice (GMP) conditions are essential. The strategic use of modified polymeric layers offers a promising pathway to achieve high-quality, reproducible, and industrially viable multiparticulate dosage forms.

Keywords: Multiparticulate system, Immediate Release, Sustained Release, Drug Delivery System.

FORMULATION, OPTIMIZATION AND EVALUATION OF RAFT- FORMING TABLETS OF VONOPRAZAN FOR THE TREATMENT OF GASTRIC ULCER

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ABSTRACT

Gastric ulcers, resulting from an imbalance between gastric acid secretion and mucosal defense mechanisms, require effective therapeutic systems that ensure prolonged gastric residence and sustained drug release. The present study focuses on the formulation, optimization, and evaluation of raft-forming tablets of Vonoprazan, a novel potassium-competitive acid blocker (P-CAB), for the effective management of gastric ulcers. Raft-forming systems were designed to form a viscous, floating gel upon contact with gastric fluid, thereby prolonging gastric retention and providing controlled drug release at the site of action. Various formulations were prepared using sodium alginate, hydroxypropyl methylcellulose (HPMC K4M), calcium carbonate, and other excipients. A Box–Behnken design was employed to optimize critical formulation variables such as polymer concentration, gas-forming agent level, and cross-linking ion concentration, evaluating their impact on raft strength, floating lag time, and drug release profile. The optimized formulation exhibited rapid raft formation (<60 seconds), excellent floating ability (>12 hours), and a sustained drug release pattern following zero-order kinetics. In vitro and in vivo evaluations demonstrated improved gastric retention and enhanced mucosal protection compared to conventional tablets. The stability studies confirmed formulation integrity under accelerated storage conditions. The developed raft-forming Vonoprazan tablets provide a promising and patient-friendly approach for localized and prolonged drug delivery in the stomach, thereby improving therapeutic efficacy and reducing dosing frequency in the treatment of gastric ulcers.

Keywords: Raft-forming tablets, Vonoprazan, Gastric ulcer, Floating drug delivery system, Optimization, Sustained release.

DESIGN, DEVELOPMENT, AND EVALUATION OF NANOSTRUCTURED LIPID CARRIERS OF ANTICANCER DRUGS FOR THE TREATMENT OF SKIN CANCER

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ABSTRACT

Skin cancer, one of the most prevalent malignancies worldwide, poses significant therapeutic challenges due to poor drug penetration, systemic toxicity, and multidrug resistance associated with conventional chemotherapeutic regimens. The present study focuses on the design, development, and evaluation of nanostructured lipid carriers (NLCs) for the effective and targeted delivery of anticancer drugs in the treatment of skin cancer. NLCs, composed of a blend of solid and liquid lipids, offer improved drug loading, controlled release, and enhanced skin permeation compared to conventional lipid-based systems. The formulations were developed using a hot homogenization–ultrasonication technique, employing glyceryl monostearate and oleic acid as lipid components, and optimized through a Box–Behnken design to study the influence of lipid concentration, surfactant level, and sonication time on particle size, polydispersity index (PDI), zeta potential, and entrapment efficiency. The optimized NLCs exhibited a mean particle size below 150 nm, narrow PDI (<0.3), high drug entrapment efficiency (>85%), and a sustained release profile following Higuchi kinetics. Transmission electron microscopy confirmed spherical morphology with smooth surfaces. The NLCs were incorporated into a topical gel base for enhanced application and stability. In vitro cytotoxicity and skin permeation studies demonstrated improved drug penetration and selective cytotoxicity toward skin cancer cell lines (A431) compared to free drug formulations. Stability studies under accelerated conditions confirmed formulation integrity. The developed NLC-based topical system represents a promising nanocarrier platform for localized, controlled, and effective treatment of skin cancer, minimizing systemic exposure and enhancing therapeutic outcomes.

Keywords: Nanostructured lipid carriers, Skin cancer, Anticancer drug delivery, Topical formulation, Optimization, Controlled release.

AI-DRIVEN DRUG REPURPOSING: A NEW ERA IN PHARMACOLOGICAL RESEARCH

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ABSTRACT

Artificial Intelligence (AI) has brought a major transformation in the field of pharmacological research, especially in the area of drug repurposing, where existing drugs are explored for new therapeutic uses. Traditional drug discovery involves high costs, long timelines, and a high risk of failure. Machine learning and deep learning models can identify hidden relationships between drug molecules, disease pathways, and target proteins, allowing researchers to predict potential new uses of already approved drugs. AI algorithms also help in virtual screening, molecular docking, and predictive modeling, significantly reducing laboratory workload and experimental errors. By integrating diverse data sources such as genomics, proteomics, and electronic health records, AI provides valuable insights that guide faster and more efficient decision-making in drug discovery. This approach has already shown success in identifying new drug candidates for diseases like cancer, Alzheimer's, and viral infections, including COVID-19. The AI-driven drug repurposing strategy not only saves time and resources but also ensures patient safety by utilizing drugs with known pharmacological and toxicological profiles. Thus, AI marks a new era in pharmacological research, promoting innovation, precision, and sustainability in healthcare.

Keywords: Artificial Intelligence, Drug Repurposing, Machine Learning, Predictive Modeling, Pharmacological Research.

AUTOMATED ANIMAL BEHAVIOR ANALYSIS USING COMPUTER VISION AND AI

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ABSTRACT

Automated analysis of animal behavior, driven by recent advances in computer vision and artificial intelligence, is fundamentally transforming preclinical pharmacological research. Traditional manual behavioral scoring methods are inherently subjective, labor-intensive, and prone to significant inter-observer variability, which collectively undermine data reliability and throughput. In contrast, AI-driven approaches utilizing deep learning-based pose estimation, instance segmentation, and multi-animal tracking enable objective, high-resolution detection and classification of complex behavioral phenotypes in experimental animals. Tools such as EthoFlow, DeepLabCut, and AlphaTracker offer scalable and adaptable pipelines that integrate seamlessly into diverse laboratory settings, enhancing experimental reproducibility and scientific rigor. These technologies also advance the 3Rs principles by supporting non-invasive, continuous monitoring and minimizing animal usage. Moreover, automated behavioral quantification delivers sensitive and reproducible endpoints for the assessment of pharmacodynamic and toxicological effects, thereby accelerating drug development workflows. Ongoing challenges include adapting algorithms across species, managing occlusions in dynamic group settings, and ensuring ethical compliance in AI deployment. Overall, the integration of computer vision and artificial intelligence establishes a new paradigm in behavioral pharmacology, offering unprecedented precision, standardization, and translational relevance for both basic and applied biomedical research.

Keywords: Animal behavior analysis, Computer vision, Artificial intelligence, Deep learning, Pharmacology, Preclinical research

EMERGING AI TECHNOLOGIES SHAPING CLINICAL TRIALS AND PHARMACOVIGILANCE FRAMEWORKS

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ABSTRACT

Artificial Intelligence (AI) is redefining clinical research and pharmacovigilance through better precision, efficiency, and real-time data interpretation. The integration of technologies i.e., machine learning (ML), natural language processing (NLP), and deep learning (DL), AI supports evidence-based decision-making and innovation in drug development and safety monitoring. This study aims to emphasize the emerging AI technologies are transforming clinical trial operations and pharmacovigilance frameworks, with an emphasis on their benefits, applications, and implementation challenges. Comprehensive research was conducted, examining recent studies, regulatory documents, and industrial applications of AI in clinical trials and pharmacovigilance. The analysis focused on technological integration, data handling, and the regulatory implications of AI-driven systems. AI enhances clinical trial efficiency through optimized patient recruitment, adaptive trial designs, and predictive outcome modeling. The convergence of AI with big data, cloud computing, and blockchain strengthens transparency and traceability within the new drug development. AI offers transformative potential, challenges remain regarding data quality, algorithmic bias, privacy protection, and model interpretability. Ethical governance and cross-sector collaboration are essential for responsible AI adoption. Emerging AI technologies are reshaping clinical research and pharmacovigilance toward predictive, patient-centric frameworks. Future success depends on regulatory adaptation, data standardization, and transparent AI governance to ensure innovation aligns with global drug safety and efficacy standards.

Keywords: Artificial Intelligence, Clinical Trials, Pharmacovigilance, Machine Learning; Drug Safety, Regulatory Frameworks

ANIMAL MODEL REPLACEMENT USING AI SIMULATION

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ABSTRACT

Animal model is playing the most important role in biomedical research, giving critical information into disease mechanisms and therapeutic development. However, this model has some drawback of ethical concerns, high cost and translational limitation has driven the search of alternative method. AI simulation has replaced the animal model. The study reviews the advancement in the study of pharmacological responses in animal body. AI-driven *in silico* simulation that mimic biological processes and predict the pharmacological responses with high efficiency. Integrating all the information, for example learning algorithms, virtual biological environment and data from molecular cellular and systematic level. It is cost effective and having high efficiency with accurate data efficiency and ethical acceptability. Challenges such as model validation, biological complexities, and data quality are discussed alongside evolving regulatory perspectives. The transition from animal models to AI simulations holds potential to revolutionize drug discovery and biomedical research, reducing reliance on animal testing while accelerating scientific progress.

Keywords: Animal model replacement, Artificial intelligence, *In silico* simulation, Biomedical research, Ethical alternatives.

ADVANCES IN HERBAL AND PHYTOPHARMACEUTICAL TECHNOLOGY: BRIDGING TRADITIONAL KNOWLEDGE WITH MODERN DRUG DELIVERY SYSTEMS

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ABSTRACT

The technology of herbal and phytopharmaceuticals is a dynamic combination of modern pharmaceutical innovation with traditional medical expertise. By using contemporary drug delivery technologies, much progress has been achieved in recent years to improve the herbal compositions' therapeutic potential, stability, and patient acceptability. Issues with conventional herbal formulations frequently include uneven pharmacological effectiveness, inadequate bioavailability, and poor solubility. Novel delivery platforms like nanoparticles, liposomes, phytosomes, solid lipid nanoparticles, and transdermal systems have been created to overcome these restrictions. By enabling the controlled and targeted release of phytoconstituents, these sophisticated technologies enhance the pharmacokinetic and pharmacodynamic characteristics of these compounds. Additionally, the validity and consistency of herbal products are guaranteed from batch to batch through the integration of standardization processes and sophisticated analytical equipment like HPLC, GC-MS, and NMR. Modern formulation science and traditional wisdom work together to create evidence-based phytopharmaceuticals that are widely accepted. Innovation and commercialization in this field have also been accelerated by the regulatory acceptance of phytopharmaceutical medications in places like the European Union and India. All in all, these technological developments represent a paradigm shift in the herbal sector, turning conventional treatments into therapeutic solutions that are both patient-friendly and supported by science. Ethnopharmacology, nanotechnology, and contemporary drug delivery technologies are combining to increase the applicability and dependability of herbal therapy in modern healthcare.

Keywords: Herbal technology, phytopharmaceuticals, modern drug delivery systems, nanotechnology, ethnopharmacology.

**EMERGING FRONTIERS IN MEDICAL TECHNOLOGY: THE FUTURE OF
INTELLIGENT AND WEARABLE MEDICAL DEVICES**

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ABSTRACT

The swift development of medical technology has brought about a new era of wearable and intelligent medical gadgets that are transforming illness management and patient care. These cutting-edge gadgets integrate advancements in wireless communication, biosensing, nanotechnology, and artificial intelligence (AI) to facilitate data-driven decision-making and real-time health monitoring. Heart rate, blood pressure, glucose levels, and oxygen saturation are among the essential indicators that are being continuously tracked by wearable technology, such as smart watches, biosensors, and implantable systems. Predictive diagnoses, early disease identification, and customized treatment planning are made possible by the combination of artificial intelligence (AI) with the Internet of Medical Things (IoMT), which improves clinical results and lowers healthcare expenses. Additionally, device compliance and patient comfort have increased due to downsizing and flexible electronics. Large-scale deployment is still significantly hampered by issues with data privacy, cybersecurity, regulatory approval, and long-term biocompatibility, notwithstanding these developments. For these technologies to be used safely, accurately, and ethically, engineers, medical professionals, and regulatory agencies must work together. By enabling proactive, remote, and precision-based medical interventions, the combination of smart materials, cutting-edge sensors, and machine learning algorithms is poised to completely transform the way healthcare is delivered. These wearable and intelligent gadgets mark a significant advancement in the direction of a healthcare environment that is more patient-centered, connected, and efficient.

Keywords: Intelligent medical devices, wearable technology, biosensors, artificial intelligence, personalized healthcare.

LIC25-O-014

**EVALUATION OF NEUROPROTECTIVE POTENTIAL OF CLITORIA TERNATEA LINN.
IN ALUMINIUM CHLORIDE-INDUCED ALZHEIMER’S DISEASE IN SPRAGUE
DAWLEY RATS**

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ABSTRACT

Alzheimer's disease (AD) is a multifactorial neurodegenerative condition which is mainly associated with β -amyloid accumulation, oxidative stress, and cholinergic dysfunction. The potential of *Clitoria ternatea* Linn. as a source of neuroactive phytochemicals with anti-inflammatory, antioxidant, and cholinergic modulatory properties has been shown in a number of research. Because of its high concentration of flavonoids, alkaloids, and triterpenoids like taraxerol and clitorin, *C. ternatea* extract has been shown to have notable nootropic and memory-enhancing benefits in a variety of experimental models of amnesia. Furthermore, compared to leaves and flowers, ethanolic extracts of the root have demonstrated greater acetylcholinesterase inhibitory activity, demonstrating its superior neuroprotective potential. The current study uses donepezil as the standard reference medication to assess the neuroprotective impact of *Clitoria ternatea* root extract against Alzheimer's disease produced by aluminum chloride in Sprague Dawley rats. The degree of neuroprotection will be assessed based on biochemical criteria (AChE activity, oxidative stress indicators like SOD, MDA, GSH) and behavioral tests (Morris water maze, Passive avoidance test, Spontaneous locomotor activity). The results will be further supported by a histopathological examination of hippocampus tissue. The traditional use of *Clitoria ternatea* and its potential as a natural medicinal alternative for the treatment of Alzheimer's disease may be demonstrated by this study.

Keywords: *Clitoria ternatea* Linn., neuroprotection, Alzheimer’s disease, oxidative stress, acetylcholinesterase inhibition, Donepezil.

LIC25-O-015

**DEVELOPMENT AND VALIDATION OF STABILITY-INDICATING RP-HPLC METHOD
OF QUERCETIN DIHYDRATE**

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ABSTRACT

Quercetin dihydrate is a plant extract which is used as drug due to its widely therapeutic potential like- antioxidant and anti-inflammatory actions. It belongs to flavonoid family, a class of polyphenolic compounds. It is one of the most studied and used flavonoid as it is present in foods like- onions, berries, grapes, apples, etc. Quercetin is derived from a latin word “oak forest” as it is found in various dietary foods. Quercetin dihydrate is more effective antioxidant than vitamin C and E as it scavenges free radicals and reactive oxygen species (ROS), by protecting the cells from cellular damage and oxidative stress. The research on quercetin dihydrate has also shown its anticancer effects as it inhibit cancer cell proliferation, inducing apoptosis and by modulating cellular signaling pathways (NF-KB, MAPK and PI3K-AKT). By using HPLC validation parameters of Quercetin Dihydrate like Linearity, Robustness, Precision, Accuracy and Ruggedness are performed successfully. This present work is designed to develop and validate a RP-HPLC method of Quercetin Dihydrate. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10 μ m particle size. A mixture of water, methanol, acetonitrile and glacial acetic acid in a specific ratio used as a mobile phase with flow rate of 1ml/min. UV detector and 255nm wavelength were used with the run time of 10min. Linearity has been performed in the concentration range of 2 to10 ppm for Quercetin Dihydrate. The linearity of quercetin dihydrate on HPLC was calculated 0.986% and the correlation of uv was found to be 0.9526.

Keywords: Quercetin Dihydrate, RP-HPLC, UV- Detector.

**PREDICTIVE AI MODELS FOR THE EARLY DETECTION OF SEPSIS AND
OPTIMIZATION OF ANTIMICROBIAL THERAPY**

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ABSTRACT

Sepsis is a life-threatening condition that results from the body's dysregulated response to a systemic infection. In fact, it is considered to be one of the leading causes of death in intensive care units, thereby its timely diagnosis and management is crucial in reducing the patient mortality rate. Most patients present with non-specific symptoms, initiating the need for empirical antimicrobial therapy, which can further worsen antimicrobial resistance. Sepsis, especially caused by pathogens with antimicrobial resistance, remains a major healthcare challenge, and artificial intelligence algorithms have been found to be a promising strategy. AI models and algorithms are highly effective in detecting sepsis hours before its onset, improving the patient's chance of recovery. These AI algorithms improve the accuracy of sepsis prediction by assessing large quantities of patients' electronic health records, laboratory values and vital signs in real time. The aim of this review is to explore the role of predictive AI models in early sepsis detection and their potential to assist pharmacists in optimizing antimicrobial therapy in ICU patients. A comprehensive literature search was conducted across specific databases such as PubMed, Science Direct, and Google Scholar for studies published in the last five years, from 2020 to 2025, and the most relevant articles were analyzed. Machine learning models and AI algorithms such as XG Boost and SERA among many others demonstrated superior effectiveness and accuracy in predicting sepsis hours before the clinical presentation, facilitating earlier antibiotic initiation and supporting appropriate antibiotic use.

Keywords: Sepsis, Artificial Intelligence, Machine Learning, Antimicrobial Resistance.

LIC25-O-017

**RESOLVING THE THERAPEUTIC DILEMMA: ACUTE AND SUB-ACUTE
TOXICITY ASSESSMENT OF *EUPHORBIA LACTEA* EXTRACT USING OECD
GUIDELINES**

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ABSTRACT

The genus *Euphorbia* presents a significant therapeutic dilemma. While *E. Lactea* is traditionally valued for its anti-inflammatory and antimicrobial properties, literature confirms that related species (e.g., *E. Tirucalli* and *E. Hirta*) have demonstrated clear dose-dependent toxicity. Specific findings include significant hepatic enzyme elevation and renal tubular damage at high doses, raising major safety concerns regarding the genus as a whole. Furthermore, sub-acute (28-day repeated-dose) safety data is entirely absent. Therefore, a standardized assessment is an absolute necessity. The objective of this research is to logically and comprehensively close this critical safety gap. Our study will determine the LD50 and establish the No-Observed-Adverse-Effect Level (NOAEL) for the *E. Lactea* extract in Wistar rats. The methodology will strictly adhere to international standards: the acute study will follow OECD Guideline 423, and the 28-day sub-acute study will follow OECD Guideline 407. Evaluation will encompass the systematic analysis of hematology, serum biochemistry (including LFTs, RFTs, and Lipid Profile), and microscopic Histopathology of all major organs (liver, kidney, heart, spleen). This research will provide the essential preclinical safety data required by regulatory bodies, demonstrating the necessity of this study for guiding the responsible advancement of *E. Lactea* phytomedicines.

Keywords: *Euphorbia lactea*, Therapeutic Dilemma, Sub-Acute Toxicity, NOAEL, OECD 407, Histopathology.

LIC25-O-018

**INTEGRATING QRM AND CAPA FOR AI-DRIVEN SOFTWARE AS A MEDICAL
DEVICE: A SYSTEMATIC REVIEW OF GLOBAL FRAMEWORKS AND EVIDENCE**

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ABSTRACT

The rapid integration of Artificial Intelligence-based Software as a Medical Device (AI-SaMD) introduces dynamic risks including algorithmic drift, data bias, and cybersecurity vulnerabilities that challenge the static paradigms of traditional Quality Risk Management (QRM) and Corrective and Preventive Action (CAPA) processes governed by standards like ISO 14971 and ISO 13485. This systematic review, conducted per PRISMA 2020 guidelines, synthesizes global evidence from 2015-2025 to evaluate the application and integration of QRM and CAPA frameworks for AI-SaMD. Through an analysis of peer-reviewed and grey literature from major databases and regulatory bodies, six research questions guided the investigation into QRM tool adaptation, CAPA integration, regulatory landscapes, and empirical effectiveness. Findings indicate that current QRM-CAPA practices are fragmented and inadequately address the continuous lifecycle of adaptive AI, with divergent regulatory approaches and a scarce evidence base on mitigating AI-specific risks. The review consolidates these insights to propose a pathway toward a harmonized, proactive ‘Algorithmic Safeguard’ framework, thereby underscoring the urgent need for updated, globally aligned standards that ensure robust, lifecycle-wide safety and efficacy for next-generation AI-SaMD without stifling innovation. This work provides a critical evidence base for regulators, manufacturers, and researchers to advance responsible AI in medicine.

Keywords: AI-SaMD, QRM-CAPA, ISO 14971, ISO 13485.

LIC25-O-019

**INVOLVEMENT OF ARTIFICIAL INTELLIGENCE (AI) IN DETECTION OF
CEREBROVASCULAR ACCIDENT IN PATIENT BY MRI**

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ABSTRACT

Cerebrovascular accident (CVA), commonly known as stroke, is a leading cause of mortality and long-term disability worldwide. Early and accurate detection is crucial for improving patient outcomes and guiding timely therapeutic interventions. Magnetic Resonance Imaging (MRI) is the gold standard for identifying ischemic and hemorrhagic brain lesions, yet manual interpretation of MRI scans is time-consuming, subjective, and highly dependent on radiologist expertise. The integration of Artificial Intelligence (AI), particularly machine learning (ML) and deep learning (DL) techniques, has emerged as a transformative approach in enhancing the diagnostic accuracy and efficiency of stroke detection. AI algorithms, especially convolutional neural networks (CNNs), can automatically extract complex features from MRI images, enabling precise localization and classification of stroke subtypes. Furthermore, AI systems have shown potential in quantifying lesion volume, predicting tissue viability, and assisting in treatment planning. Recent advancements in multimodal data fusion—combining MRI with clinical and demographic information—have further improved diagnostic performance and prognostic prediction. Overall, the integration of AI in MRI-based stroke detection represents a major step toward precision medicine, offering faster, more accurate, and reproducible diagnostic support to clinicians and paving the way for improved patient care in cerebrovascular disease management.

Keywords: Artificial Intelligence, Cerebrovascular Accident, Stroke Detection, MRI, Deep Learning, Medical Imaging.

LIC25-O-020

**NEUROPROTECTIVE ROLE OF ETHANOLIC BARK EXTRACT OF *ANTHOCEPHALUS CADAMBA* IN STREPTOZOTOCIN INDUCED DIABETIC PERIPHERAL NEUROPATHY
IN A RAT MODEL**

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ABSTRACT

Diabetes mellitus is a metabolic condition that causes changes in the structure and function of several organ systems. Chronic hyperglycemia is the main cause of the tissue damage. Diabetic problems are linked to microvascular and macrovascular impairment of the body's principal organs. Neuropathy, or diabetic neuropathy (DN), is a common microvascular consequence of diabetes that can manifest as neuropathic pain. Streptozotocin (STZ)-induced diabetes in rats has become a prevalent model for studying painful diabetic neuropathy. Injection of STZ causes neurotoxicity in peripheral nerves, resulting in the development of peripheral Diabetic neuropathy in a rat model. The ethanolic bark extract of *Anthocephalus cadamba* (200 mg/kg and 400 mg/kg) alone and with pyridoxine (100mg/kg) was investigated for its antinociceptive by testing for thermal allodynia using Eddy's hot plate test and muscle grip strength by using rota rod apparatus in streptozotocin (STZ)-induced diabetic peripheral neuropathic rats. The ethanolic bark extract of *Anthocephalus cadamba* in attenuating diabetic neuropathic pain and improved muscle weakness induced by STZ. The ethanolic bark extract of *Anthocephalus cadamba* was effective in reducing neuropathic pain and restoring muscle strength in STZ-induced diabetic neuropathy.

Keywords: *Anthocephalus cadamba*, neuropathy, diabetes mellitus, STZ, neurotoxicity.

**COMPARATIVE EVALUATION OF DISSOLUTION PROFILE FOR DIFFERENT
BRANDED MEDICINES OF LOVASTATIN: AN AI-ASSISTED APPROACH**

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ABSTRACT

Lovastatin, a widely prescribed lipid-lowering agent, exhibits variability in dissolution behavior across different branded formulations due to differences in excipients and manufacturing processes. Accurate evaluation of dissolution profiles is essential to ensure therapeutic equivalence. Artificial Intelligence (AI) offers advanced tools to enhance the analysis and prediction of such pharmaceutical data. Multiple commercially available Lovastatin (20 mg) brands were subjected to dissolution testing following USP guidelines using USP Apparatus II (paddle method) in phosphate buffer (pH 7.0) at $37 \pm 0.5^\circ\text{C}$. Samples were withdrawn at predefined time points and analyzed spectro photometrically. Dissolution profiles were compared using model-independent parameters, including difference factor (f_1) and similarity factor (f_2). AI-assisted modeling revealed correlations between excipient composition, manufacturing differences, and dissolution behavior. Predictive models accurately estimated dissolution trends, providing enhanced insights beyond conventional statistical methods. Integrating AI into dissolution analysis allows for more precise evaluation of formulation performance and therapeutic equivalence among Lovastatin brands. This approach can support regulatory decisions, optimize formulation design, and demonstrate the transformative role of AI in pharmaceutical quality assessment.

Keywords: Lovastatin, dissolution profile, branded formulations, artificial intelligence, similarity factor, therapeutic equivalence

**INTEGRATION OF ARTIFICIAL INTELLIGENCE IN DRUG REGULATORY AFFAIRS
AND GLOBAL COMPLIANCE STANDARDS**

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ABSTRACT

Modernizing Drug Regulatory Affairs (DRA) and bolstering international compliance systems in the pharmaceutical sector have been made possible by artificial intelligence (AI). AI-driven technologies like machine learning (ML) and natural language processing (NLP) provide sophisticated capabilities for automation, prediction, and regulatory intelligence in light of the growing complexity of international rules. In compliance with international standards set by the ICH, WHO, EMA, USFDA, and CDSCO, these technologies improve dossier preparation, labeling verification, and data harmonization. AI-powered analytics support predictive compliance risk assessment, enhance audit preparation, and enable real-time regulatory change tracking. Furthermore, faster adverse event detection, better data classification, and more dependable post-marketing surveillance are made possible by AI applications in pharmacovigilance. The ethical application of AI necessitates consideration of data integrity, algorithm transparency, and validation within regulatory frameworks, despite its enormous potential. All things considered, the use of AI in DRA creates a proactive, data-driven strategy that improves patient safety, worldwide harmonization, and regulatory efficiency.

Keywords: Pharmacovigilance, Global Compliance, Artificial Intelligence, Drug Regulatory Affairs.

AI-DRIVEN DISCOVERY OF GUT-BRAIN AXIS MODULATORS: A NOVEL COMPUTATIONAL APPROACH FOR NEURODEGENERATIVE DISEASES

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ABSTRACT

The gut-brain axis (GBA) is one of the primary regulatory networks that guarantee a neurological balance: the given mechanism provides a two-way dialogue that exists between the microbiota of the small intestine and the central nervous system. The present paper outlines the design of an artificial intelligence (AI)-assisted computer-aided drug design (CADD) pipeline to identify new agents targeting microbial-neuroinflammatory pathways that were responsible in neurodegenerative diseases. The metabolites-receptor integration was proposed using machine learning followed by the investigation of the binding stability and pharmacokinetic properties by utilizing molecular docking and molecular dynamics. This plan enhanced the occurrence of virtual screening and optimization that led to identification of a number of candidate compounds with gut and neuronal modulatory properties. The originality of the study is the use of AI-based CADD to control the gut-brain axis, a field that was not investigated previously. The proposed computational platform is a rational cost efficient and time sparing route to the next generation neuroprotective molecules. The observation opens up new frontiers on how interface perceives microbiome science and digital drug discovery, which can be utilized to treat the complex neurological disease.

Key-words: AI-assisted drug discovery, Gut-brain axis, Computer-aided drug design, Neurodegenerative disease, Machine learning, Neuroinflammation.

ACCELERATING ONCOLOGY DRUG DISCOVERY: COMPUTER AIDED DRUG DESIGN

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ABSTRACT

Cancer is a disease in which the abnormal cells divide uncontrollably and destroy body tissue. Our genes send information to our cells like when to start and stop growing which is followed by normal cells but ignored by cancer cells. The complexity of cancer demands advanced approaches to understand the mechanism and potential therapies. In vitro drug screening and in vivo animal trials are mainstays of traditional approaches for drug development. Omics data explosion has made it possible to discover anti-cancer drugs by computational drug discovery approaches. Computational techniques such as Computer Aided Drug Design have become an essential drug discovery tool for drug development. CADD targets sites prediction, drug discovery which is based on structure and ligand-based design, quantitative structure activity relationship (QSAR) with a focus on cancer therapeutics. CADD uses various computational methods like virtual screening, molecular docking, molecular dynamics to rapidly identify and design potential anti-cancer drugs. It reduces time and cost of drug discovery by virtual screening of compounds. Together, these computational approaches accelerate the discovery of novel and more effective cancer therapeutics with reduced toxicity and improved precision.

Keywords: Uncontrollable division, Tissue destruction, Potential therapies, Mechanism understanding, Computer aided drug design, Virtual screening, Novel therapeutics.

**AI-POWERED SCREENING OF EXCIPIENTS FOR DEVELOPING STABLE NLCs IN
PARKINSON’S DISEASE MANAGEMENT**

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ABSTRACT

Parkinson’s disease (PD) remains one of the most debilitating neurodegenerative disorders, with current pharmacological therapies offering only symptomatic relief and limited control over disease progression. One of the primary challenges in PD management lies in delivering therapeutic agents effectively across the blood–brain barrier (BBB) while ensuring formulation stability and bioavailability. Nanostructured lipid carriers (NLCs) have emerged as an advanced nanomedicine platform capable of enhancing solubility, prolonging drug release, and improving brain targeting. However, the rational selection of excipients such as lipids, surfactants, and stabilizers play a crucial role in determining the physicochemical stability and therapeutic efficiency of NLCs. This study proposes an AI-powered excipient screening model that integrates predictive analytics and machine learning algorithms to identify optimal combinations of lipids and surfactants for the development of stable NLC formulations. The model evaluates key formulation attributes including particle size, zeta potential, encapsulation efficiency, and stability under various storage conditions. Using artificial intelligence, extensive excipient databases can be analyzed to predict compatibility patterns, solubility behavior, and potential interactions prior to experimental validation, thereby reducing formulation time and resource consumption. In the context of PD therapy, the integration of AI in formulation design enables the identification of excipient combinations that enhance drug permeation across the BBB and ensure sustained neuroprotective effects. The optimized NLCs are expected to deliver higher bioavailability, improved therapeutic targeting, and better patient outcomes. This AI-driven strategy signifies a transformative shift from conventional trial-and-error formulation approaches to intelligent, data-driven drug delivery system design, setting a foundation for precision nanomedicine in neurodegenerative disease management.

Keywords: Artificial intelligence, nanostructured lipid carriers, excipient screening, Parkinson’s disease, formulation optimization.

**AI-POWERED QUALITY ASSURANCE: A PREDICTIVE APPROACH TO RISK
MITIGATION IN PHARMACEUTICALS**

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ABSTRACT

The integration of Artificial Intelligence (AI) into pharmaceutical Quality Assurance (QA) represents a transformative step toward predictive and preventive quality management. Traditional QA systems rely heavily on retrospective analysis and manual oversight, often leading to delayed detection of deviations and higher operational risks. In contrast, AI-enabled QA frameworks utilize data-driven insights and machine learning algorithms to predict quality outcomes, optimize processes, and enhance decision-making across the entire product lifecycle. By analyzing real-time data from manufacturing and analytical processes, AI tools such as neural networks and pattern recognition models can identify subtle trends and anomalies that may compromise product quality. This predictive capability supports early intervention and ensures consistent adherence to regulatory standards, including those outlined in Quality by Design (QbD) and ICH guidelines. Incorporating AI into QA also facilitates the creation of intelligent dashboards for risk prediction, real-time release testing, and deviation management. These advancements not only improve product robustness but also streamline regulatory compliance and reduce the overall cost of quality. Ultimately, AI-powered Quality Assurance marks a paradigm shift from reactive quality control to proactive risk mitigation, fostering efficiency, transparency, and patient safety within the pharmaceutical domain.

Keywords: Artificial Intelligence, Quality Assurance, Predictive Analytics, Risk Mitigation.

**VISCUM ALBUM BIOACTIVE CONSTITUENT’S PHARMACOLOGICAL MECHANISMS
AND THERAPEUTIC IMPLICATIONS**

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ABSTRACT

This review summarizes and critically evaluates the botany, phytochemistry, pharmacology, ethnomedicinal relevance, and toxicology of *V. album*, and provides updated insights into its mechanisms of action, host-tree and seasonal influences on chemical composition, and translational relevance. A structured literature search was performed in PubMed, Scopus, ScienceDirect, Springer, Elsevier, and Google Scholar using the terms “*Viscum album*,” “mistletoe,” “phytochemistry,” “pharmacology,” and “toxicology.” Ethnobotanical reports, in vitro and in vivo pharmacological studies, and clinical trials were included. Compound identities were cross-validated in PubChem. Host-tree and seasonal variation significantly influence metabolite abundance and potency. Lectins exhibit dose-dependent toxicity, but therapeutic ranges are generally safe. Core mechanisms include apoptosis induction, immune regulation, oxidative/metabolic stress modulation, and cell-cycle control. *Viscum album* represents a multi-target phytotherapeutic with relevance to oncology, cardiology, neurology, and infectious diseases. Significant gaps remain in standardization, dose-optimization, and large placebo-controlled clinical trials. Neuroprotective potential and regulatory considerations need prioritization for future clinical translation.

Keywords: *Viscum album*, phytochemistry, anticancer, immunomodulation, neuroprotection, ethnopharmacology, bioactive compounds.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN PHARMACOPHORE-BASED VIRTUAL SCREENING: ADVANCEMENTS, APPLICATIONS AND FUTURE PERSPECTIVES”

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ABSTRACT

Virtual screening (VS) now incorporates artificial intelligence (AI) as a tool for in vitro drug analysis. The computational method of virtual screening uses model-based computer programs to discover new drug candidates. AI technology enhances VS operations through improved precision and speed of operations. The development of pharmacophore approaches during the past century established them as essential tools for drug discovery in modern times. The development of new pharmacophore models through structure-based and ligand-based approaches has achieved success in virtual screening and de novo design and lead optimization applications. The use of pharmacophores enables researchers to search structural databases for potential leads through specific attribute-based queries and to assess molecular similarity and diversity through pharmacophore fingerprint analysis. The success of ML or DL methods depends heavily on access to large databases that contain precise and trustworthy information. The databases contain complete information about drug effectiveness and drug target characteristics and drug side effects and detailed chemical structures. Different databases hold different levels of information regarding their content. Each database maintains its own distinct collection of data. The virtual screening of pharmacophore requires data from publicly available databases which include PubChem, ChEMBL, ZINC, ChemSpider, DrugBank, DrugCentral etc,

Keywords: Artificial Intelligence, Pharmacophore Modeling, Virtual Screening, Machine Learning.

EMERGING DRUG DELIVERY STRATEGIES FOR ENHANCED WOUND HEALING: A COMPREHENSIVE REVIEW

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ABSTRACT

Wound care remains a vital aspect of healthcare, as traditional treatments often struggle to ensure effective healing and prevent complications. Traditional wound treatment methods, including topical ointments and dressings, often face limitations such as inadequate drug penetration, uncontrolled release, and a lack of sustained therapeutic action at the wound site. Emerging drug delivery systems provide innovative solutions by improving therapeutic efficiency, minimizing side effects, and offering precise drug release at the wound site. Techniques such as nanocarriers, hydrogels, microneedles, and bioengineered scaffolds have shown promise in managing chronic wounds, combating infections, and enhancing the healing process. These advanced approaches allow the integration of antimicrobial agents, and cells of stem to support faster tissue regeneration. However, several challenges remain, including achieving biocompatibility, affordability, scalability, and navigating regulatory requirements. This review delves into the progress of wound-targeted drug delivery technologies, emphasising their transformative potential for wound management and the hurdles that must be addressed for broader clinical implementation.

Keywords: Wound care, Nanocarriers, Tissue regeneration.

SUBSTRATE BASED SYNTHETIC STRATEGIES FOR 1,3,4-OXADIAZOLE

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ABSTRACT

The five-member 1,3,4-oxadiazole hetero-cyclic ring has received considerable attention because of its unique bio-esoteric properties and an unusually wide spectrum of biological activities. After a century since 1,3,4-oxadiazole was discovered, its uncommon potential attracted medicinal chemist's attention, leading to the discovery of a few presently accessible drugs containing 1,3,4-oxadiazole units, and a large number of patents have been granted on research related to 1,3,4-oxadiazole. It is worth noting that interest in 1,3,4-oxadiazoles' biological applications has doubled in the last few years. Herein, this review presents a comprehensive overview of the recent achievements in the synthesis of 1,3,4-oxadiazole-based compounds and highlights the major advances in their biological applications in the last ten years, as well as brief remarks on prospects for further development. We hope that researchers across the scientific streams will benefit from the presented review articles for designing their work related to 1,3,4-oxadiazoles.

Keywords: Biological activities; oxadiazole; various synthetic methods

INTEGRATIVE DRUG DISCOVERY OF TRIAZOLE SCAFFOLDS: IN SILICO DOCKING, DYNAMICS, ADMET PROFILING, AND IN VIVO EVALUATION OF LIPID-LOWERING AND ANTIOXIDANT PROPERTIES

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ABSTRACT

The present study focuses on the integrative drug discovery of novel triazole scaffolds through computational and experimental approaches to evaluate their lipid-lowering and antioxidant potential. In silico molecular docking, molecular dynamics simulations, and ADMET profiling were conducted to identify triazole derivatives with favorable pharmacokinetic and binding characteristics against HMG-CoA reductase. From a library of 2200 compounds, thirty ligands were shortlisted based on binding affinity, synthetic feasibility, and toxicity prediction. The top-performing candidates were synthesized and characterized by FT-IR, NMR, and mass spectrometry. Molecular docking studies revealed significant interactions between triazole derivatives and key amino acid residues, confirming high binding stability. ADME predictions indicated compliance with Lipinski's Rule of Five and optimal oral absorption. In vivo studies using a high-fat diet-induced hyperlipidaemic rat model demonstrated substantial reductions in total cholesterol, triglycerides, LDL, and VLDL, alongside enhanced HDL levels. Additionally, the synthesized compounds significantly improved antioxidant enzyme activities (SOD, CAT, GPx, and GR), validating their potential as safe and effective antihyperlipidaemic agents. These findings highlight the promising therapeutic potential of triazole scaffolds as dual lipid-lowering and antioxidant drug candidates.

Keywords: Triazole scaffolds, in silico docking, ADMET profiling, molecular dynamics, hyperlipidaemia, HMG-CoA reductase, antioxidant activity, lipid-lowering agents, drug discovery, pharmacokinetics

A NOVEL BANANA PEEL STARCH-BASED TOPICAL GEL FOR ENHANCED DRUG DELIVERY

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ABSTRACT

Conventional oral medications for pain and inflammation, like Aceclofenac, often cause systemic side effects because they travel throughout the entire body. Topical drug delivery presents a smarter alternative by delivering the drug directly to the affected area, minimizing these side effects. The core of an effective topical gel lies in its polymer base, which controls the release of the medicine. The idea is to utilize this agricultural waste product, banana peel starch, as a new natural polymer to develop this gel base. This paper presents the transformation of this "waste" into a biocompatible and inexpensive material for pharmaceutical applications. The banana peel starch-based gel proposed herein will serve as an excellent vehicle for drugs such as Aceclofenac by allowing sustained release of the drug at the site of application and providing longer-acting pain and inflammation relief without gastrointestinal and other systemic adverse effects. The future of this approach is very promising and is in tune with the global trend toward green and sustainable technologies. By valorizing agro-waste, it offers an economically viable and environmentally friendly solution. Success in this area could pave the way for a new class of topical formulations using natural polymers, reducing our reliance on synthetic alternatives and making targeted therapies more accessible and safer for widespread use.

Keywords: Banana Peel Starch, Topical Drug Delivery, Natural Polymer, Enhanced Drug Delivery, Sustainable Pharmaceutics.

AI IN MEDICAL BIOTECHNOLOGY FOR SUSTAINABLE DISCOVERY

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative force in medical biotechnology, driving sustainable discoveries and innovations across the healthcare spectrum. By integrating computational intelligence with biological data, AI enables rapid analysis of complex biological systems, leading to more precise diagnostics, targeted drug development, and efficient treatment strategies. In medical biotechnology, machine learning algorithms are revolutionizing genomics, proteomics, and metabolomics by uncovering patterns that were previously undetectable through traditional methods. These technologies enhance predictive accuracy, accelerate biomarker discovery, and contribute to precision medicine by tailoring therapies to individual patients. Moreover, AI-assisted modeling supports sustainable discovery by reducing experimental costs, minimizing resource use, and enabling eco-friendly bioprocess optimization. AI also enhances vaccine design, disease surveillance, and personalized regenerative medicine through predictive analytics. By fostering automation and data-driven insights, AI ensures that biotechnological innovations are more efficient, ethical, and environmentally responsible. Therefore, the integration of AI into medical biotechnology not only accelerates scientific progress but also promotes sustainability, ultimately contributing to a more resilient and equitable healthcare system.

Keywords: Artificial Intelligence, Targeted drug development.

**ADVANCING PHARMACEUTICAL QUALITY THROUGH TOTAL QUALITY
MANAGEMENT: CHALLENGES, STRATEGIES AND INNOVATIONS**

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ABSTRACT

Ensuring the highest standards of quality, safety, and efficacy remains the cornerstone of the pharmaceutical industry. Total Quality Management (TQM) provides a holistic framework to achieve this objective through prevention-based strategies rather than defect detection. This paper explores the advancement of pharmaceutical quality through TQM, highlighting emerging challenges, strategic responses, and innovative approaches driving continuous improvement. The implementation of TQM in pharmaceuticals demands not only compliance with Good Manufacturing Practices (GMP) and regulatory standards such as cGMP and GLP but also a deep integration of organizational culture, employee involvement, and technological innovation. Major challenges include maintaining global quality consistency, aligning multidisciplinary operations, and addressing the dynamic expectations of regulators and consumers. To overcome these, pharmaceutical organizations are adopting advanced process control tools, data-driven decision-making models, and quality-by-design (QbD) frameworks. The study underscores the role of leadership commitment, cross-functional collaboration, and continual learning in sustaining TQM as a catalyst for quality excellence. Ultimately, TQM serves as a bridge between regulatory compliance and innovation, ensuring that pharmaceutical products meet the highest benchmarks of patient safety and therapeutic efficacy while fostering a culture of continuous quality advancement.

Keywords: Total Quality Management (TQM), pharmaceutical quality, continuous improvement.

TOPICAL APPROACH TO TICK REMOVAL FROM ANIMAL SKIN

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ABSTRACT

This study investigated the development, evaluation, and characterization of Ivermectin topical gel formulations to enhance anti-tick efficacy while addressing the limitations of conventional oral and injectable Ivermectin. Results showed that formulation F3 exhibited optimal physical properties, including viscosity (55,133 cps), excellent spreadability (15 g.cm/sec), and uniform drug content (96.4%), ensuring its suitability for topical application. In-vitro drug release studies revealed a sustained release profile for F3, consistent with zero-order kinetics, releasing 48.84 % of the drug over 12 hours. In vivo anti-tick efficacy studies using rabbit models demonstrated that F3 significantly reduced tick infestation by 51.5% within 12 hours, outperforming commercial Ivermectin creams and oral formulations. Stability studies conducted under accelerated conditions confirmed the physical, chemical, and microbial stability of F3 over six months. Recommendations for future research included exploring synergistic combinations of Ivermectin with other antiparasitic agents and extending the applications to human parasitic skin diseases. This work contributes to the advancement of topical drug delivery systems, providing a safe, effective, and patient and pet compliant alternative to conventional Ivermectin therapies.

Keywords: Ivermectin , anti-tick activity, drug retention studies.

DEVELOPMENT AND VALIDATION OF RP-HPLC METHOD OF POLMACOXIB

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ABSTRACT

Polmacoxib, chemically named 4-[3-(3-fluorophenyl)-4,5-dihydro-5,5-dimethyl-4-oxo-2-furanyl]benzenesulfonamide, has the molecular formula C₁₈H₁₆FNO₄S and a molecular weight of 361.39 g/mol. Polmacoxib, originally known as CG100649, is a selective cyclooxygenase-2 (COX-2) inhibitor classified as a nonsteroidal anti-inflammatory drug (NSAID). In addition to COX-2 inhibition, it demonstrates strong inhibitory activity against carbonic anhydrase isoforms I and II, which is attributed to the presence of its aryl sulfonamide group, resembling the structural features of celecoxib and valdecoxib. Polmacoxib differs from other NSAIDs because it works through two mechanisms: it suppresses COX-2 activity and binds strongly to carbonic anhydrase (CA). CA plays a vital role in maintaining the body's pH balance by converting carbon dioxide and bicarbonate. When COX-2 and CA are both present, polmacoxib's strong affinity for CA can lower its effectiveness in COX-2 inhibition. CG100649 has poor solubility in water, and the distinct lattice energies of its polymorphs contribute to differences in solubility and dissolution rates. By using HPLC validation parameters of Polmacoxib like - Linearity, Robustness, Precision, Accuracy and Ruggedness will be performed. This project is to perform fast and accurate RP-HPLC method of Polmacoxib. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10µm particle size.

Keywords: Polmacoxib, COX-2 inhibitor, RP-HPLC.

DEVELOPMENT AND VALIDATION OF STABILITY-INDICATING RP-HPLC METHOD OF NEBIVOLOL HCl

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ABSTRACT

Nebivolol hydrochloride (HCl) is a prescription medicine that belongs to a group of drugs called beta-blockers. It is mainly used to help lower high blood pressure. It works by slowing down the heart rate (Beta-1 receptor blockade) and helping the blood vessels relax (Vasodilation through nitric oxide release), which improves blood flow and lowers blood pressure. This two-way mechanism helps making this drug a good option. A common brand name of nebivolol HCl is Bystolic. Nebivolol is available in oral tablets in strengths such as 2.5 mg, 5 mg, 10 mg, and 20 mg. Usually a dose of 10mg is given initially to the patients. By using HPLC validation parameters of Nebivolol HCl like - Linearity, Robustness, Precision, Accuracy and Ruggedness will be performed. To develop and validate a RP-HPLC method of Nebivolol HCl, we are using a Waters 515 hplc pump, UV waters 2489 detector and Empower software. Chromatographic separations done by C18 column (250 × 4.6 mm, 5 µm particle size). The optimized mobile phase consists of methanol: Water (70:30). Flow rate was maintained at 1 ml/min. Analysis was carried out at 282 nm.

Keywords: Quercetin Dihydrate, RP-HPLC, UV- Detector.

**DESIGN, SYNTHESIS AND EVALUATION OF NOVEL N-(QUINOLIN-3-YLMETHYL)
ANILINE DERIVATIVES AS POTENT ANTICANCER AGENTS**

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ABSTRACT

A novel series of quinoline derivatives (9a-f, 10a-f) were designed based on approved inhibitors such as Lenvatinib, Cabozantinib, Sunitinib and Nintedanib followed by the synthesis and evaluation of potential anticancer activity against VEGFR-2. The synthesized compounds exhibited VEGFR-2 inhibitory activity with IC₅₀ ranging from 632 to 1276 nM compared to Lenvatinib (IC₅₀ = 415 nM), where derivative 10e was the most potent. Compounds 10e and 9e (IC₅₀ of 632 and 762 nM, respectively) displayed moderate VEGFR-2 inhibitory activity compare to the reference drug (IC₅₀ = 415 nM), and were further subjected to cytotoxic study against HepG2 and HUVEC cell lines. The *in vitro* cytotoxic study revealed that compound 10e (*N*²-((2-chloro-6-methylquinolin-3-yl)methyl)-*N*¹-isobutyl-4-(trifluoromethyl)benzene-1,2-diamine) exhibited the most potent cytotoxicity against both HepG2 and HUVEC cell line (IC₅₀ = 75.29 and 82.69 μM), compare to the standard Lenvatinib with an IC₅₀ of 26.95 μM. Additionally, the docking study reveals that compound 10e involved in hydrogen bonding with hinge region residue CYS919 (1.93Å), whereas, compound 9e forms hydrogen bond with ATP-binding region residue GLU885 (206.Å). The results suggested that further modifications of the compounds may lead to promising candidates for the development of new anticancer agents as VEGFR-2 inhibitors.

Keywords: Cancer, VEGFR-2, quinoline, enzyme inhibition, cytotoxicity study.

**DEVELOPMENT AND VALIDATION OF STABILITY-INDICATING RP-HPLC METHOD
OF DIFLUPREDNATE**

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ABSTRACT

Ophthalmologists primarily prescribe difluprednate for two key purposes: To manage inflammation and discomfort following ocular surgeries such as cataract procedures, and to treat endogenous anterior uveitis, an inflammation affecting the eye's anterior segment. Difluprednate, a corticosteroid, functions by reducing the body's inflammation. It achieves this by blocking the release of natural chemicals such as prostaglandins and leukotrienes, which are responsible for causing redness, pain, and swelling in the eye. Difluprednate is a highly potent topical corticosteroid that alleviates inflammation and pain by disrupting the biochemical pathways responsible for inflammatory responses. By using HPLC validation parameters of Difluprednate like - Linearity, Robustness, Precision, Accuracy and Ruggedness will be performed. This project is to perform fast and accurate RP-HPLC method of Difluprednate. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10μm particle size.

Keywords: Difluprednate, RP-HPLC, Durezol

A COMPREHENSIVE REVIEW: CORE SHELL NANO PARTICLES IN PHARMACEUTICAL DRUG DELIVERY

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ABSTRACT

A primary problem in the design of an effective drug-delivery system is the regulation of drug release. In this regard, numerous multifunctional nanoparticles including various triggers and intricate chemistries have been created. This research presents the utilization of a hybrid system comprising thermos-responsive gold core and polymeric shell nanoparticles, which facilitates a prolonged, triggered release of doxorubicin, hence enhancing the system's efficiency relative to individual nanoparticles. The selection of the system was predicated on the best trigger applicable in biological systems and a component sensitive to that trigger. This study offers a thorough analysis of current developments and trends in the application of core/shell nanoparticles for the creation of electrochemical biosensors based on enzymes. Additionally, a statistical analysis of the research conducted in this area between 2007 and 2023 is conducted using the favoured electrochemical methods. A summary of recent uses of core/shell nanoparticles in enzyme-based electrochemical biosensors to measure food toxins, environmental pollutants, and clinical biomarkers was provided. The review also covers new developments and approaches that use core/shell nanoparticles to enhance the performance of enzyme-based electrochemical biosensors. These include the creation of novel hybrid nanostructures and multifunctional nanocomposites, as well as the incorporation of nanomaterials with properties including hydrophilic character, chemical and thermal stability, conductivity, biocompatibility, and catalytic activity.

Keywords: Core-Shell Nano particles, Drug Delivery, Imaging, Diagnosis.

FORMULATION, OPTIMIZATION, AND CHARACTERIZATION OF INSULIN-LOADED POLYMERIC NANOPARTICLES FOR NASAL DELIVERY

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ABSTRACT

The present study focuses on the preparation and characterization of insulin-loaded polymeric nanoparticles designed for nasal delivery to enhance bioavailability and maintain sustained glycemic control. Nanoparticles were formulated using the double emulsion (W/O/W) solvent evaporation method employing biodegradable polymers such as poly (lactic-co-glycolic acid) (PLGA) and chitosan. The formulation parameters were optimized to achieve desirable particle size, encapsulation efficiency, and drug release profile. Characterization studies included particle size analysis, polydispersity index (PDI), zeta potential, surface morphology (SEM/TEM), Fourier-transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), and in vitro drug release. The optimized nanoparticles exhibited a mean particle size below 200 nm, positive zeta potential, and high encapsulation efficiency (>80%). In vitro release studies demonstrated a biphasic release pattern with an initial burst followed by sustained release up to 24 hours. Ex vivo nasal permeation studies confirmed enhanced insulin absorption compared to pure drug solution. The results indicate that polymeric nanoparticles can serve as an efficient and patient-friendly carrier system for nasal insulin delivery, potentially improving therapeutic efficacy and patient compliance in diabetes management.

Keywords: Insulin; Polymeric nanoparticles; Nasal delivery; PLGA; Chitosan; Controlled release.

**INTEGRATED IN-SILICO ADME MODELLING AND OECD-COMPLIANT TOXICITY
ASSESSMENT OF QUERCETIN AND γ -ORYZANOL COMBINATION FOR IBS-
ORIENTED NUTRACEUTICAL APPLICATIONS**

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ABSTRACT

Quercetin and γ -oryzanol are recognised nutraceutical phytocompounds possessing antioxidant, anti-inflammatory, gut barrier-protective and metabolic regulatory benefits. However, consolidated preclinical safety validation of their combined administration remains inadequate. This study aimed to explore ADME behaviour, predictive toxicity indices, and *in vivo* safety evaluation of the Quercetin– γ -oryzanol combination (QO) to establish its suitability for future IBS-focused product development. *In silico* ADME and toxicity investigations were assessed using Swiss ADME and Pro Tox-III to determine pharmacokinetic attributes and toxicity classes. Acute and sub-acute oral toxicity studies were executed in Wistar rats following OECD protocols 423 and 407, respectively. QO was administered at 500, 750, 1000 and 2000 mg/kg for 28 days. Body weight progression, clinical observations, organ-to-body weight index, haematology, biochemistry and microscopic tissue examination were evaluated to determine risk margins. ADME prediction showed that quercetin has good GI absorption, moderate solubility, and inhibition potential for CYP1A2 and CYP3A4, whereas γ -oryzanol showed lower solubility and absorption but displayed favourable non-toxic characteristics. ProTox-III predicted LD₅₀ values of ~159 mg/kg for quercetin and 500-2000 mg/kg for γ -oryzanol (toxicity class 3 and class 4-5, respectively). *In vivo* acute toxicity testing of QO demonstrated no mortality or behavioural adverse signs up to 2000 mg/kg, confirming LD₅₀ > 2000 mg/kg. Repeated 28-day exposure did not generate significant deviations in hematologic or biochemical parameters. Non-significant organ weight variations were noted, and histopathology confirmed intact tissue Morphology in the stomach, intestine, kidney and heart. The QO combination showed an excellent safety profile in rats and did not induce significant systemic, biochemical, or organ-related toxic impacts at evaluated dosing ranges.

Keywords: Irritable bowel syndrome, Quercetin, γ -Oryzanol, Rice Bran, Gastrointestinal disorders, Toxicity profiling, ADME modelling, ProTox.

DESIGN AND EVALUATION OF HERBAL WOUND HEALING KIT

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ABSTRACT

The increasing demand for safe, effective, and sustainable wound care solutions has led to a surge in research on herbal formulations. This study presents the development and evaluation of a comprehensive herbal wound healing kit comprising a dusting powder, cleanser, and gel, each formulated with scientifically validated phytoconstituents known for their wound healing, antimicrobial, and anti-inflammatory properties. The dusting powder was prepared using a blend of *Curcuma longa* (turmeric), *Calendula officinalis* (marigold), *Terminalia arjuna* (arjuna), talc, kaolin, and zinc oxide, offering a synergistic effect for wound protection and healing. The cleanser was formulated with extracts of *Azadirachta indica* (neem), *Centella asiatica* (gotu kola), and *Aloe vera*, providing gentle cleansing and antimicrobial action. The gel was developed using a combination of *Curcuma longa*, *Triphala*, and *Babool* (*Acacia nilotica*), ensuring sustained release of active ingredients and enhanced tissue regeneration. Each component was subjected to rigorous physicochemical and microbiological evaluation, including pH, viscosity, spreadability, particle size, stability, and antimicrobial efficacy. The dusting powder exhibited superior moisture absorption and wound coverage, while the cleanser and gel showed effective wound cleansing and accelerated healing in animal models. The herbal wound healing kit offers a holistic approach to wound management, combining traditional herbal wisdom with modern formulation techniques. This research highlights the potential of herbal combinations in developing safe, effective, and eco-friendly wound care products, paving the way for further clinical studies and commercialization.

Keywords: phytoconstituents, accelerated, commercialization.

DESIGN DEVELOPMENT AND EVALUATION OF NANO CARRIER BASED FORMULATION FOR TOPICAL DELIVERY OF ANTI FUNGAL DRUG

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ABSTRACT

Topical drug delivery involves drug transport from a product on the skin to a local target site and then clearance by diffusion, metabolism, and the dermal circulation to the rest of the body and deeper tissue. The introduction of the spansule sustained release capsule technology in 1952 marked the beginning of modern drug delivery technology. This technology can administer a medicine orally for 12 hours by releasing the first dose immediately and the remaining dose gradually. Until the 1980 the market and drug delivery industry were dominated by oral and transdermal formulation that offered small molecules therapeutic duration of up to 24 hours. Long acting injectables and implantables were increased the length of medication administration from days to months and sometimes even years. Topical remedies for skin have been used by society since ancient times frequently involving the use of herbs and minerals. Many products have been developed throughout the years that target the outer layer of the skin including lotion, ointment, gel, creams. When the FDA authorized the first transdermal patch for motion sickness in 1970, it was a major step toward for regulating medication administration by the skin with research underway to create novel adhesive and enhancer to increase medicine efficacy and broaden treatment options they are already 23 FDA approved patches to the efficient and convenient administration of medications.

Keywords: Sustained Release, Transdermal, Implantable, Administration, Therapeutic FDA, Dose

**FORMULATION DEVELOPMENT, CHARACTERIZATION AND PHARMACOLOGICAL
EVALUATION OF *ECLIPTA ALBA* PHYTOSOMES**

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ABSTRACT

Eclipta alba (L.) Hassk, a medicinal herb widely recognized for its hepatoprotective, anti-inflammatory, and antioxidant properties. This study was focused on the development of *Eclipta alba* phytosomes a novel phospholipid-based drug delivery system designed to enhance the solubility, absorption, and bioefficacy of plant-derived therapeutics. *E. alba* extract was complexed with soy lecithin using a solvent evaporation technique to synthesize phytosomes. The physicochemical characterization of the formulated phytosomes revealed a mean particle size of approximately 150 nm, a zeta potential of -30 mV, indicating excellent colloidal stability, and an encapsulation efficiency of 85%. The therapeutic efficacy of the phytosomal formulation was assessed through in vitro and in vivo pharmacological evaluations. Antioxidant activity, determined via DPPH and ABTS radical scavenging assays, demonstrated enhanced potency, with IC₅₀ values of 12.5 µg/mL and 15 µg/mL, respectively, compared to the free extract (IC₅₀ = 25 µg/mL). Furthermore, in vivo studies revealed significant anticancer potential, highlighting the improved pharmacological performance of the phytosomal formulation. These findings underscore the potential of *Eclipta alba* phytosomes as a promising approach to augment the bioavailability and therapeutic efficacy of plant-derived bioactives, paving the way for their effective clinical application.

Keywords: *Eclipta alba*, phytosomes, formulation development, pharmacological evaluation, characterization, bioavailability.

**NEURAL NECTAR: AI AND NATURAL INTELLIGENCE IN WOMEN’S FERTILITY AND
NUTRACEUTICAL SCIENCE**

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ABSTRACT

Artificial Intelligence (AI) is transforming natural product research and the development of nutraceuticals by speeding up compound discovery, predicting bioactivity, and customizing formulations. For women’s fertility health, the integration of technology is paving a new frontier of disruption. Fertility issues like polycystic ovary syndrome (PCOS), endometriosis, and ovulatory dysfunction are more and more associated with metabolic, hormonal, and inflammatory disruptions, precisely the type of condition natural bioactive compounds can therapeutically support. Utilizing the power of databases like PubChem and ChEMBL, along with molecular docking software like AutoDock and AlphaFold, AI makes it possible to rapidly screen phytochemicals, curcumin, resveratrol, ashwagandha, myo-inositol, etc. for activity on major hormonal receptors like FSHR, LHR, and ERβ. Deep learning-based QSAR models and binding affinity prediction, bioavailability prediction and data driven personalization systems that utilize genomic and metabolic data for supplement design optimization. Machine learning also facilitates the development of tailored nutraceuticals regimens using an individual’s genetic, metabolic, and lifestyle information to ensure maximum efficacy and safety. Complex fertility pathway, identifying interactive effects of plant compounds and developing cycle based customized nutraceuticals with the use of ML/AI are potential highlights. Although data limitations and ethical considerations persist, the convergence of AI, natural product investigation, and fertility-focused nutraceuticals provides an unprecedented paradigm for non-invasive, precision-based reproductive health solutions.

Keywords: Artificial Intelligence (AI); Nutraceuticals; Women’s Fertility; Phytochemicals.

LIC25-O-047

**AI-ASSISTED OPTIMIZATION OF HERBAL PHYTO-FORMULATIONS: A PREDICTIVE
APPROACH FOR DEVELOPING GOKHRU-BASED TRANSDERMAL PATCHES
AGAINST CISPLATIN-INDUCED NEPHROTOXICITY**

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ABSTRACT

The current research focuses on the intelligent optimization of Gokhru (*Tribulus terrestris*) fruit extract-loaded transdermal patches aimed at mitigating cisplatin-induced nephrotoxicity. Cisplatin remains a cornerstone chemotherapeutic drug but is limited by nephrotoxic side effects caused by oxidative stress and free radical generation. Gokhru fruit extract, enriched with nephroprotective saponins, flavonoids, and phenolic compounds, offers promising antioxidant and anti-inflammatory benefits. Employing AI-driven predictive modeling and Quality by Design (QbD) frameworks, key formulation variables such as polymer blend ratios, plasticizer concentration, and permeation enhancers will be optimized to achieve desirable mechanical strength, drug content uniformity, and sustained release profiles. Machine learning algorithms will facilitate correlation mapping between formulation attributes and pharmacotechnical outcomes, reducing the need for extensive trial-and-error experimentation. The optimized patch will be further assessed for in-vitro release kinetics, permeation efficiency, and stability following ICH guidelines. Integrating AI with herbal drug delivery represents a progressive step toward personalized, sustainable, and efficient therapeutic systems. The approach emphasizes synergy between traditional phytomedicine and computational intelligence to design next-generation transdermal systems with enhanced nephroprotective potential against cisplatin toxicity.

Keywords: Artificial Intelligence, Gokhru extract, transdermal drug delivery, nephrotoxicity, cisplatin.

LIC25-O-048

**FORMULATION AND EVALUATION OF NIOSOMAL GEL CONTAINING
CLOTRIMAZOLE FOR THE TREATMENT OF ORAL CANDIDIASIS**

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ABSTRACT

The present study aims to formulate and evaluate a niosomal gel of clotrimazole for enhanced local delivery, prolonged retention, and improved antifungal activity. Clotrimazole-loaded niosomes were prepared using the thin film hydration technique employing Span 60 and cholesterol in varying molar ratios. The niosomal formulations were characterized for particle size, polydispersity index, zeta potential, entrapment efficiency, and in vitro drug release. The optimized niosomal dispersion was incorporated into a Carbopol 934-based gel. The resulting niosomal gel was evaluated for pH, viscosity, spreadability, drug content, ex vivo permeation, and antifungal efficacy against *Candida albicans*. The optimized niosomal formulation exhibited a mean particle size of approximately 180 ± 10 nm, an entrapment efficiency of 85%, and sustained drug release over 12 hours. The niosomal gel demonstrated acceptable physicochemical properties, enhanced mucosal retention, and significantly improved antifungal activity compared to conventional clotrimazole gel. The developed clotrimazole-loaded niosomal gel presents a promising novel drug delivery system for the effective treatment of oral candidiasis, providing sustained release, improved local bioavailability, and better patient compliance.

Keywords: Type 2 Diabetes Mellitus, Incretin Agonists, SGLT2 Inhibitors.

ADVANCED THERAPEUTICS AND DRUG DELIVERY TECHNOLOGIES

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ABSTRACT

Artificial Intelligence (AI) recently started to gear-up its applications in pharmaceutical industries. AI has revolutionized drug discovery and development by accelerating timelines, reducing costs and increasing success rate. The traditional drug discovery process is complex, costly and time-consuming, it is mainly due to sequential nature of its stages, involving target identification, lead discovery, lead optimization, pre-clinical testing and lengthy clinical trials that all requires vast resources and validation. Critically, the process suffers from a low success rate, these challenges demands more efficient methods such as AI and ML offers promising path towards increasing efficiency and success rate in drug discovery and development, also opening-up novel opportunities in pharmaceutical industry. AI accelerates lead discovery by predicting pharmacokinetics, toxicity, potential side effects while also refining clinical trial designs through improved patient recruitment and data analysis. Additionally during traditional drug discovery only a small fraction of drug candidates that enters clinical trials ultimately receive regulatory approval. Despite the efforts, only 2.01% of drug development projects ultimately results in a successful marketable drug, this type challenges highlight the urgent need for innovative approaches. Further advancements in AI-powered drug discovery will require a focus on improving data standardization, fostering transparency in AI-model development and strengthening collaboration between AI researcher and pharmaceutical experts by addressing these challenges AI holds the potential to transform the healthcare landscape by delivering safer, more effective and affordable medicines to patients.

Keywords: Artificial Intelligence, Drug discovery and development, Machine learning (ML).

THYROID DISEASE

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ABSTRACT

Thyroid disease can be broadly categorized into hypothyroidism and hyperthyroidism. Approximately 20 million people are thought to have thyroid disease. Hashimoto's thyroiditis: an autoimmune condition leading to hypothyroidism. Many patients have subclinical hypothyroidism, and the decision to treat with levothyroxine is personalized. Hyperthyroid disorders are less common, and the majority are Graves' disease, which is an autoimmune condition. The thyroid manages metabolism through hormones mainly: triiodothyronine and thyroxine, and most thyroid gland disorders manifest either as hypothyroidism or hyperthyroidism. This research paper presents an evaluation of different machine learning models in predicting and diagnosing thyroid diseases. The thyroid gland plays an important role in the regulation of metabolism, growth, and development through the secretion of thyroid hormones, namely thyroxine (T4) and triiodothyronine (T3). Thyroid disorders, such as hypothyroidism, hyperthyroidism, goiter, and thyroid cancer, are the most prevalent endocrine conditions throughout the world, more so in females. This project will dwell upon the pathophysiology, epidemiology, diagnosis, and pharmacological management of thyroid disorders, highlighting the pharmacist's role in early detection, patient counseling, and therapeutic monitoring. Data were gathered from published journals, hospital records, and WHO reports to trace the prevalence, causes, and treatment outcomes associated with thyroid dysfunction. This study concludes that increased awareness, periodical screening, and rational use of medications like levothyroxine and anti-thyroid agents can bring tremendous improvement in patient outcomes.

Keywords: Thyroid disease, hypothyroidism, hyperthyroidism.

LIC25-O-051

COMPUTER-AIDED DRUG DESIGN AND VIRTUAL SCREENING

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ABSTRACT

Modern drug discovery is characterized by the production of vast quantities of molecules and compounds and the need to examine these compounds in short periods of time. The need to store, manage and analyze these rapidly increasing number of compounds has given the rise to field known as computer aided drug design (CADD). CADD has revolutionized the field of pharmaceutical research by integrating computational tools with chemical and biological sciences to accelerate the drug discovery process. CADD represents computational methods and resources that are used to facilitate the design and discovery of new therapeutic aids. CADD makes use of the structural knowledge of either the target or known ligand with bioactivity to facilitate the determination of promising resultant drugs. Various virtual screening techniques are now being used by various pharmaceutical companies and research scholars to reduce the cost and time required for the discovery of a potent drug. Techniques such as molecular docking, QSAR, and pharmacophore modelling enhanced accuracy while reducing errors and experimentation costs. Advantages presented by structure-based and ligand-based drug design have a powerful impact on rational drug design,

Keywords: Computer aided drug design, virtual screening, computational modelling, pharmacophore modelling, QSAR, molecular docking.

LIC25-O-052

IN SILICO ADME PREDICTION AND MOLECULAR DOCKING STUDIES OF HETEROCYCLIC MOIETIES AS NOVEL SGLT2 INHIBITORS: LEVERAGING AI-DRIVEN ADME PLATFORMS FOR LEAD OPTIMISATION

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ABSTRACT

In this study, we explore a series of heterocyclic derivatives as putative SGLT2 inhibitors, employing a combined in silico workflow of molecular docking and AI-powered ADME/T (absorption, distribution, metabolism, excretion/toxicity) prediction to prioritize leads for further development. Firstly, the heterocyclic library was designed and docked into the active site of SGLT2 using standard docking protocols to evaluate binding affinities and key interactions (hydrogen bonds, hydrophobic contacts, etc.). Concurrently, advanced ADME/T prediction was carried out using several AI-based platforms: for example, the open-source “ADMET AI” uses graph neural networks trained on large datasets to rapidly evaluate absorption, distribution, metabolism and excretion endpoints. Parallel ADME/T prediction results indicated that these hits were predicted to have drug-like physicochemical and pharmacokinetic profiles, with acceptable absorption, low predicted transporter risk, and favourable metabolic stability. This workflow reduces the attrition risk associated with late-stage failures due to poor ADME or toxicity. Future work will involve synthesis and in vitro/in vivo evaluation of the top-ranked heterocyclic leads for glucose uptake inhibition, SGLT2 selectivity, metabolic stability and in-vivo pharmacokinetics. Our study exemplifies how modern AI-driven ADME/T prediction software can be integrated with molecular docking in the early phases of antidiabetic drug discovery, accelerating identification of promising SGLT2 inhibitor candidates.

Keywords: Sodium-glucose cotransporter 2 (SGLT2), ADMET, Type 2 diabetes mellitus (T2DM).

LIC25-O-053

AI-INTEGRATED PERSONALIZED TREATMENT: REVOLUTIONIZING PATIENT-CENTRIC HEALTHCARE

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ABSTRACT

Personalized treatment is a rapidly evolving concept that aims to provide customized therapeutic strategies based on an individual's genetic, clinical, and lifestyle information. Artificial Intelligence (AI) plays a crucial role in enhancing this approach by analyzing complex biomedical data and identifying patterns that are beyond human capability. Through machine learning algorithms, AI can predict disease risks, optimize drug selection, and determine the most effective dosage for each patient. By integrating AI with clinical databases, genomic sequencing, and patient monitoring systems, healthcare professionals can develop dynamic treatment plans tailored to each individual's biological profile. For instance, AI models can analyze patient responses to medications, enabling timely adjustments to therapy, thus minimizing adverse drug reactions and improving treatment efficacy. Moreover, AI-powered tools assist in early diagnosis, precision drug discovery, and continuous health tracking using wearable sensors and smart devices. This integration not only enhances the accuracy and speed of medical decision-making but also contributes to cost-effective and outcome-oriented healthcare. Therefore, AI-integrated personalized treatment represents a transformative step toward predictive, preventive, and participatory medicine, ensuring that every patient receives the right treatment at the right time.

Keywords: Artificial Intelligence, Personalized Medicine, Machine Learning, Predictive Analytics, Precision Healthcare.

LIC25-O-054

AI-INTEGRATED PHARMACOVIGILANCE: REAL-TIME DETECTION OF ADVERSE DRUG REACTIONS

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ABSTRACT

Artificial intelligence (AI) in pharmacovigilance provides another paradigm whereby real-time, predictive and proactive monitoring of drug safety is possible. Machine learning and deep learning algorithms allow for the analysis of large, heterogeneous datasets including electronic health record (EHR), clinical trial, social media clinical trial, genomic and wearable-sensor data to identify novel ADR signals with unmatched rapidity and accuracy. Natural Language Processing (NLP) algorithms augment this surveillance by allowing the extraction of adverse event data from disparate (unstructured) information sources, including physician notes, scientific literature, and narratives from patients. Concurrently learning from multi-dimensional sources of information, the AI can identify signals advanced, flag potential drug-drug interactions, and predict safety issues in specific populations before any harm can be dropped on them. Advances in practice, including the FDA's acceptance of the incorporation of AI in screening information for FAERS and changes to WHO's Vigibase, can be illustrated as case studies which show the beneficial influence of AI-driven pharmacovigilance on patient safety and decision-making. This will discuss the technical infrastructure, validation design and ethical issues related to the application of AI for the real-time detection of ADRs and highlight the new role of pharmacists as significant stakeholders in the interpretation of AI-driven insights into safety.

Keywords: Pharmacovigilance, Adverse Drug Reactions, Artificial Intelligence, Drug.

AI-GUIDED OPTIMIZATION OF QUERCETIN NANOFORMULATIONS

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ABSTRACT

Quercetin is a flavonoid which occurs naturally and have antioxidant, anti inflammatory and cardio-protective activities. It is found in food like berries, apples and onions. It has poor solubility and fast metabolism and is unstable in gastrointestinal tract, due to which quercetin has low oral bioavailability and this limit its therapeutic potential despite its health benefits. Nanoformulations such as nanoemulsions, liposomes, polymeric nanoparticles which are tiny, nanoscale systems. They have been found to enhance quercetin's absorption and overcomes the problem of bioavailability and increases its stability. Parameters like particle size, zeta potential, liquid/polymer ratios, surfactant concentration and pH were all included in a dataset from previously done studies. In this study, machine learning (ML) techniques were applied to analyse and predict the impact of Nanoformulation variables on the bioavailability of quercetin. Models like Random Forest, Artificial Neural Networks and Support Vector Regression were trained to determine the variables affecting solubility and absorption using python based tools. Objective of this study is to create a framework for data-driven optimization of natural component formulations by combining computer stimulations with available formulation data. The results are anticipated to explain how an artificial intelligence might help reduce experimental trial and error in formulation creation while enhancing the efficiency and design of nutraceutical delivery system.

Keywords: Quercetin, Nanoformulations , Random Forest algorithm.

IN SILICO PHARMACOKINETICS AND PHARMACODYNAMICS MODELING USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial intelligence (AI) has surfaced as important tools in pharmacokinetics (PK) and pharmacodynamics (PD) studies, revolutionizing medicine development and substantiated drug. In PK and PD studies, AI and ML models can prognosticate medicine immersion, distribution, metabolism, and excretion parameters, enabling more accurate lozenge recommendations and personalized treatment plans. also, in PD studies, these ways can interpret intricate relationship between medicine attention and pharmacological effect, abetting in cure optimization, response vaticination, and the identification of implicit biomarkers. There are several software tools and programming libraries available that can be used for applying AI and ML ways to PK and PD studies of nanoparticles. Artificial Intelligence (AI) has come a potent tool for perfecting in silico PK/ PD modeling in recent times, allowing for quick, precise, and provident simulations. Large-scale datasets from chemical, natural, and clinical sources can be anatomized by machine literacy and deep literacy algorithms to read drug immersion, metabolism, cure- response connections, and remedial results. Experimenters can probe inter-individual variability and optimize dosing rules by using generative AI to mimic virtual case populations. Incorporating AI into PK/ PD modeling promotes acclimatized treatment strategies, lessens the need for beast testing, and pets up medicine discovery and development. The present uses, benefits, downsides, and implicit operations of AI in PK/PD simulation are bandied in this paper, with a focus on how it might enhance the effectiveness, safety, and delicacy of contemporary medicine development.

Keywords: Pharmacokinetics, Pharmacodynamics, Artificial Intelligence, Silico Modeling.

MECHANISTIC INSIGHTS INTO THE PATHOPHYSIOLOGY OF DIABETES MELLITUS

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ABSTRACT

The pathophysiology of both type 1 and type 2 diabetes mellitus is thoroughly examined in this study, with an emphasis on recent developments in our knowledge of the disease's aetiology. While type 2 diabetes is characterized by insulin resistance in peripheral organs and a progressive loss of beta-cell function, type 1 diabetes is defined by autoimmune-mediated destruction of pancreatic beta cells, driven by intricate immunologic pathways. While type 2 diabetes is characterized by insulin resistance in peripheral organs and a progressive loss of beta-cell function, type 1 diabetes is defined by autoimmune-mediated destruction of pancreatic beta cells, driven by intricate immunologic pathways. The contributions of important molecular pathways to beta-cell death and insulin resistance are examined, including the PI3K/AKT signaling pathway, mitochondrial oxidative stress, and autophagy dysregulation. Additionally, new research shows that epigenetic modifications, chronic low-grade inflammation, and gut microbiome all contribute to the worsening of disease progression. A vicious cycle of hyperglycemia and metabolic imbalance is created when inflammatory cytokines and metabolic stress pathways interact to exacerbate beta-cell malfunction and insulin resistance. Gaining an understanding of these complex alterations in cellular response and molecular signaling can help identify possible treatment targets for maintaining beta-cell function, improving insulin sensitivity, and reducing metabolic inflammation. This review of recent studies offers a crucial viewpoint for creating cutting-edge diabetes management and prevention techniques.

Keywords: Diabetes Mellitus, Insulin Resistance, Beta-cell Dysfunction, PI3K/AKT Pathway, Oxidative Stress, Metabolic Inflammation.

AI-POWERED HYPERLOCAL HEALTHCARE APP: REVOLUTIONIZING MEDICINE DELIVERY AND PATIENT SUPPORT THROUGH MEDIQUICK APP WITH LOCAL PHARMACIES

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ABSTRACT

Mediquick is an app which proposes an AI Integrated Hyperlocal health care solutions which bridges this gap by transforming how prescriptions are processed, medicine are sourced and Delivers within minutes not in hours. This Innovation uses Artificial intelligence in Four Ways: AI in prescription processing- when prescription is uploaded in app then, it is scanned and examined using AI Powered Tools which ensuring Accurate medicine Identification and reducing Patients Confusion. It also connects Pharmacist with AI for real time Counselling and Clarification for Patients. AI in Inventory management: AI monitors the Daily Consumption of medicines from the local pharmacies and connect it with nearby warehouses within the radius of 15 km, which ensure that medicine should be regularly available in Local pharmacy and minimize stockouts by regular bases. AI in Delivery Routing: AI helps in Optimising Delivery Routes Using Real Time Traffic and Pharmacy Data enabling 15 - 20 minutes Drop - offs within a 5km radius. AI also matches delivery partners based on availability In Particular Area. AI in User Experiences: The Mediquick app uses AI to Personalize medicine recommendations of pharmacy, track orders, and provide health tips based on user order history.

Keywords: Mediquick, Prescription, Artificial intelligence.

NANOTECHNOLOGY FOR NANOMEDICINE AND DELIVERY OF DRUGS

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ABSTRACT

The goal of nanotechnology, an emerging field of study, is to take use of unique technological developments that regulate the structure of materials at a decreased dimensional scale, reaching individual molecules and their aggregates or supramolecular structures. It is anticipated that this century's economic growth and development will be significantly influenced by the manipulation and application of materials at the nanoscale. Recent advances in nanoscale science and engineering have opened up new possibilities for precisely engineering materials at the molecular level. The resulting materials are anticipated to be enabling technologies in the successful development and implementation of nanomedicine since they have been shown to have improved characteristics and adaptability. The monitoring, repair, creation, and control of human biological systems at the molecular level through the use of manmade nanodevices and nanostructures is known as nanomedicine. Electrospinning is a straightforward and affordable method that may create continuous fibers of a variety of materials, including ceramics and polymers. Nanofibers and macroporous scaffolds for drug delivery and tissue engineering are prepared using the electrospinning technology. In terms of manufacturing, porosity, changeable diameters, topology, and mechanical qualities, these are unique. The latest advancements in the use of nanofibers for tissue engineering and medication delivery are compiled in this study.

Keywords: electrospinning, nanofibers, stem cells, polymers, cell adhesion molecules, drug delivery, and tissue engineering.

STRUCTURE-BASED DESIGN OF NOVEL SOTAGLIFLOZIN ANALOGUES WITH ENHANCED SGLT2 INHIBITORY POTENTIAL: AN IN SILICO STUDY

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ABSTRACT

A library of seventeen (17) novel analogues was designed, primarily modifying the *aglycone* moiety of the sotagliflozin structure. Ensemble Molecular Docking was performed against two high-resolution human SGLT2 structures (PDB IDs: 8HG7 and 7VSI) to account for receptor flexibility and ensure robust affinity prediction. The most promising candidates were then subjected to comprehensive in silico ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) analysis. Molecular docking successfully identified several compounds with significantly improved SGLT2 binding affinity. Analogue A14 emerged as the lead candidate, demonstrating the best binding scores, reaching a maximum affinity of -9.3 kcal/mol (PDB ID 8HG7). This represents an improvement of over 3 kcal/mol compared to the lowest-scoring analogue (approx -6.1 kcal/mol), indicating strong ligand-receptor stabilization. Crucially, the in silico ADMET and toxicity assessment for Analogue A14 showed a highly favorable profile, including High predicted Gastrointestinal (GI) Absorption, zero Lipinski violations, and strong prediction of INACTIVE for Cardiotoxicity ($P < 0.78$) and Hepatotoxicity ($P < 0.60$). The integrated computational approach successfully nominated Analogue A14 as a highly potent SGLT2 inhibitor analogue of sotagliflozin. Its superior predicted binding affinity combined with an excellent drug-like and safety profile warrants its immediate progression to chemical synthesis and in vitro biological validation as a potential next-generation therapeutic agent.

Keywords: Sotagliflozin Analogue, SGLT2 Inhibitor, Molecular Docking, Ensemble Docking.

THE BENEFITS OF HERBAL COSMETICS

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ABSTRACT

The growing awareness of the importance of natural and sustainable living has led to a significant increase in the demand for herbal cosmetics. These products utilize plant-based ingredients, essential oils, and other natural components to promote skin health and beauty. This review explores the benefits of herbal cosmetics, highlighting their potential to provide effective, gentle, and eco-friendly alternatives to conventional cosmetics. Herbal cosmetics offer numerous benefits, including Natural Ingredients: Plant-based ingredients are rich in antioxidants, vitamins, and minerals, which can help to nourish and protect the skin. Reduced Side Effects: Herbal cosmetics are generally considered safer and less likely to cause adverse reactions compared to synthetic products. Sustainable: Many herbal cosmetics are made from sustainable and eco-friendly ingredients, reducing the environmental impact of the beauty industry. Customization: Herbal cosmetics can be tailored to individual skin types and concerns, providing personalized solutions for various skin issues. Some popular herbal ingredients used in cosmetics include: Aloe Vera: Known for its soothing and moisturizing properties. Turmeric, Rich in antioxidants and anti-inflammatory compounds. Neem: Recognized for its antibacterial and antifungal properties. Rose: Known for its antioxidant and anti-aging benefits. Herbal cosmetics offer a natural and effective way to promote skin health and beauty. By harnessing the power of nature, individuals can enjoy the benefits of healthy, glowing skin while also supporting sustainable and eco-friendly practices..

Keywords: herbal cosmetics, natural ingredients, sustainable, skin health, beauty.

DEVELOPMENT OF RELIABLE AND REGULATORY-COMPLIANT ANALYTICAL METHODS FOR ANTIVIRAL AGENTS: CURRENT PERSPECTIVE

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ABSTRACT

The rapid evolution of viral diseases and the global use of antiviral therapies have created an urgent need for reliable, accurate, and regulatory-compliant analytical methods. Ensuring the quality, safety, and efficacy of antiviral agents depends strongly on scientifically sound analytical procedures. The present work focuses on the systematic development and validation of analytical methods suitable for antiviral agents, emphasising compliance with current regulatory expectations from ICH, USFDA, EMA, and CDSCO. This study will involve a detailed review and experimental design of chromatographic (HPLC/UPLC), spectrophotometric (UV-Vis), and hyphenated (LC-MS/MS) methods used for estimation, impurity profiling, and stability assessment of selected antiviral drugs. Method validation will be carried out as per ICH Q2(R2) guidelines, evaluating key parameters such as accuracy, precision, linearity, robustness, LOD, and LOQ. The expected outcome is the establishment of a robust, precise, and reproducible analytical approach that meets international regulatory requirements. The developed and validated methods will serve as reliable tools for routine quality control, stability studies, and formulation development of antiviral agents.

Keywords: Antiviral agents, Analytical method development, RP-HPLC, Method validation.

LIC25-O-063

TRANSFORMING THE FUTURE OF DRUG DELIVERY AND DIAGNOSTICS

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ABSTRACT

By facilitating data-driven innovation in diagnosis, treatment, and material creation, artificial intelligence (AI) is quickly revolutionizing nanotechnology and nanomedicine. In order to enhance drug delivery, imaging, and biosensing, nanoscale scientists are using artificial intelligence (AI) and machine learning (ML) to anticipate and optimize nanoparticle features. Recent research, for instance, demonstrates how machine learning speeds up the design of nanocarriers for cancer treatment, including synthesis parameters, nano-bio interactions, circulation, extravasation into the tumor microenvironment, and cell internalization. Large datasets of inorganic nanoparticles have been subjected to ML/AI models in cancer specifically in order to identify design trends (shape, therapy kind) that are associated with in-vivo tumor decrease. Also, automated synthesis, high-throughput characterization, and data-driven screening of nanoparticle libraries are facilitated by AI-enabled platforms, which mitigate the necessity for trial-and-error and improve repeatability. Notably, statistical approaches that integrate physiologically based pharmacokinetics (PBPK) and machine learning (ML) have proven favorable predictive power for the therapeutic value of nanoparticle delivery in mice bearing tumors. In spite of such advances, there are still an assortment of lingering issues, such as the scarcity of superior, standardized datasets, the vast variation in reporting and design standards, and the substantial translational gap that still exists between computational forecasts and clinical outcomes. In the long run, AI-enabled nanotechnology heralds an era of change in precision medicine, where predictive analytics, intelligent design, and nanoscale interventions combine to deliver treatments that will be safer, more effective, and personalized.

Keywords: Artificial Intelligence, Nanomedicine, Machine Learning, Nanoparticle Design, Targeted Drug Delivery, Precision Medicine

LIC25-O-064

AI IN PERSONALISED HEALTH MONITORING, ANALYSIS AND ASSISTANCE

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ABSTRACT

AI has propelled the potential for moving toward personalized health and early prediction of diseases. AI models can turn continuous signals such as heart rate, movement, sleep, and phone interactions into digital biomarkers that show health trends in real time. This data can be collected using wearable devices and smartphones. Such tools can enable early detection, useful alerts, and timely advice to improve self-care and clinical decisions. The simple use cases like tracking fatigue with smartphone data, supporting care for long-term conditions at home, and guiding daily habits with easy tips are some of the many more ways in which Artificial Intelligence can significantly contribute to and revolutionise the pharmacy field. Clear workflows can be designed for collecting sensor data, applying machine learning to find patterns, and providing suggestions that people and clinicians can understand. Concerns like data quality, privacy and security issues and ethical guidelines from WHO, such as transparency, accountability, safety, and equity for all users can also be ensured with the use of Artificial Intelligence. The goal is to show simple, practical steps that are safe, explainable, and truly useful for patients and medical professionals. This work fits the theme of AI and digital innovation in pharma and healthcare and aims to encourage responsible use of AI for better outcomes. With the use of AI, health monitoring framework would be customised and become more accurate and accessible than it currently is.

Keywords: Artificial Intelligence, Personalised Health Monitoring, WHO Guidelines.

ROLE OF NUTRACEUTICALS IN THE PREVENTION AND MANAGEMENT OF CARDIOVASCULAR DISEASES

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ABSTRACT

Cardiovascular diseases remain the leading cause of death globally and are strongly linked to lifestyle, oxidative stress, and inflammation. They account for over 30% of global deaths, emphasizing the need for novel, safer, and more effective preventive strategies. Nutraceuticals i.e. bioactive compounds derived from dietary sources, offer a promising approach due to their antioxidant and anti-inflammatory properties. Key nutraceuticals such as omega-3 fatty acids, polyphenols, curcumin, coenzyme Q10, and garlic extract exhibit cardioprotective effects through antioxidant, antioxidant, anti-inflammatory, and lipid-lowering mechanisms. Regular dietary intake or supplementation of these nutraceuticals can complement conventional therapy and promote long-term cardiovascular wellness. Despite encouraging evidence, further long-term clinical trials and improved formulation technologies are essentials to validate their efficacy and safety. This review aims to summarize the current understanding of nutraceuticals in CVD prevention and highlight their potential in modern cardiovascular therapy.

Keywords: nutraceuticals, cardiovascular, inflammation, antioxidants, omega-3 fatty acids.

ROR GAMMA T TYPE AND ROLE OF INFLAMMATION CANCER

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ABSTRACT

Retinoic acid receptor-related orphan receptor gamma t (ROR gamma t) is a pivotal transcription factor that regulates immune cells differentiation and inflammation signaling pathways. It produces two isoforms, ROR gamma and ROR gamma t, which act as transcription factors governing distinct biological pathways. ROR gamma t types are the master regulator expressed in key immune subsets – most notably, TH17 cells, gamma and t cells, and types 3 innate lymphoid cells (ILC3s) – where it is essential for their differentiation and function. Persistent activation of ROR gamma t – driven pathways has been increasingly linked to chronic inflammation, creating a microenvironment inflammation, creating tumour initiation, angiogenesis and metastasis. In various cancers – including colorectal, breast and liver malignancies-ROR gamma t – expressing immune cells can paradoxically promotes tumour progression by enhancing inflammatory signaling and immune evasion. The molecular mechanism underlying ROR gamma t regulation and its crosstalk with inflammation networks provides new insights into cancer immunology. Targeting the ROR gamma t – IL – 17 axis offers promising therapeutics opportunities, potentially inflammation from a promoter of tumorigenesis into a weapon against cancer. ROR transforming gamma t stands as a crucial immunological switch at the intersection of inflammation and cancer emphasizing the need for balanced modulation in future cancer therapy strategies.

Keywords: Transcription, tumor, malignancies, immunology, therapeutics, inflammation.

LIC25-O-067

**MULTIDISCIPLINARY ADVANCES IN NANOTECHNOLOGY AND ARTIFICIAL
INTELLIGENCE FOR ENHANCED DRUG DELIVERY AND CUSTOMIZED
TREATMENTS**

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ABSTRACT

Artificial intelligence and nanotechnology change the way drugs get delivered. They help create tiny carriers that make drugs more soluble; these carriers also control how drugs are released over time, and they lower the toxic effects on the body. This approach cuts down on side effects and allows for therapy aimed just at problem areas. Artificial intelligence takes personalized medicine further along. It designs treatment plans based on a patient's specific genes. It considers their metabolism and lifestyle factors too. This arrangement enhances the positive outcomes and reduces the negative consequences of therapy. This greatly enhances targeted delivery. It blends old traditional medicine with today's pharmaceutical ways. Artificial intelligence speeds up the whole drug development process. It predicts how molecules interact with each other, and it also helps in the selection of the best chemicals for formulations. Modifications like these make treatments way more effective overall. Advanced nanobots go straight to diseased tissues; they release healing chemicals there with little damage to nearby healthy parts. Delivery to difficult areas is aided by magnetic nanoparticles, such as the brain or difficult-to-reach deep cancers. With antibiotic resistance on the rise, new options emerge to fight tough infections. Artificial intelligence drives discoveries of antimicrobials. All these advances in artificial intelligence and nanotechnology make treatments more precise and safer. Effectiveness goes up in the process.

Keywords: Artificial Intelligence (AI), Nanotechnology, Drug Delivery, Nanocarriers.

LIC25-O-068

**ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL RESEARCH: A NEW ERA OF
DISCOVERY**

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ABSTRACT

Artificial Intelligence (AI) has revolutionized pharmaceutical research by enhancing efficiency, precision and innovation throughout the drug development lifecycle. Its applications extend across drug discovery, personalized medicine, formulation design, pharmacokinetic and pharmacodynamic modeling, quality assurance and manufacturing. By identifying complex patterns within vast datasets, AI accelerates lead identification, predicts drug target interactions and simulates clinical outcomes thereby reducing the time, cost and risk associated with traditional R&D approaches. AI also enables accurate prediction of molecular behavior, ADME properties and formulation performance, improving decision-making and success rates. Integration of AI with Quality by Design (QbD) principles further supports process optimization, product consistency and regulatory compliance. Despite its transformative potential, challenges such as data integrity, ethical considerations and regulatory acceptance remain. Therefore, close collaboration between AI experts, data scientists and pharmaceutical researchers is essential to ensure reliable and meaningful implementation. As the industry advances toward Pharmaceutical Industry 4.0 and 5.0, AI-driven innovations are set to redefine the pharmaceutical landscape making drug development faster, smarter and more patient-centric.

Keywords: Artificial intelligence, Drug Discovery, Personalized Medicine, Product consistency.

LIC25-O-069

FORMULATION, CHARACTERIZATION AND OPTIMIZATION OF ANTI CANCER DRUGS (DOXORUBICIN, CURCUMIN, TAMOXIFEN) SOLID LIPID NANOPARTICLES FOR THE IMPROVED CYTOTOXICITY AGAINST COLON CANCER CELLS

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ABSTRACT

Breast cancer is a major global health concern for women. In order to increase the effectiveness of anticancer drugs against breast cancer cells, this study investigates the development and optimization of solid lipid nanoparticles (SLNs). Lipid concentration, surfactant ratio, and homogenization speed were used to optimize SLNs using a solvent evaporation approach. Particle size, zeta potential, drug entrapment effectiveness, and shape were evaluated using scanning electron microscopy and dynamic light scattering. When compared to pure drug solutions, the optimized SLN formulation significantly boosted cytotoxicity, improved cellular absorption, and allowed controlled drug release, according to in vitro drug release and cytotoxicity experiments. According to these results, SLNs show promise as a drug delivery system for localized breast cancer treatment, with the potential to improve patient outcomes and lessen systemic adverse effects.

Keywords: Drug delivery, Solid lipid nanoparticles, cytotoxicity, drug delivery, optimization.

LIC25-O-070

COMPARATIVE STUDY OF DIFFERENT MOLECULAR DOCKING SOFTWARE

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ABSTRACT

Molecular docking represents a pivotal computational methodology in the field of structure-based drug design (SBDD), facilitating the prediction of the optimal binding conformation of small-molecule ligands within the active site of target macromolecules, such as proteins or nucleic acids. The advent and advancement of molecular docking software have significantly accelerated the drug discovery pipeline by enabling *in silico* screening of vast chemical libraries, thereby reducing the cost and duration associated with experimental assays. These programs employ sophisticated algorithms and scoring functions to approximate the binding affinity and stability of ligand– receptor complexes, integrating principles of molecular mechanics, thermodynamics, and quantum chemistry. Prominent docking platforms, including **AutoDock**, **AutoDock Vina**, **GOLD**, **Glide**, **LeDock**, and **MetaDock**, have become integral tools in computational pharmacology and chemical biology. AutoDock and Vina utilize Lamarckian genetic algorithms combined with empirical scoring functions to achieve flexible ligand docking, while Glide employs a proprietary grid- based energy evaluation scheme to yield high-precision binding poses. GOLD, on the other hand, implements an evolutionary genetic algorithm to explore ligand conformational space, and LeDock is optimized for high-throughput virtual screening with efficient search algorithms. **MetaDock** represents an advanced ensemble docking system that integrates results from multiple docking programs to enhance consensus scoring accuracy and predictive robustness. Despite the robustness of these tools, inherent limitations persist, including simplified treatment of solvation effects, inadequate modeling of protein conformational flexibility, and dependency on the accuracy of input crystal structures. Nevertheless, molecular docking continues to serve as an indispensable approach in rational drug design, aiding in lead identification, optimization, and elucidation of molecular interaction mechanisms. Ongoing developments in hybrid machine learning-assisted scoring functions and dynamic docking methodologies are expected to further refine predictive accuracy and computational efficiency in the coming years.

Keywords: Molecular Docking, Computational Efficiency, In Silico Screening.

LIC25-O-071

DEGRADATION PATHWAY OF CAFFEINE IN BULK DRUG, PHARMACEUTICAL DOSAGE FORM AND SOFT DRINKS

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ABSTRACT

The study mainly focuses on the degradation pathway of caffeine, a widely used central nervous system stimulant, in bulk drug, pharmaceutical dosage forms, and soft drinks. Utilizing a validated reverse-phase high-performance liquid chromatography method, the research simultaneously estimated caffeine, theophylline, and theobromine under various stress conditions to identify degradation products. The method demonstrated high specificity, linearity in the 8-12 µg/mL range, precision, accuracy, and robustness as per ICH guidelines. Forced degradation studies revealed that caffeine is stable under acidic, basic (up to 0.1 N), oxidative, thermal, and photolytic conditions except for optimal degradation in 1 N NaOH and significant photolytic degradation in soft drinks after sunlight exposure. Analytical results showed caffeine degrades to theophylline and theobromine in soft drink samples, establishing the degradative pathway in these matrices. The developed reverse-phase high-performance liquid chromatography method enables reliable identification and quantification of caffeine and its key degradation products, contributing to improved quality control in pharmaceutical and food applications.

Keywords: Caffeine, Soft drinks, Theophylline, Theobromine, Quality Control.

LIC25-O-072

ARTIFICIAL INTELLIGENCE IN MEDICINAL PLANT RESEARCH: A SMART APPROACH TO SUSTAINABLE DRUG RESOURCE DEVELOPMENT

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ABSTRACT

Medicinal plants are an important source of bioactive compounds that form the basis of many modern medicines. However, traditional methods used to monitor their growth, quality, and yield are time-consuming, labour-intensive, and often affected by environmental conditions. To overcome these challenges, the present study explores the use of Artificial Intelligence (AI) as a smart and sustainable tool in medicinal plant research. In this approach, AI algorithms such as Random Forest (RF) and Convolutional Neural Networks (CNN) were used to analyse data collected from remote sensing and spectroscopic techniques. These included satellite-based imaging, hyperspectral analysis, and GIS mapping to study plant growth and stress patterns. Laboratory techniques like FTIR and UV-Visible spectroscopy were then used to confirm the presence and concentration of major phytoconstituents predicted by the AI models. The AI-based model successfully identified variations in plant health and predicted the yield of bioactive compounds with an accuracy of about 92%, showing strong agreement with experimental data. This demonstrates that AI can make the process of medicinal plant monitoring faster, more reliable, and environment-friendly. Overall, the integration of AI with remote sensing and analytical technologies provides a sustainable, precise, and data-driven approach for the cultivation, conservation, and standardization of medicinal plants. This study supports the development of high-quality herbal raw materials and promotes innovation in pharmaceutical research and drug formulation.

Keywords: Remote sensing, Spectroscopic analysis, Convolutional neural networks, Hyperspectral analysis, GIS mapping, Phytoconstituents.

LIC25-O-073

DEVELOPMENT OF A CRISPR-CAS9 MEDIATED GENOME ENGINEERING IN *SACCHAROMYCES BOULARDII* FOR FUNCTIONAL PROBIOTIC INNOVATION

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ABSTRACT

In this study, we established a CRISPR-Cas9-based strategy for stable gene integration in *S. boulardii* for the development of next-generation functional probiotics. Electroporation parameters were initially optimized to enhance transformation efficiency and cell viability for CRISPR-mediated editing in *Saccharomyces boulardii*, where the *TRP1* locus was selected as the genomic target site to create a tryptophan auxotrophic background while enabling in-frame integration of heterologous genes. Optimisation of key parameters, including cell optical density, DNA concentration, voltage, and resistance, resulted in the highest transformation efficiency of approximately 4.2×10^4 transformants under optimal conditions, with a cell OD₆₀₀ of around 0.8, 2 µg of plasmid DNA, a resistance of 200 Ω, a voltage of 1500 V, and a capacitance of 25 µF. As a proof of concept, a GFP reporter cassette with locus-specific homology arms was first designed and successfully integrated into the *TRP1* locus, confirmed by colony PCR, sequencing, and fluorescence microscopy. Using optimised electroporation parameters with 2 µg of donor DNA, a knock-in efficiency of approximately 75% was achieved. The resulting recombinant strain was verified by sequencing. This work fills a critical methodological void by establishing a reliable and versatile CRISPR-Cas9 system for *S. boulardii*, paving the way for rational design of functional probiotic yeasts with therapeutic applications.

Keywords: *Saccharomyces boulardii*, CRISPR-Cas9, electroporation, in-frame knock-in, probiotic engineering.

LIC25-O-074

TARGETED DRUG DELIVERY SYSTEMS

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ABSTRACT

Artificial Intelligence (AI) has become a transformative tool in the development of targeted drug delivery systems (TDDS). Targeted delivery aims to transport therapeutic agents precisely to diseased tissues while minimizing side effects and improving treatment outcomes. AI techniques such as machine learning (ML) and deep learning (DL) enable the analysis of large biomedical datasets to optimize drug design, carrier selection, and delivery parameters. Through predictive modeling, AI assists in identifying suitable ligands, nanocarrier size, and surface properties for specific cellular targets. It also helps in forecasting drug–target interactions, pharmacokinetics, and biodistribution, thereby reducing experimental costs and time. Moreover, AI supports the advancement of personalized medicine by tailoring drug formulations according to individual patient profiles. Integration of AI with nanotechnology and biotechnology paves the way for smart, efficient, and patient-specific drug delivery systems that enhance therapeutic efficacy and safety.

Keywords: Artificial intelligence, Targeted Drug Delivery, Machine Learning, Nanocarriers.

APPLICATIONS OF REGENERATIVE MEDICINE IN NEUROLOGICAL DISORDERS: A REVIEW

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ABSTRACT

In the field of neurology, it focuses on healing the central nervous system (CNS), which includes the brain and spinal cord—areas that are difficult to repair once injured. Regenerative neurosurgery uses advanced techniques to restore or preserve neurological function by introducing cells, growth factors, or genes into the CNS to combat diseases such as Parkinson’s disease, Alzheimer’s disease, amyotrophic lateral sclerosis (ALS), stroke, and spinal cord injury. Stem cells play a major role in this process because they can renew themselves and develop into many types of cells. Embryonic stem (ES) cells, induced pluripotent stem (iPS) cells, neural stem cells, and mesenchymal stem cells are being explored to replace lost neurons or provide support to existing ones. For example, iPS cells have shown promise in generating dopamine-producing neurons for treating Parkinson’s disease in animal models. Although stem cell-based therapies are still in the early stages, they hold great potential for curing neurodegenerative disorders that currently lack effective treatments. Ongoing research and clinical trials aim to improve the safety, effectiveness, and ethical use of these therapies. With advances in technology and collaboration among scientists, surgeons, and clinicians, regenerative neurosurgery could soon provide new hope for patients suffering from chronic or currently incurable neurological diseases. The objective of this review is to evaluate current progress, challenges, and future prospects of stem cell-based regenerative strategies for neurodegenerative disorders.

Keywords: Stem Cells, Neurodegenerative, Tissue Regeneration, Neurotrophin

REVOLUTIONIZING DRUG DISCOVERY: THE ROLE OF AI IN EARLY DEVELOPMENT STRATEGIES

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ABSTRACT

Artificial intelligence (AI) is emerging as a crucial element of innovation and change in drug discovery and early development. It answers some of the age-old problems faced by classical approaches, such as higher research costs, lengthy development processes, and low success rates. This review addresses the issue of how AI can be harnessed for better integration within current drug discovery and development methods for selected key activities, including compound screening, target identification, and clinical evaluation. AI is indeed useful for finding new canyon pathways and potential targets of treatment using multi-omics datasets and network-based approaches. Furthermore, systems like AlphaFold have tremendously improved our ability to predict protein structures, aiding in the evaluation of drug ability and guiding drug design. The digital twin and synthetic control arm, by using real-world or simulated data on patients, help to alleviate ethical and logistical issues. But the odds aren't quite in yet. Data might be biased either as a result of limited or unrepresentative datasets. Over-relying on either chronological or synthetic data may limit generality or lead the model to over-fit. For AI to truly revolutionize drug discovery, the field must foster interdisciplinary collaboration, ensure strict data governance, and continually validate systems for regulatory.

Keywords: Artificial Intelligence (AI), Drug Discovery, Early Development, Protein Structure.

ROLE OF ARTIFICIAL INTELLIGENCE IN THE DISCOVERY AND PERSONALIZATION OF NUTRACEUTICALS

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ABSTRACT

Nutraceuticals are bioactive food-derived compounds that provide health benefits and therapeutic benefits beyond general nutrition. Proteins, lipids, vitamins, minerals, and carbohydrates, which are essential nutrients, and functional groups like antioxidants, dietary fibers, probiotics, and plant extracts are some examples of nutraceuticals. The market for nutraceuticals is growing at a very fast pace in the world, and India is also becoming one of the key players due to its vast storehouse of traditional medicine and growing demand for preventive health care. Growth, however, notwithstanding, quality assurance, standardization, and regulatory lacunae are creating obstacles and highlighting the necessity for technological upgradation. Artificial intelligence (AI) has, in recent years, become a disruptive technology in health food R&D. With the use of machine learning, deep learning, and natural language processing, AI enables new bioactive compound discovery, formulation development at an accelerated rate, and effective quality monitoring. AI-driven simulation studies also predict compound stability, therapeutic potential, and interaction, saving time and cost compared to conventional methods. AI-driven personalized nutrition platforms also utilize genetic, metabolic, and lifestyle information to provide personalized dietary and supplement recommendations. Several AI-based platforms, such as Bright seed Forager, Nuritas Magnifier, and Nutrify Genie, are already operational, demonstrating the practical reality of AI use in nutraceutical discovery, personalization, and business. In short, AI has the potential to revolutionize the nutraceutical sector by bridging gaps and supporting evidence-based, personalized healthcare interventions. Its intersection with nutrigenomics and microbiome science represents the gateway to the future of precision nutrition.

Keywords: Nutraceuticals, Nutrigenomics, Microbiome, Antioxidant, Bioactive compound.

**AI-DRIVEN NANOTECHNOLOGY: DESIGN AND OPTIMIZATION OF
FUNCTIONALIZED NANOCARRIERS FOR RHEUMATOID ARTHRITIS**

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ABSTRACT

Rheumatoid arthritis (RA) is a systemic autoimmune and inflammatory condition characterised by chronic synovial inflammation, bone erosion and cartilage degradation, leading to stiffness swelling and joint pain. The conventional RA treatment such as NSAIDs, immunosuppressive drugs etc. often fail to achieve site specific localised action, resulting in limited targeting efficacy, systemic toxicity and other side effects. This study presents an AI-driven framework for design and optimization of functionalized nanocarriers to enhance targeted drug delivery to inflamed synovial fluid for treatment of RA. Nanocarriers based drug delivery have emerged as promising approach to improve drug targeting, control release with reduction in side effects. The integration of AI offers novel opportunities for designing and optimizing the functionalized nanocarrier tailored for RA treatment. Machine learning models were applied to predict critical quality attributes (CQAs) of formulation such as particle size, PDI, zeta potential, entrapment efficiency and drug loading. Computational modelling, molecular docking and Quantitative Structure-Activity Relationship (QSAR) analysis guided the selection of functional ligand such as folate and RGD (Arginine-Glycine-Aspartic acid) peptide for receptor mediator targeting of inflamed synovial tissue. The integrated AI approach enabled iterative in silico optimization of nanocarriers structure, reducing experimental workload and improving precision in formulation design. This smart formulation strategy demonstrates, the potential of AI-driven nanotechnology in advancing personalized, efficient and targeted therapeutic strategies for RA.

Keywords: Artificial intelligence, Rheumatoid arthritis, Nano drug delivery, Functionalized nanocarriers, Machine learning.

**AI IN HEALTH INFORMATICS, ELECTRONIC HEALTH RECORDS AND DATA
ANALYTICS**

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ABSTRACT

Electronic Health Records data from notes, labs, and images can be shared safely across systems by using the HL7 FHIR standard and its easy-to-use web APIs. With growing nationwide exchange through TEFCA, data can move securely between organizations to support care coordination and patient access to their own information. Analytics on EHR data can power clinical decision support that helps doctors follow guidelines, make better diagnoses, and improve outcomes when tools fit the daily workflow. Simple examples include risk flags to prevent readmissions, clear drug-interaction alerts, and dashboards to track chronic diseases across a population. A clear pathway can be designed: map data to FHIR, check and clean it, run models, and deliver results inside the EHR with human review. Data quality problems like —missing values, mixed formats can be aptly dealt with by finding and fixing early to prevent unsafe or unfair results. Privacy is protected by HIPAA de-identification methods such as Safe Harbor and Expert Determination, along with strong access controls in systems. The easy first steps would be to choose one high-value use case, build a small dataset, test with clinicians, and measure benefits in the real world. This work supports global digital health goals to use AI and data in a safe, fair, and effective way for everyone. The use of AI would greatly increase the efficiency and accuracy of data analysis and Informatics.

Keywords: Dataset, TEFCA, EHR, HIPAA, Analysis.

LIC25-O-080

AI-POWERED PHARMACOVIGILANCE: A LOOK AT MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING FOR DRUG SAFETY MONITORING

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ABSTRACT

Drug safety monitoring, known as pharmacovigilance, is really important for public health. But the old manual systems are struggling because there's just so much safety data coming in from all over the world, and it's getting more and more complicated. That's where artificial intelligence (AI), especially machine learning (ML) and natural language processing (NLP), is becoming super useful. It helps us get past those limitations and actually keep an eye on drug safety proactively. When you look at recent studies, you see all sorts of AI methods being used. We're talking about classic ML techniques like Random Forests and Support Vector Machines, all the way to advanced Deep Learning models and even Bayesian networks. NLP is particularly key because it can pull out meaningful safety signals from huge amounts of unstructured data. This means we can mitigate risks faster and get a more precise idea of potential drug risks from a wide variety of large datasets. Looking ahead, these AI approaches really promise to change the game, moving us towards continuous, real-time safety assessment throughout a drug's entire lifecycle. However, getting everyone to adopt these systems widely still has some big hurdles. We need to make sure the data quality is top-notch, that we can understand and interpret how the algorithms work (that's Explainable AI), and that we have solid regulatory standards so everything can be integrated consistently.

Keywords: Drug safety, pharmacovigilance, artificial intelligence (AI), machine learning (ML), natural language processing (NLP), safety data, proactive monitoring.

LIC25-O-081

SMART PHYTOPHARMACEUTICS: ADVANCES IN TARGETED DRUG DELIVERY

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ABSTRACT

Phytopharmaceuticals are the medicinal formulation of standardized plant extracts containing defined bioactive compounds. New technology in the design of smart phytopharmaceuticals brings modern science and traditional herbal medicine together for a successful targeted bioactive delivery with safety. These new formulations are important because they could improve the bioavailability, reduce the side effects, and ensure the controlled release of the plant-derived actives. Smart systems have specific advantages over conventional phytomedicines in aspects like stability, compliance, and therapeutic precision. Nanoscience plays a prime role in the development of phytopharmaceuticals through platforms like phytosomes, ethosomes, niosomes, nanostructured emulsions, and hydrogels. These nanocarriers increase the solubility and permeability of plant actives across biological membranes. Recent developments include green nanotechnology, 3D printing of herbal dosage forms, biopolymers, hydrogel patches, and microneedles for transdermal drug delivery. Further, incorporation of artificial intelligence (AI) and computational modeling enables data-driven formulation design, optimization, and predictive pharmacokinetics that have revolutionized the research landscape of herbal therapeutics. In summary, smart phytopharmaceuticals represent the transformational bridge between traditional herbal wisdom and modern pharmaceutical innovation. Integration of nanotechnology and AI guarantees a sustainable and personalized mode of healthcare and therefore ensures maximum therapeutic efficacy with minimum toxicity.

Keywords: Smart phytopharmaceuticals, nanocarriers, targeted drug delivery, AI modeling, phytosomes, green nanotechnology.

ARTIFICIAL INTELLIGENCE IN ARTHROPLASTY: ADVANCING SURGICAL PRECISION, REHABILITATION, AND PHARMACOTHERAPY

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ABSTRACT

Arthroplasty, or joint replacement surgery, is becoming increasingly common due to rising osteoarthritis and an ageing population. However, traditional surgical approaches can lead to implant misalignment, prolonged rehabilitation, and variable post-operative medication requirements. To address these challenges, the present study explores the use of Artificial Intelligence (AI) as a modern, reliable, and patient-centric tool in arthroplasty. Recent developments in robotic navigation systems, machine learning prediction models, and deep learning-based imaging allow surgeons to achieve precise implant placement while minimizing intra-operative errors and complications. AI-driven models can also predict 30–90-day post-operative risks such as infection, implant failure, and hospital readmission, supporting early clinical decision-making. Additionally, wearable sensor technology enables continuous remote monitoring of mobility, pain levels, and medication response. These data-driven insights allow personalized pharmacotherapy adjustments, reduce unnecessary opioid consumption, and improve rehabilitation outcomes. Studies conducted between 2022–2024 demonstrated that AI-assisted arthroplasty accelerates recovery, reduces healthcare costs, and enhances long-term functional outcomes. Overall, the integration of AI across the surgical and postoperative pathways supports safer, faster, and more effective orthopedic care. This approach encourages the development of personalized treatment strategies in pharmacy practice and highlights the growing role of digital health innovations in modern therapeutics.

Keywords: Arthroplasty, Robotic navigation, Predictive analytics, Wearable sensors, Personalized pharmacotherapy.

NOVEL DRUG DELIVERY SYSTEMS

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ABSTRACT

Novel Drug Delivery Systems (NDDS) help to control the release of the medicine, reduce side effects, and increase the effectiveness of the treatment. There are several types of NDDS, including liposomes, nanoparticles, microspheres, niosomes, and transdermal patches. Liposomes are small spherical vesicles that can carry both water-soluble and fat-soluble drugs, while nanoparticles are extremely small particles that can easily pass-through biological barriers to reach the target site. These systems make it possible for drugs to stay longer in the body and act slowly over time, which improves patient comfort and compliance. NDDS are very helpful in treating chronic diseases such as cancer, diabetes, asthma, and heart diseases. Recent research in nanotechnology and polymer science has led to the development of smart drug delivery systems that can respond to body signals like temperature, pH, or enzymes. These systems can automatically release medicine when needed, making them more efficient and suitable for personalized treatment. As the famous quote says, “The future of medicine lies not in discovering new drugs, but in finding better ways to deliver them.” NDDS perfectly reflect this vision by combining technology and medicine to provide safer, more effective, and patient-friendly treatments.

Keywords: Novel Drug Delivery Systems, Controlled Release, Nanoparticles, Liposomes, Targeted Therapy, Smart Drug Delivery.

INTEGRATING ARTIFICIAL INTELLIGENCE INTO THE PHARMACEUTICAL PIPELINE: A REVIEW OF EMERGING TOOLS AND TECHNIQUES

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ABSTRACT

Artificial Intelligence (AI) is fundamentally changing how we discover, design, and bring medicines to market. In the past, finding a new drug was a long and arduous process, demanding extensive lab work, rigorous testing, and significant financial investment. Today, however, with the integration of AI and Machine Learning (ML), this entire journey has become much faster, more reliable, and increasingly data-driven. AI systems have a remarkable ability to sift through vast amounts of chemical, biological, and clinical data, uncovering intricate patterns that humans might easily miss. These crucial insights help researchers pinpoint promising compounds, better understand how they might interact within the human body, and ultimately, create improved drug formulations. Innovative tools like AlphaFold are helping scientists predict protein structures with incredible accuracy, while generative AI platforms such as MolGPT are playing a key role in designing new molecules for further testing. This review explores how AI is being seamlessly woven into every stage of the pharmaceutical journey, including drug discovery, pre-clinical development, clinical trials, and large-scale manufacturing. It also takes a close look at significant challenges, such as maintaining impeccable data quality, the need to clearly explain AI-generated predictions, and the importance of adhering to strict ethical and regulatory standards. Overall, AI is paving the way for a smarter, quicker, and more economical approach to pharmaceutical research, and it's widely expected to play a pivotal role in shaping the future of global healthcare.

Keywords: Artificial Intelligence, Machine Learning, Drug Discovery, Pharmaceutical Pipeline, Deep Learning.

ADVANCE IN BIOMEDICAL SCIENCE

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ABSTRACT

Gene therapy, stem cell therapy, and regenerative medicine represent three interrelated frontiers of modern biomedical science aimed at curing the root cause of diseases rather than merely managing symptoms. Technologies such as CRISPR-Cas9 and viral vector-based approaches have accelerated progress, leading to clinical successes like Zolgensma for spinal muscular atrophy and Luxturna for inherited retinal disorders. Gene therapy thus offers a pathway for permanent correction of genetic abnormalities. Stem cell therapy utilizes undifferentiated cells capable of self-renewal and differentiation into specialized cell types. These cells can replace or regenerate damaged tissues, providing novel treatments for conditions such as Parkinson's disease, myocardial infarction, diabetes, and spinal cord injury. Sources include embryonic stem cells (ESCs), adult stem cells, and induced pluripotent stem cells (iPSCs), the latter offering ethical and immunological advantages by reprogramming adult somatic cells into a pluripotent state. Regenerative medicine integrates both gene and stem cell therapies, along with tissue engineering, biomaterials, and bioactive molecules, to restore or replace entire tissues and organs. Through advances such as 3D bioprinting and cell-based scaffolds, regenerative medicine aims to rebuild functional biological structures. Its ultimate goal is to stimulate the body's own repair mechanisms to achieve long-term healing.

Keywords: Gene Therapy, Stem cell therapy, Biomedical Science.

LIC25-O-086

ANALYTICAL METHOD DEVELOPMENT AND VALIDATION OF ANTI-HYPERTENSIVE DRUG

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ABSTRACT

Utilization of analytical chemistry in drug analysis has always been crucial to assure quality throughout its shelf life. Analytical techniques like HPLC, GC & UV-VIS along with advanced techniques like NMR (Nuclear Magnetic Resonance), LC-MS (Liquid Chromatography- Mass Chromatography), ICP-MS (Inductively Coupled Plasma Mass Chromatography) etc. has been proven efficient to measure elements, compounds and drug sample to keep stringent quality control, for effective therapeutic effect and treatment in patients. However, development of suitable and efficient analytical method for estimation is also an essential and necessary step. This ABSTRACT focuses on analytical method development and validation of anti- hypertension drug. As Hypertension is an arising issue in today's era not only in aged people but also in young generation and for this many new drugs have been developed through advanced technologies. One of the recent anti-hypertension drugs is WIDAPLIK, an FDA approved first trio-combo pill containing Telmisartan (Angiotensin II receptor Blocker), Amlodipine (Dihydropyridine CCB) and Indapamide (Diuretic) and available in different doses. So, it is essential to develop a highly efficient either HPLC or UV method to determine the concentration of all the APIs in the pill simultaneously in order to ensure high quality assurance.

Keywords: LC-MS, Inductively Coupled Plasma Mass Chromatography, WIDAPLIK, Telmisartan, Amlodipine, Amlodipine.

LIC25-O-087

TRANSFORMATIVE ROLE OF AI IN MODERN DRUG DISCOVERY AND DEVELOPMENT

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ABSTRACT

The pharmaceutical assiduity has seen Artificial Intelligence (AI) arise as a transformative source in medicine discovery and development. New remedial medicine identification via being styles is laborious, expensive, and frequently requires expansive laboratory evaluation. AI can advance our thinking at different stages of the drug development process, which includes but is n't limited to target identification, virtual webbing, lead optimization and clinical trial design. One illustration of the power of AI platforms is using AI- driven tools and training data to model and prognosticate medicine- target relations, therefore removing the nonstop necessity to experimentally test on targets. For illustration, DeepMind's AlphaFold has been an unknown development for structural biology, whereby AI can directly detect the 3D protein structure, and this information can help interpret or clarify the natural armature that underlies complaint and medicine list. Also, Benevolent AI applied an AI approach to repurpose the rheumatoid arthritis medicine Baricitinib to treat COVID- 19 and produced useful information in weeks rather than months. In addition, AI is critical for prognosticating pharmacokinetics, toxins, and side goods, which enhances patient safety and pets nonsupervisory blessing. As conclusion, AI represents a paradigm shift in ultramodern pharmaceutical exploration. By adding speed, delicacy, and cost- effectiveness, AI- grounded medicine development has the capacity to give safe and effective drugs.

Keywords: Artificial Intelligence, Drug Discovery, Machine Learning, Deep Learning,

LIC25-O-088

HERBAL AI: ARTIFICIAL INTELLIGENCE ASSISTED TOOLS IN HEALTHCARE RESEARCH AND STUDIES

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ABSTRACT

Artificial Intelligence (AI) has emerged as one of the most rapidly advancing and transformative technologies in modern research and healthcare. Herbal AI is an innovative artificial intelligence tool designed to recognize and classify medicinal plants, marking a new step forward in the use of AI for pharmaceutical and healthcare research. The system works by scanning live images or photographs of plants and accurately identifying their species using advanced image processing and machine learning techniques. Once identified, it provides detailed information such as the plant's botanical name, family, major chemical constituents, and extraction methods for key bioactive compounds. This technology is especially helpful for researchers working in remote or field areas, where quick and reliable plant identification can be challenging. Since many plants look similar but differ greatly in their chemical composition, some being beneficial and others toxic. Herbal AI can help ensure correct identification and safer use. Beyond recognition, the tool supports researchers in selecting suitable species, extracting medicinal compounds, and applying them effectively in healthcare or emergency situations. By combining traditional botanical knowledge with modern AI capabilities, Herbal AI offers a faster, more accurate, and accessible way to study and utilize medicinal plants, ultimately contributing to safer and more efficient natural product discovery and healthcare innovation.

Keywords: Artificial Intelligence (AI), Medicinal Plant Recognition, Plant Classification, Research.

LIC25-O-089

ARTIFICIAL INTELLIGENCE AS A TRANSFORMATIVE FORCE IN THE PHARMACEUTICAL INDUSTRY: REDEFINING DRUG DISCOVERY, EDUCATION, AND GLOBAL HEALTH

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ABSTRACT

Artificial Intelligence (AI) integration is causing a significant transformation in the pharmaceutical industry. AI is a fundamental force that is reshaping the fundamental pillars of the pharmaceutical industry, not just a tool. Drug discovery and development's conventional, expensive, and time-consuming methods are facing serious challenges. AI applications in research and industry, such as machine learning (ML), deep learning, and predictive analytics, are speeding up target identification, improving compound screening, facilitating de novo drug design, and expediting clinical trials. This clever invention promises to lower expenses, improve precision, and significantly reduce the time from lab to market, resulting in more effective and customized medications. At the same time, integrating AI necessitates a revolution in education. To prepare the workforce of the future with the computational abilities, data literacy, and ethical awareness needed to function in an AI-driven environment, pharmacy and related programs must change. This covers instruction in data modelling, bioinformatics, and how to critically evaluate insights produced by artificial intelligence. In the end, adopting AI in the pharmaceutical industry is essential for improving global health. With an emphasis on how strategic AI integration can usher in a new era of accuracy, efficiency, and ground-breaking discovery that redefines industry standards and dramatically improves patient outcomes, this examines the many applications, advantages, and difficulties of this intelligent transition.

Keywords: Artificial Intelligence, Machine learning (ML), Drug discovery and development.

INVESTIGATING THE NEUROPROTECTIVE EFFECTS OF BETA-GLUCOGALLIN ON ACRYLAMIDE-INDUCED NEUROTOXICITY

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ABSTRACT

Despite the well-known neurotoxic effects of acrylamide (ACR), it continues to be overlooked as a significant health concern. ACR is normally formed during high-temperature cooking of starchy foods and has been linked to neurodegeneration, oxidative stress, and mitochondrial dysfunction. At the cellular level, ACR can both induce and inhibit autophagy, resulting in impaired neuronal homeostasis. This dysregulation contributes to neuronal apoptosis and loss of mitochondrial quality control. Natural compounds with antioxidant and anti-inflammatory properties have gained attention for mitigating ACR-induced toxicity. Beta-glucogallin (BGG), a naturally occurring polyphenolic compound, exhibits strong free radical scavenging ability and potential to restore redox balance, protect mitochondria, and regulate autophagic activity. BGG act as a promising therapeutic candidate for combating acrylamide-induced neurodegeneration.

Keywords: Acrylamide (ACR), Beta-glucogallin (BGG), Neurotoxicity, oxidative stress, Mitochondrial dysfunction.

TO FORMULATE AND EVALUATE A GASTROPROTECTIVE HYDROGEL CONTAINING TINOSPORA CORDIFOLIA EXTRACT FOR THE TREATMENT AND PREVENTION OF CHRONIC GASTRITIS

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ABSTRACT

The present study aims to formulate and evaluate a gastroprotective hydrogel containing Tinospora cordifolia extract for the treatment and prevention of chronic gastritis. Tinospora cordifolia (Guduchi) is a well-known medicinal plant possessing potent anti-inflammatory, antioxidant, and mucosal healing properties beneficial for gastric protection. The hydrogel was prepared using suitable polymers such as carbopol 934 and HPMC to achieve optimal viscosity, spreadability, and bioadhesive characteristics. The formulation was evaluated for physicochemical parameters, pH, homogeneity, drug content, swelling index, and in vitro drug release. Additionally, the gastroprotective potential was assessed using an ethanol-induced gastric ulcer model in rats, comparing the hydrogel with a standard anti-ulcer formulation. Results indicated that the optimized hydrogel exhibited sustained drug release, excellent mucoadhesion, and significant reduction in ulcer index, confirming its efficacy in protecting the gastric mucosa. The study concludes that the Tinospora cordifolia-based hydrogel can serve as a promising therapeutic approach for the management and prevention of chronic gastritis with improved patient compliance and reduced side effects.

Keywords: Tinospora cordifolia, hydrogel, gastroprotective, chronic gastritis, mucoadhesion, sustained release.

SMART MATERIALS AND AI: SHAPING THE FUTURE OF MEDICAL DEVICES

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ABSTRACT

We use several medical devices in healthcare, research, and industry, and there are many recent innovations which is changing the way of designing and usage of medical devices. These changes occur due to the new smart materials, advances in AI, and eco-friendly designs. For example, scientists are now developing tiny medical sensors from materials that safely and easily dissolve in the body, so after usage, there is no need for removal. These sensors can monitor a patient's health and send updates to doctors in real time. Simultaneously, wearable devices like smart textiles, such as shirts or patches that are being developed with built-in mini sensors and AI that can track health data and can automatically adjust to the user's needs. This makes health monitoring easy, comfortable, and personal, even outside of the hospitals. Other medical devices, like wearable LED phototherapy to treat medical problems at home, can be used by using AI, which ensures that the treatment is safe and well-matched to each person. For now, modern materials like hydrogels and cellulose not only make these devices flexible and kind to the body, but they also aid in energy storage, quicker recovery, and long-term, safe use. All these inventions mean medical equipment is becoming smarter, more sustainable, and better tailored to each patient. This new wave of innovation is also connecting the worlds of education, research, and industry in exciting ways.

Keywords: Biodegradable sensors, wearable medical devices, smart textiles, hydrogels, cellulose materials, LED phototherapy, real-time health monitoring

ADVANCES IN ARTIFICIAL INTELLIGENCE FOR CANCER DIAGNOSIS AND TREATMENT

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ABSTRACT

Artificial Intelligence (AI) refers to the capability of computer systems to perform tasks that typically require human intelligence, while minimizing human intervention. AI technologies can identify complex patterns and relationships within large datasets, making them highly valuable in clinical settings for disease diagnosis, treatment planning, and predicting patient outcomes. Cancer, being a highly aggressive disease with generally poor survival rates, has become a major focus of AI-driven research. In recent years, the growing use of AI—particularly machine learning and deep learning—has substantially improved the accuracy of cancer detection and prognosis. Through these advanced algorithms, AI systems such as machine learning models and neural networks can accelerate drug discovery, utilize biomarkers to match patients with suitable clinical trials, and personalize cancer therapy based on individual patient data.

Keywords: Artificial Intelligence (AI), Machine Learning, Deep Learning, Cancer Diagnosis, Personalized Medicine, Predictive Analytics.

LIC25-O-094

**PREPARATION AND EVALUATION OF MOUTH DISSOLVING TABLETS USING
DIFFERENT TYPES OF SUPERDISINTEGRANTS**

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ABSTRACT

Over the past 20 years, there has been an increase in demand for mouth-dissolving tablets, particularly among older people and youngsters who have swallowing issues. Mouth dissolving tablets are solids from that rapidly disintegrates and dissolve in the mouth usually within seconds without the need of water they are useful for pain management where rapid concept of action and patient conveyance are desired. The primary requirements for mouth-dissolving tablets are that they dissolve or disintegrate quickly in the oral cavity with saliva in 15 to 60 seconds while requiring water. By breaking down the tablets within the allotted time, the disintegrants should meet the requirements. A range of natural and synthetic super disintegrants were chosen for the current study, and tablets were made by direct compression. The prepared tablets were evaluated for weight variation, hardness, friability, *in-vitro* disintegration time, wetting time, *in-vitro* dissolution study. The current study describes the different superdisintegrants collected from natural origin, which are being used in the formulation to provide safer, effective drug delivery with improved patient compliance.

Keywords: Natural super disintegrants, Synthetic super disintegrants, mouth-dissolving tablets.

LIC25-O-095

**AI-ASSISTED BENCHMARKING AND QUALITY CULTURE DEVELOPMENT IN
PHARMACEUTICAL INDUSTRY**

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ABSTRACT

The advent of Artificial Intelligence (AI) in pharmaceutical manufacturing has revolutionized the sector by redefining quality management, operational efficiency, and regulatory compliance. This paper explores the pivotal role of AI-assisted benchmarking and quality culture development in strengthening pharmaceutical manufacturing systems. By integrating AI tools such as computer vision, image recognition, and predictive analytics, industries can achieve unparalleled precision in quality control and decision-making. AI-driven visual inspection systems, supported by machine learning algorithms, detect product irregularities and deviations with far greater accuracy than human operators. Moreover, the combination of AI with Internet of Things (IoT)–based real-time monitoring enables continuous process supervision, ensuring adherence to stringent regulatory norms and maintaining product consistency. Beyond quality control, AI empowers organizations to make data-informed decisions by evaluating large and complex datasets to uncover patterns and predict outcomes. The study concludes that AI not only enhances quality assurance but also nurtures a proactive quality culture by promoting continuous improvement, transparency, and innovation. Through its intelligent applications, AI is poised to transform pharmaceutical manufacturing into a more adaptive, efficient, and quality-driven industry.

Keywords: Artificial Intelligence, Pharmaceutical Manufacturing, Quality Control.

**CURCUMIN AND DAIDZEIN AS PROMISING PHYTOCHEMICALS IN COLORECTAL
CANCER PREVENTION AND TREATMENT**

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ABSTRACT

Colorectal Cancer (CRC) is one of the most frequently diagnosed malignant tumours, with the result that it has been ranked second highest in terms of cancer-related death rate globally for years. Under these circumstances, it seems like a big load on everyone and everywhere. Having seen the difficulty of recurrent, metastatic or resistant tumours as well as chemotherapy agents that cannot be absorbed by patients' bodies anymore with many difficult side effects, shows scientists are drawn towards the world outside synthesis. For the last few years, Natural phytochemicals have attracted a growing amount of attention for their potential as safer, more multi-targeted therapeutic alternatives. Curcumin, a polyphenol extracted from *Curcuma longa* and Daidzein, an isoflavone found in soy, both possess powerful anti-cancer, anti-inflammatory and antioxidant capabilities that have attracted attention recently. Curcumin affects diverse oncogenic signaling pathways such as Wnt/ β -catenin, NF- κ B and apoptotic cascade, finally suppressing tumour-promoting tendencies like metastasis. Yet, its actual application in clinical environments continues to be somewhat limited, largely because of its poor solubility and restricted bioavailability. These barriers, however, can be substantially overcome through advanced nanoformulation strategies such as liposomes, polymeric nanoparticles, and solid lipid carriers. Similarly, Daidzein demonstrates a remarkable antiproliferative ability by modulating estrogen receptor-mediated pathways, encouraging programmed cell death, and maintaining oxidative balance within cells. The use of nano-encapsulation technologies has significantly improved Daidzein's pharmacokinetic performance and its precise delivery to colonic tissues. Studies from 2018–2024 gathered from PubMed, Scopus, Google Scholar, and some more that highlight steady progress in nanocarrier development and combination therapies for colorectal cancer. The joint use of Curcumin and Daidzein shows synergistic effects by modulating oncogenic pathways, boosting apoptosis, and improving treatment response. Taken together, this review reflects the growing understanding of these naturally derived compounds, their interconnected molecular actions, and the rising promise of nanocarrier-based delivery systems as an evolving strategy for the effective prevention and treatment of colorectal cancer.

Keywords: Colorectal Cancer (CRC), Curcumin, Daidzein, Nanocarriers, Synergistic therapy, Apoptosis, Molecular mechanisms.

ROLE OF RP-HPLC IN ENSURING DRUG STABILITY, PURITY, AND QUALITY-A REGULATORY PERSPECTIVE

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ABSTRACT

The assurance of drug quality, safety, and efficacy is a cornerstone of pharmaceutical development and regulatory compliance. Among the various analytical techniques available, Reverse Phase High-Performance Liquid Chromatography (RP-HPLC) has emerged as a leading method for evaluating drug stability, purity, and overall product quality. Its superior resolution, reproducibility, and adaptability make it an indispensable tool throughout the drug lifecycle from raw material assessment to finished product analysis. This work highlights the critical role of RP-HPLC in detecting impurities, degradation products, and formulation inconsistencies that directly impact therapeutic performance and patient safety. Emphasis is placed on the design of stability-indicating methods, which allow identification and quantification of active pharmaceutical ingredients (APIs) in the presence of their degradation products. Furthermore, the paper discusses the alignment of RP-HPLC method development and validation with ICH Q2(R1) guidelines and other regulatory frameworks, ensuring global acceptance and harmonization of analytical data. Regulatory bodies such as the U.S. FDA, EMA, and WHO mandate the use of validated chromatographic methods for routine quality control and stability testing. Recent advancements including Quality by Design (QbD)-based analytical approaches, green chromatography, and hyphenated HPLC techniques are reshaping the regulatory landscape by improving method robustness and environmental sustainability. In conclusion, RP-HPLC continues to be the gold standard analytical technique for ensuring pharmaceutical product integrity. Its role extends beyond quantification, serving as a critical regulatory tool that safeguards drug quality, supports lifecycle management, and strengthens confidence in therapeutic reliability.

Keywords: RP-HPLC, Drug Stability, Purity, Quality Assurance, Regulatory Compliance.

DIFFERENT ACTIVITY OF BENZIMIDAZOLE DERIVATIVE

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ABSTRACT

Benzimidazole derivatives have emerged as a cornerstone in modern medicinal and synthetic chemistry due to their remarkable structural versatility and wide spectrum of biological activities. The benzimidazole nucleus, an isosteric analogue of purine, exhibits strong affinity toward diverse biological targets, rendering it an essential pharmacophore in the design of novel therapeutic agents. Over the past decades, extensive research has demonstrated that benzimidazole derivatives possess potent antimicrobial, anticancer, antiviral, anti-inflammatory, antihypertensive, and antioxidant properties. Structural modifications on the benzimidazole scaffold significantly influence pharmacokinetic and pharmacodynamic behaviors, enhancing bioavailability and target specificity. Furthermore, their coordination ability with transition metals has opened new avenues in the development of metallo-drugs and catalytic systems. This review highlights recent advances in the synthesis, structural modifications, and pharmacological applications of benzimidazole derivatives, emphasizing their potential as promising leads in drug discovery and development.

Keywords: Benzimidazole derivatives, pharmacophore, biological activity, drug design, antimicrobial, anticancer, synthesis, structure–activity relationship (SAR), metallo-drugs.

LIC25-O-099

CONCURRENT EXPOSURE TO LIGHT AND NOISE STRESS- A MODEL TO EXPLORE MODERN DAY LIFESTYLE INDUCED NEUROCOGNITIVE DECLINE

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ABSTRACT

In today's world, people are constantly getting exposed to multiple stressors including chronic noise pollution and lights during day and late nights. Each of these factors can cause physical and mental issues on their own. However, their combined effect is even more dangerous for human health. Regular, prolonged exposure to traffic, industrial, or environmental noise triggers the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis. This leads to higher cortisol levels, sleep interruptions, hypertension, anxiety, and decreased cognitive function. Light rays emitted from screens at night attributed to mobile devices and laptops also suppresses melatonin production, disrupts circadian rhythms, and leads to insomnia, mood disorders, metabolic problems, and oxidative stress. When noise and light exposure occur together, they are directly linked to more sleep disturbances, poor memory, decreased attention, irritability, and a greater risk of depression and anxiety disorders. Long-term exposure includes a higher risk of hypertension, obesity, diabetes, and neurodegenerative diseases. As mental stress and lifestyle-related disorders become more common, it is vital to understand how noise and light stress affects human health. We have selected a model of concurrent light and noise exposure which will help us explore anomalies related to brain and its function.

Keywords: Stress, Cortisol, HPA axis.

LIC25-O-100

TRANSFORMATIVE IMPACT OF ARTIFICIAL INTELLIGENCE IN ENDOCRINE DISORDER DIAGNOSTICS AND THERAPEUTICS

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ABSTRACT

The application of artificial intelligence (AI) to the treatment of metabolic and endocrine diseases, including diabetes and thyroid issues, offers ground-breaking potential to improve patient care. The creative uses of AI technology, such as machine learning algorithms and predictive analytics, to enhance metabolic monitoring, personalize treatment regimens, and increase diagnostic accuracy are examined in this ABSTRACT. AI can see trends that human healthcare professionals would miss by examining enormous datasets from continuous glucose monitors and electronic health records. This allows for early interventions and lowers complications. Furthermore, image analysis and biochemical evaluations in thyroid problems are being transformed by AI technologies, resulting in more accurate diagnosis and individualized treatment plans. AI's potential to revolutionize endocrine health management is becoming more and more apparent as it develops; it promises better results, increased efficiency, and a paradigm change toward data-driven medicine. In the battle against chronic metabolic illnesses, this comprehensive investigation highlights the crucial nexus between technology and healthcare.

Keywords: Artificial Intelligence, Endocrine, Metabolic Diseases, Diagnostic.

**ADVANCED MEDICAL DEVICES WITH AI INTEGRATION: TRANSFORMING
HEALTHCARE DIAGNOSTICS AND THERAPEUTICS**

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ABSTRACT

Recent advancements in artificial intelligence (AI) have revolutionized the design, functionality, and clinical utility of modern medical devices, marking a paradigm shift from reactive to predictive and personalized healthcare. The integration of AI algorithms—particularly machine learning (ML), deep learning (DL), and computer vision models—into medical devices has enabled real-time data processing, adaptive decision-making, and enhanced diagnostic precision. This convergence of biomedical engineering, data analytics, and AI allows devices to learn from patient-specific physiological data, improving outcomes in cardiology, neurology, oncology, and critical care. For instance, AI-enabled ECG analyzers can detect arrhythmias with superior accuracy, while smart insulin pumps adjust dosage autonomously based on glycaemic patterns. Integration with the Internet of Medical Things (IoMT) further expands connectivity, ensuring real-time monitoring and clinical feedback loops. However, the adoption of AI-integrated medical devices also introduces regulatory, ethical, and cybersecurity challenges, necessitating robust validation frameworks and transparent algorithmic governance. The present paper reviews the state-of-the-art innovations in AI-assisted medical devices, explores their clinical applications, regulatory perspectives, and highlights the roadmap for their safe and effective deployment in precision medicine. By bridging the gap between intelligent computation and biomedical technology, AI-integrated devices are poised to redefine the future of evidence-based, predictive, and patient-centric healthcare.

Keywords: Artificial intelligence, Medical devices, Machine learning, Internet of Medical Things (IoMT), Predictive healthcare, Biomedical innovation.

**AI-INTEGRATED ADVANCED MEDICAL DEVICES: REVOLUTIONIZING
DIAGNOSTICS AND THERAPEUTICS IN MODERN HEALTHCARE**

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ABSTRACT

AI-powered imaging systems, wearable biosensors, and implantable monitoring devices now enable continuous patient tracking, early disease detection, and remote healthcare delivery. This helps clinicians monitor patients beyond hospital walls, offering faster and more precise interventions. The convergence of biomedical innovation, data analytics, and AI has expanded possibilities in cardiology, neurology, oncology, and critical care. Devices can now learn from each patient's unique physiological patterns to tailor treatment. Through the Internet of Medical Things (IoMT), these devices are connected into intelligent networks that enable continuous monitoring and clinical feedback. However, as these systems evolve, they also raise concerns about data privacy, regulatory compliance, ethics, and cybersecurity. This paper reviews current advancements in AI-assisted medical devices, explores their clinical applications and regulatory challenges, and highlights their role in shaping precision medicine. By merging intelligent computation with biomedical technology, AI-driven devices are redefining healthcare—making it more proactive, predictive, and patient-centric.

Keywords: Artificial Intelligence, Medical Devices, Machine Learning, Deep Learning.

BEYOND THE NEEDLE: BREAKTHROUGH IN MODERN IMMUNIZATION

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ABSTRACT

Injections have served as the primary method of vaccination for centuries; however, traditional approaches present challenges related to discomfort, anxiety, and administration difficulties. The increasing demand for new vaccine options, driven by existing limitations, has led to ongoing research into minimally invasive and non-invasive vaccines as viable alternatives. Concerns over pandemic illness, bioterrorism, and eliminating infectious disorders have pushed the hunt for needle-free vaccination administration techniques. Needle-free vaccine delivery may enhance mass vaccination efforts by facilitating rapid administration, improving safety and adherence, lowering costs, and minimising pain related to vaccinations. The challenges have driven the advancement of non-invasive vaccination methods, which present opportunities for safer, simpler, and patient-friendly immunisation. This study aims to present a thorough analysis of the latest advancements in vaginal, buccal, sublingual, intranasal, oral, and microneedle vaccines. Additionally, it will highlight the immunological processes at play, preclinical formulation tactics, marketed product examples, and recent clinical trials.

Keywords: Vaccine, Non-Invasive, Intranasal, Immunization, Clinical Trials.

ROLE OF NUTRACEUTICALS IN THE PREVENTION AND MANAGEMENT OF CARDIOVASCULAR DISEASES

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ABSTRACT

Cardiovascular diseases (CVDs) remain the leading cause of death globally and are strongly linked to lifestyle factors, oxidative stress, and inflammation. They account for over 30% of global mortality, emphasizing the need for novel, safer, and more effective preventive strategies. Nutraceuticals, i.e., bioactive compounds derived from dietary sources, offer a promising approach due to their antioxidant, anti-inflammatory, and cardioprotective properties. Key nutraceuticals such as omega-3 fatty acids, polyphenols, curcumin, coenzyme Q10, and garlic extract exhibit beneficial effects through antioxidant, anti-inflammatory, and lipid-lowering mechanisms. Regular dietary intake or supplementation of these nutraceuticals can complement conventional therapies and promote long-term cardiovascular wellness. Despite encouraging evidence, further long-term clinical trials and improved formulation technologies are essential to validate their efficacy and safety. This review aims to summarize the current understanding of nutraceuticals in CVD prevention and highlight their potential role in modern cardiovascular therapy.

Keywords: Nutraceuticals, Cardiovascular diseases, Inflammation, Antioxidants, Omega-3 fatty acids.

CURRENT TREATMENT THERAPY AND FUTURE PROSPECTIVE OF ATAXIA

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ABSTRACT

Numerous conditions, such as degenerative processes, autoimmune and paraneoplastic diseases, as well as gene mutations inherited in autosomal dominant, autosomal recessive, or X-linked patterns, is responsible for causing cerebellar ataxia. Cerebellar diseases can be treated by both symptomatically and target specific disease type. Omaveloxolone is the first and only approved treatment of ataxia in the year 2023. Supportive care includes mobility aids, speech treatment, physical therapy, routine monitoring management of diabetes, genetic counseling, respiratory and nutritional support. Some drugs are under study which is antioxidant and mitochondrial targeting agents such as Idebenone and vatiquinone. Frataxin replacement therapy (Nomlabofusp) has showed early promise in delivering functional frataxin protein to cells. Trials for gene therapy employing AAV-based techniques, such as Lexeo's LX2006, are now in progress and seek to introduce a healthy FXN gene. New studies are being conducted to increase the synthesis of frataxin in order to treat Friedreich Ataxia in the future. These studies include mRNA delivery, CRISPR gene editing, and epigenetic activation.

Keywords: Ataxia, Omaveloxolone, Frataxin replacement therapy, CRISPR gene editing.

ARTIFICIAL INTELLIGENCE AND DIGITALIZATION IN PHARMACEUTICAL REGULATORY AFFAIRS

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ABSTRACT

This study emphasis on the current applications, methodologies, and challenges in the integration of AI and digital technologies within regulatory frameworks. Key findings highlight the diversity of AI techniques ranging from machine learning and deep learning to natural language processing and hybrid models applied across pharmacovigilance, regulatory dossier management, and quality control. Despite demonstrable efficiency gains and improved patient safety, significant barriers persist, including regulatory fragmentation, data privacy concerns, algorithmic bias, and stakeholder trust. Comparative analyses reveal that tool selection and data context critically influence AI performance and interpretability. Case studies from leading regulatory agencies and industry illustrate both successes and ongoing challenges. The study concludes with future perspectives, emphasizing the need for harmonized international regulatory frameworks, explainable AI, federated learning, and collaborative innovation to fully realize the potential of AI in pharmaceutical regulatory affairs while safeguarding ethical and societal values. Recommendations for best practices and policy evolution are provided to guide stakeholders in this rapidly evolving technology. AI and digitalization are reshaping pharmaceutical regulatory affairs, offering substantial benefits in efficiency, safety, and compliance.

Keywords: Artificial Intelligence, Digitalization, Pharmaceutical Regulatory Affairs.

AI-INTEGRATED ADVANCED MEDICAL DEVICES: REDEFINING DIAGNOSTICS AND THERAPEUTICS IN THE PHARMA WORLD

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ABSTRACT

Embedding machine learning and deep learning algorithms into diagnostic and therapeutic devices, the healthcare ecosystem is now moving toward predictive, preventive, and personalized medicine. These intelligent systems process voluminous physiological data in real time to enable enhanced disease detection, patient monitoring, and adaptive therapy delivery. In the pharmaceutical context, AI-powered devices, including smart inhalers, biosensor-based drug monitoring systems, and automated infusion pumps, make precision dosing, tracking of adherence, and remote pharmacovigilance possible. Similarly, AI-driven imaging and point-of-care diagnostic tools enhance clinical decision-making by combining patient data with evidence-based algorithms. Growing IoMT networks further reinforce the interface between connected devices, clinicians, and digital health platforms to foster data-driven interventions. The aim of this paper is to provide the current landscape, technological enablers, regulatory considerations, and future prospects pertaining to AI-integrated medical devices for the transformation of pharmaceutical research, clinical trials, and healthcare delivery. The synergy of AI intelligence and biomedical engineering thus provides a unique opportunity to redefine modern therapeutics through smart, self-learning, and patient-centric devices.

Keywords: Artificial Intelligence, Advanced Medical Devices, Internet of Medical Things (IoMT), Precision Medicine, Smart Therapeutics, Pharma AI Integration.

FORMULATION AND EVALUATION OF BIGEL CONTAINING BLACK GLUTINOUS RICE EXTRACT FOR TOPICAL APPLICATION

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ABSTRACT

The present study was aimed to formulate and evaluate a stable bigel containing Black Glutinous Rice (*Oryza sativa* L. var. *glutinosa*) extract for topical application. Black glutinous rice is rich in anthocyanins, phenolic compounds, and flavonoids, which possess significant antioxidant and skin-protective properties. The bigel was prepared by combining Carbopol 940 hydrogel and beeswax-olive oil oleogel in a 60:40 ratio using a simple mixing method. The prepared formulation was evaluated for pH (5.4), viscosity (45,000 cP), spreadability (6.9 cm), and stability, all of which were within acceptable limits for dermatological use. Antioxidant activity was assessed by DPPH radical scavenging assay, which confirmed the strong free radical inhibition potential of the extract. The bigel showed good homogeneity, smooth texture, and ease of spreadability without phase separation. The results indicated that the formulation was physically stable and suitable for skin application. Hence, black glutinous rice-based bigel can serve as an effective antioxidant topical formulation with potential applications in cosmetic and dermatological preparations.

Keywords: Bigel, Black Glutinous Rice, Antioxidant, Topical Formulation, Carbopol 940.

**THE ROLE OF NEURAL OBSTRUCTION IN PARKINSON’S DISEASE: INSIGHTS INTO
ADVANCED THERAPEUTICS AND AI-DRIVEN DRUG DELIVERY STRATEGIES**

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ABSTRACT

Parkinson’s disease (PD), is a progressive neurodegenerative disorder, it continues to challenge. The researchers due to its multifactorial etiology and very limited treatment outcomes. Recent evidence suggests that neural obstruction is a disruption in the normal cerebrospinal fluid (CSF) dynamics or neuronal signaling may contribute to the degeneration of dopaminergic neuron in the substantia nigra, impairing dopamine synthesis and transmission. This phenomenon may arise from structural anomalies, neuroinflammation, or hereditary factors that compromise neuronal pathways. In the context of advanced therapeutics and drug delivery technologies, by integrating artificial intelligence (AI) provides transformative potential in understanding and managing PD. AI-based neuroimaging analytics can detect early-stage neural obstruction and predict dopaminergic neuron degeneration with precision. Moreover, AI-driven modeling aids in the design of targeted nanocarrier systems, ensuring efficient blood–brain barrier (BBB) penetration and localized delivery of neuroprotective agents. These smart delivery platforms, coupled with real-time AI feedback, enhance the precision, safety, and personalization of PD therapy. Crucially, this paper also emphasizes the high susceptibility of Parkinson's patients to develop related neurodegenerative disorders. This review explores the interplay between neural obstruction, dopamine depletion pathways, oxidative stress, and inflammation, while focusing on how AI-assisted therapeutic designs can revolutionize the Parkinsonism management. By bridging neuropathology with intelligent drug delivery systems, this study highlights the promise of AI-integrated strategies in early diagnosis, target treatment, and the development of next-gen of neurotherapeutics for Parkinson’s disease.

Keywords: Neural Obstruction, Parkinson’s Disease, Artificial Intelligence, Dopamine Depletion, Substantia Nigra

**RECENT ADVANCEMENT OF PHYTO-NANO FORMULATIONS IN THE TREATMENT
OF NEURODEGENERATIVE DISEASES**

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ABSTRACT

Neuronal loss, oxidative stress, neuroinflammation, and problems with neurotransmission are all features of neurodegenerative illnesses including Parkinson's and Alzheimer's. Due in significant part to inadequate blood–brain barrier (BBB) penetration, conventional therapies only provide a limited amount of symptomatic alleviation. As a therapeutic approach, recent developments in phyto-nanoformulations—nano-engineered carriers for bioactives derived from plants—show promise. These formulations enhance antioxidant defences, lower inflammation, prevent protein aggregation, boost mitochondrial function, and improve the solubility, stability, bioavailability, and targeted delivery of phytochemicals like curcumin, resveratrol, quercetin, and ginkgo extract. Additionally, biocompatible, controlled-release systems that improve cellular absorption and reduce toxicity are made possible by green nanotechnology. Phyto-nanoformulations represent a major step towards disease-modifying treatments for neurodegenerative diseases, but additional clinical research is required to prove long-term efficacy, tolerability, and translational potential, despite encouraging preclinical results.

Keywords: Phyto-nanoformulations, Neurodegenerative Diseases, Nanoparticles, Phytochemicals.

FORMULATION, CHARACTERIZATION AND OPTIMIZATION OF ANTI CANCER DRUGS (PACLITAXEL, DOXORUBIXIN, CURCUMIN, CAPECITABINE) SOLID LIPID NANOPARTICLES FOR THE IMPROVED CYTOTOXICITY AGAINST BREAST CANCER CELLS

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ABSTRACT

Breast cancer is a major global health concern for women. In order to increase the effectiveness of anticancer drugs against breast cancer cells, this study investigates the development and optimization of solid lipid nanoparticles (SLNs). Lipid concentration, surfactant ratio, and homogenization speed were used to optimize SLNs using a solvent evaporation approach. Particle size, zeta potential, drug entrapment effectiveness, and shape were evaluated using scanning electron microscopy and dynamic light scattering. When compared to pure drug solutions, the optimized SLN formulation significantly boosted cytotoxicity, improved cellular absorption, and allowed controlled drug release, according to in vitro drug release and cytotoxicity experiments. According to these results, SLNs show promise as a drug delivery system for localized breast cancer treatment, with the potential to improve patient outcomes and lessen systemic adverse effects.

Keywords: Solid Lipid Nanoparticles, Breast Cancer, Cytotoxicity, Drug Delivery, Optimization, Characterization, Controlled Release.

DEVELOPMENT, CHARACTERIZATION, AND EVALUATION OF HYBRID HYDROGEL FOR HEMOSTATIC AND ANTIMICROBIAL ACTIVITY

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ABSTRACT

This study discusses the creation of a hybrid chitosan-carboxymethyl cellulose (CS-CMC) hydrogel linked with 1,4-butanediol diglycidyl ether (BDDE). This design aims to tackle heavy bleeding, bacterial resistance, and slow wound healing at the same time. Initial formulation trials with 18 samples optimized the ratios of the polymers (CS: 1.0–2.0% w/v; CMC: 1.0–2.0% w/v), pH (5–9), and BDDE concentration (20–60 μ L). Successful gel formation occurred only at pH 7, with a CS:CMC ratio of 1.5:2.0 w/v and at least 20 μ L of BDDE in distilled water. Trinocular microscopy showed that a porous 3D network formed through ionic (CS^+-CMC^-) and covalent (BDDE epoxide) linking. Future improvements will include adding copper nanoparticles (CuNPs, 0.1–0.5% w/v) and tricalcium phosphate for antimicrobial release that responds to pH and temperature, as well as 2% glycerol for better flexibility. The hydrogel aims for quick blood control in less than 2 minutes (tested via the Lee-White assay), offers wide-ranging antimicrobial properties (over 15 mm inhibition zones, AATCC 100), and helps speed up tissue healing through controlled release of bioactive compounds at a wound's pH of about 5.5 and body temperature of 37°C. Detailed characterization using methods like SEM, FTIR, rheology, and swelling tests, along with in vitro and in vivo validation, will occur over an 11-month period. The goal is to create a biocompatible, cost-effective prototype that could cut infection rates by 50–70% and healing times by 20–30%. This work supports the development of smart biomaterials for modern wound care in settings with limited resources.

Keywords: Chitosan-CMC Hydrogel, BDDE Crosslinking, Copper Nanoparticles, Hemostasis, Antimicrobial Resistance, Ph-Responsive Release, Wound Healing.

IMPROVING THE SOLUBILITY OF HALOPERIDOL, A BCS CLASS II ANTIPSYCHOTIC, THROUGH SUPRAMOLECULAR CHEMISTRY

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ABSTRACT

Although antipsychotic medications have improved the management of this disorder, many of these drugs suffer from low solubility and limited bioavailability, which can reduce their therapeutic effects. One such drug is haloperidol, a typical antipsychotic widely used to treat schizophrenia and acute psychotic conditions. Haloperidol, classified under the Biopharmaceutics Classification System (BCS) Class II, suffers from poor oral bioavailability due to low solubility at higher pH and extensive first-pass hepatic metabolism. Improving its solubility and dissolution rate remains a major challenge in optimizing therapeutic performance. Recent advances in supramolecular chemistry have provided effective approaches to enhance the physicochemical and biopharmaceutical properties of haloperidol, particularly through the formation of cocrystals and eutectic mixtures with Generally Recognized As Safe (GRAS) coformers. Various preparation techniques, including mechanochemical synthesis, solvent evaporation, and liquid-assisted grinding, have been explored alongside analytical characterization methods such as Differential Scanning Calorimetry (DSC), Powder X-Ray Diffraction (PXRD), Fourier Transform Infrared Spectroscopy (FT-IR), and Solid-State NMR (SSNMR). Studies on solubility, dissolution, and in vivo performance demonstrate the potential of these supramolecular systems to improve oral bioavailability, therapeutic efficacy, and patient compliance while reducing side effects. Overall, supramolecular strategies offer a promising pathway for developing advanced haloperidol formulations and improving treatment outcomes in schizophrenia and related psychiatric disorders.

Keywords: Cocrystals, Eutectic mixtures, Solubility, Bioavailability, Supramolecular chemistry.

AI AND RATIONAL DRUG DESIGN ASSISTED IDENTIFICATION OF PARP-1 BINDERS

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ABSTRACT

Poly (ADP-ribose) polymerase-1 (PARP-1) is a key nuclear enzyme involved in DNA repair and the maintenance of genomic stability. Owing to its critical role in the DNA damage response, PARP-1 has emerged as a validated therapeutic target in cancer treatment. It combines AI-driven de novo design and rational drug design strategies to discover new small-molecule inhibitors with greater selectivity, potency, and safety. Using machine learning models and molecular docking simulations, the research predicts and characterizes binding interactions of potential lead compounds. It addresses key challenges like drug resistance, poor selectivity, and limited chemical diversity by exploring novel chemical scaffolds and alternative binding sites beyond the conventional catalytic pocket of PARP-1. The expected outcome is the identification of new inhibitors with favorable pharmacokinetic properties and drug-like behavior. This integrated approach aims to accelerate the drug discovery process and lay the groundwork for developing next-generation, highly selective PARP-1 modulators for cancer treatment.

Keywords: PARP-1 inhibitors, artificial intelligence, rational drug design, machine learning, molecular docking.

ROLE OF NOVEL DRUG DELIVERY SYSTEM IN MANAGEMENT OF SKIN CANCER

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ABSTRACT

Skin cancer including melanoma- basal cell carcinoma and squamous cell carcinoma poses significant therapeutic challenges due to issues like poor drug penetration through the skin various systemic toxicity of chemotherapeutic drugs and tumour the recurrence. Novel drug delivery systems have emerged as a promising approach to overcome these limitations and improve the efficiency activity and safety of treatment. Novel drug delivery systems are designed to enhance drug delivery, target tumour cells and reduce adverse effects. They use nanotechnology and biometrical engineering to control drug release and improve localization. There were various limitation of conventional therapies like poor skin penetration of drug, systemic side effects, short drug half Life, low bioavailability and multi drug resistance in tumour cells. Novel drug delivery systems represent are transformative approach in the management of skin cancer by in evening target control and efficient drug delivery system scan significantly enhance treatment efficacy while minimising adverse effects continue research in 2 minute technology

Keywords: Novel drug delivery systems, Skin cancer.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN CLINICAL RESEARCH AND PHARMACOVIGILANCE. THE AI REVOLUTION IN CLINICAL RESEARCH AND DRUG SAFETY

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ABSTRACT

In clinical research, AI enables the analysis of large and complex datasets, identification of suitable patient populations, and prediction of clinical trial outcomes. Machine learning algorithms can optimize patient recruitment by matching eligibility criteria to electronic health records, while predictive models assist researchers in forecasting trial success and potential risks. This reduces trial duration, minimizes costs, and enhances the accuracy and reliability of research outcomes. In pharmacovigilance, AI plays a critical role in monitoring and improving drug safety. Traditional methods of detecting adverse drug reactions (ADRs) often rely on manual reporting and are time-consuming. This early identification of potential ADRs helps healthcare professionals respond promptly, ensuring patient safety and regulatory compliance. Despite its promising applications, challenges such as data privacy, algorithm transparency, and integration with existing healthcare systems remain. Addressing these issues is crucial to fully realize the potential of AI in pharmacy practice. The integration of AI in clinical research and pharmacovigilance is reshaping the pharmaceutical landscape by improving efficiency, reducing risks, and accelerating the development of safer therapies. As AI technologies continue to evolve, they are expected to become indispensable tools for researchers, clinicians, and regulatory authorities, ultimately enhancing therapeutic outcomes and contributing to a more proactive and patient-centered approach to healthcare.

Keywords: Pharmacovigilance, Artificial Intelligence, Clinical Research.

**HYBRID BIOPOLYMER SYSTEMS COMBINING NATURAL POLYSACCHARIDES
WITH SYNTHETIC NANOCARRIERS FOR ENHANCED ENCAPSULATION AND
BIOAVAILABILITY**

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ABSTRACT

Natural polysaccharides such as chitosan, alginate, starch, and dextran confer biocompatibility, biodegradability, and tunable gelation, while synthetic nanocarriers (e.g., polymeric nanoparticles, lipid-polymer hybrids, and inorganic-organic composites) provide precise control over payload loading, release kinetics, and targeting capabilities. Crosslinking density, molecular weight, and functionalization (e.g., carboxyl, amine, and thiol groups) in the polysaccharide phase, together with surface modification of nanocarriers, dictate diffusion barriers, swelling behavior, and response to physiological stimuli, thereby enabling site-specific and on-demand release. Recent mucoadhesive and cell-penetrating functionalities. The hybrid approach also leverages green synthesis strategies and scalable fabrication, including aqueous processing, enzymatic crosslinking, and mild co-assembly routes to preserve drug integrity. Collectively, hybrid biopolymer systems fuse the best attributes of natural polymers with engineered nanocarriers to achieve high encapsulation efficiency, improved pharmacokinetics, reduced off-target effects, and potential for personalized therapy across oral, parenteral, transdermal, and implantable routes.

Keywords: Hybrid biopolymers, Nanocarriers, Encapsulation efficiency, Bioavailability, Targeted delivery

**TRANSLATIONAL GREEN NANOMEDICINE FOR DIABETIC WOUND REPAIR:
INTEGRATING PHYTOACTIVES WITH NEXT-GEN NANO THERAPEUTICS**

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ABSTRACT

This review highlights the therapeutic significance and translational scope of green-synthesised nanoparticles in diabetic wound healing, emphasising their mechanisms, biological advantages, and comparative benefits over conventional wound care modalities. A systematic assessment of peer-reviewed literature from standard scientific databases was performed, exploring plant-mediated nanoparticle synthesis methods, mechanistic pathways, bioactivities, and preclinical/clinical evidence in diabetic wound applications. Biogenic nanoparticles - including silver, gold, zinc oxide, and copper nano-constructs-exhibited marked anti-inflammatory, antioxidant, and antimicrobial actions, leading to reduced infection burden and accelerated wound closure. Enhanced fibroblast proliferation, improved collagen synthesis, and faster tissue remodelling support their efficiency in chronic diabetic wound microenvironment modulation with minimal toxicity. Green nanotechnology offers a sustainable, biologically compatible, and mechanistically superior strategy for diabetic wound management. Plant-derived nanoparticles demonstrate strong potential to serve as novel next-generation regenerative nano-therapeutics by effectively modulating oxidative imbalance, promoting angiogenesis, and suppressing microbial colonisation.

Keywords: Green Nanotechnology, Biogenic Nanoparticles, Diabetic Wound Healing, Oxidative Stress, Angiogenesis, Antimicrobial Activity.

REPURPOSING DRUGS TO TARGET CYSLT₂ RECEPTOR SIGNALING: A NOVEL THERAPEUTIC APPROACH TO NEUROINFLAMMATION

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ABSTRACT

Numerous neurological conditions, such as multiple sclerosis, Parkinson's disease, Alzheimer's disease, and neuropathic pain, are largely influenced by neuroinflammation. Reactive oxygen species, proinflammatory cytokines, and neurotoxic mediators that upset neuronal homeostasis are released when microglia and astrocytes are overactivated. The majority of current treatments just alleviate symptoms; they are unable to effectively block the neuroimmune signaling that maintains chronic inflammation. Therefore, a viable translational approach toward disease-modifying therapies is provided by the discovery of novel molecular targets and the repurposing of clinically licensed medications. The cysteinyl leukotriene receptor 1 (CysLT₂) is a novel target for regulating neuroinflammatory cascades, and this work focuses on it. NF-κB-mediated cytokine release, oxidative stress, and neuronal damage are all facilitated by overactivation of CysLT₂ on glial cells. Preclinical research indicates that CysLT₄ receptor antagonists, which were first used to treat asthma, can improve neuronal survival, restore redox balance, and reduce glial activation. They are appealing options for medication repurposing in neurological illnesses due to their proven safety, oral bioavailability, and capacity to pass the blood–brain barrier. This method highlights CysLT₂ blockade's therapeutic promise as a neuroprotective and inflammatory resolution technique. A mechanism-driven, economical way to move neuroinflammatory disease management from symptomatic treatment to actual disease change is through the repurposing of Cyst antagonists.

Keywords: CysLT-receptor, neuroinflammation, drug repurposing, Microglial activation, and neuroprotection.

NUTRACEUTICALS DRUG DELEVERY SYSTEMS

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ABSTRACT

Nutraceutical drug delivery systems represent a novel approach that combines the therapeutic potential of nutraceuticals with advanced pharmaceutical delivery technologies to enhance their bioavailability, stability, and targeted action. Nutraceuticals, derived from food sources, provide health benefits beyond basic nutrition, including disease prevention and management. However, many nutraceutical compounds suffer from poor solubility, low permeability, and rapid degradation in the gastrointestinal tract, limiting their clinical effectiveness. To overcome these limitations, innovative drug delivery systems such as nanoparticles, liposomes, micelles, niosomes, and nanoemulsions have been developed. These systems offer controlled and targeted release, improved absorption, and enhanced therapeutic efficacy. The integration of nutraceuticals with modern delivery platforms opens new opportunities for the development of effective and safe health-promoting formulations, bridging the gap between nutrition and pharmacotherapy.

Keywords: Nutraceuticals, Drug delivery system, Nanoparticles, Bioavailability, Targeted delivery, Liposomes, Nanoemulsion, Controlled release.

**RECENT UPDATE ON PHENOLIC GLYCOSIDES CONTAINING SALICIN IN DRUG
DISCOVERY: CLINICAL TRIALS, TOXICOLOGICAL, PHARMACOKINETIC, AND
ETHNOPHARMACOLOGICAL PERSPECTIVES**

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ABSTRACT

Salicin, a prominent phenolic glycoside derived from *Salix* species, has been traditionally employed to manage pain and inflammatory conditions. Despite its long-standing ethnomedicinal use, comprehensive knowledge regarding its pharmacokinetics, bioavailability, analytical characterization, and clinical potential remains limited. Aims to systematically consolidate current knowledge on salicin, encompassing its botanical sources, ethnopharmacological relevance, pharmacokinetics and bioavailability, analytical methodologies, and clinical evidence. A thorough literature search was performed using PubMed, Scopus, Web of Science, and Google Scholar. Studies reporting on salicin's chemistry, traditional uses, pharmacological mechanisms, bioavailability, analytical profiling, and clinical trials were included. Relevant data were critically appraised and synthesized to provide an integrated overview. *Salix* species are the primary sources of salicin, with ethnomedicinal evidence supporting its use in musculoskeletal and inflammatory disorders. Pharmacokinetic studies indicate that formulation and gut microbiota significantly influence bioavailability, with rapid hydrolysis to saligenin followed by metabolism to salicylic acid. Advances in analytical methods, including spectroscopic techniques, LC-MS, and HPLC, enable precise quantification and standardization. Although large-scale, long-term trials are lacking, existing clinical studies demonstrate notable anti-inflammatory and analgesic effects with a favourable safety profile. Salicin holds considerable therapeutic promise, bridging traditional knowledge and modern pharmacology. Future studies should improve bioavailability, standardize analyses, and conduct robust clinical trials to confirm dosing, efficacy, and safety.

Keywords: Salicin, *Salix* species, phenolic glycoside, ethnopharmacology, bioavailability, analytical profiling, clinical studies.

REPURPOSING 5-LOX–CYSLT₁ PATHWAY MODULATORS AS INNOVATIVE NEUROINFLAMMATORY TREATMENT AGENTS

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ABSTRACT

Neuroinflammation has a significant role in the development of numerous neurological and pain-related conditions. Neuronal injury and dysfunction are caused by glial cell overactivation, elevated oxidative stress, and excessive release of inflammatory mediators. The 5-lipoxygenase (5-LOX)–cysteinyl leukotriene receptor 1 (CysLT₁) axis is one of the mechanisms that controls this process, and it has recently come to light as a crucial component of inflammatory signaling. When 5-LOX is activated, leukotrienes are produced. These leukotrienes activate glial cells CysLT₁ receptors, which in turn cause the release of proinflammatory cytokines via the NF-κB and MAPK pathways.

The repurposing of 5-LOX and CysLT₁ inhibitors, which were first employed to treat inflammatory and allergy illnesses, as novel therapeutic alternatives for managing neuroinflammation is the focus of this work. In recent research, compounds like a selective 5-LOX inhibitor, and CysLT₁ receptor antagonists, have demonstrated notable anti-inflammatory and protective effects. These substances aid in lowering inflammatory mediator release, glial activation, and oxidative damage, all of which support neuronal protection. These medications currently have proven safety profiles and advantageous pharmacological characteristics, making their application to neuroinflammatory disorders more feasible and economical. Targeting the 5-LOX–CysLT₁ pathway, in general, offers a dual strategy by preventing receptor activation and decreasing leukotriene synthesis. This repurposing approach is an effective and mechanism-based approach to creating new treatments to control and avoid long-term neuroinflammation.

Keywords: CysLT-receptor, leukotrienes, 5-lipoxygenase, neuroinflammation, drug repurposing, and neuroprotection.

PATHOLOGICAL PATHWAY AND PROTECTIVE MECHANISMS OF PHYTOBIOACTIVES USED IN DIABETIC RETINOPATHY: A REVIEW

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ABSTRACT

The cause of diabetes mellitus is either insufficient or malfunctioning insulin. It is among the most common causes of diabetic retinopathy. Numerous synthetic drugs have detrimental side effects that make diabetes worse for the patient. The identification of phytochemicals from medicinal plants is a viable avenue for the development of innovative treatments for diabetes and associated consequences, including diabetic retinopathy. In addition to highlighting the pathogenic mechanism of DR, this study described a number of tiny compounds (phytochemicals) originating from plants that have been investigated for their potential to have retinal cytoprotective effects in pre-clinical and clinical contexts. This highlights the process via which phytochemicals protect the retina. Phytochemicals suppressed the development of DR by lowering oxidative stress, inflammation, and apoptotic pathways in a number of investigations. Many phytochemicals, comprising flavonoids, lignan, glycosides, phytoestrogen, and others, suppressed the generation of reactive oxygen species (ROS) and downregulated inflammatory markers including TNF-α, interleukin-6 (IL-6), and interleukin-1β (IL-1β). In general, the majority of phytochemicals exhibit retinal cryoprotection by lowering the buildup of inflammatory mediators and free radicals.

Keywords: Diabetes, Inflammation, Oxidative stress, Phytochemicals, Retinopathy.

**SECURE AND TIME-SYNCHRONIZED AI-POWERED REMOTE PATIENT
MONITORING USING WEARABLE SENSOR DATA**

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ABSTRACT

The convergence of Artificial Intelligence (AI) and wearable sensor technology has significantly transformed Remote Patient Monitoring (RPM) by enhancing the collection and interpretation of health data. Despite these advancements, challenges such as data synchronization issues and privacy risks continue to undermine system reliability. This research presents an innovative AI-driven framework designed to uphold data accuracy and confidentiality within RPM environments. Through the implementation of real-time timestamping and data sequencing, the framework ensures precise chronological tracking of key health indicators, including heart rate, oxygen saturation, and body temperature. Sophisticated preprocessing components convert raw sensor inputs into well-structured time-series datasets, optimizing them for AI-based analysis. To protect sensitive information, the system incorporates strong security protocols such as end-to-end encryption and federated learning, ensuring secure data transmission and decentralized model training. Experimental evaluations demonstrate that the proposed solution delivers high accuracy in detecting anomalies while maintaining data privacy and synchronization. This advancement holds promise for improving the dependability and impact of telehealth and digital medical platforms.

Keywords: Artificial Intelligence, Remote Patient Monitoring, Health Indicators.

**AI-DRIVEN TRANSFORMATION IN DRUG DISCOVERY: ACCELERATING PRECISION
MEDICINE AND PHARMACEUTICAL R&D**

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ABSTRACT

AI is revolutionizing the drug discovery pipeline by enabling de novo molecular design and enhancing processes from target identification to preclinical evaluation. Utilizing advanced deep learning models that analyze vast multimodal datasets—comprising genomics, proteomics, and real-world evidence—AI improves precision in target validation, molecular docking, and pathway analysis. Virtual high-throughput screening and predictive ADMET modeling significantly reduce the attrition of drug candidates, with AI-discovered molecules demonstrating Phase I clinical success rates of 80–90%, compared to 40–65% for traditional methods. This progress is projected to boost overall R&D productivity by nearly 20%, cutting both costs and development time. Despite these advances, challenges remain, including data sparsity, variability, and fragmentation across biomedical databases, which hinder effective model training. The “black box” nature of deep learning models limits transparency and complicates regulatory approval and scientific interpretability. Ultimately, AI in drug discovery represents a systemic revolution, transcending technological enhancement to reshape how medicines are conceived, tested, and delivered. By integrating intelligence across the biomedical continuum, AI promises to shorten time-to-market, expand access to therapies, and reduce the global disease burden. Responsible and collaborative deployment of AI is crucial to ensure equitable benefits for patients worldwide.

Keywords: Artificial Intelligence, Drug Discovery, Machine Learning, Precision Medicine, Pharmaceutical R&D

**A COMPENDIUS STUDY ON DEVELOPMENT AND VALIDATION OF RELUGOLIX
THROUGH RP-HPLC METHOD**

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ABSTRACT

Relugolix is a non-peptide hormonal drug that is used in prostate cancer and endometriosis. Relugolix is an orally active, nonpeptide gonadotropin-releasing hormone (GnRH) receptor antagonist used in the management of hormone-dependent disorders such as advanced prostate cancer, uterine fibroids, and endometriosis. Unlike GnRH agonists, relugolix rapidly suppresses luteinizing hormone (LH) and follicle-stimulating hormone (FSH), leading to a prompt decline in testosterone and estradiol levels without an initial hormonal surge. Administered once daily, it offers convenience and a favorable safety profile. Clinical studies have demonstrated its effectiveness in achieving and maintaining castration-level testosterone with a lower risk of cardiovascular complications compared to traditional Androgen deprivation therapies. This present work is designed to develop and validate a RP-HPLC method. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10µm particle size. A mixture of methanol and acetonitrile in a specific ratio used as a mobile phase with flow rate of 1ml/min. Using UV detector with established 290nm wavelength were used with the run time of 10min. Linearity has been performed in the concentration range of 10 to 50 ppm for Relugolix were used with the run time of 10 min.

Keywords: Relugolix, RP-HPLC, UV Detector.

**AI-BASED PRODUCT DEVELOPMENT AND MARKETING: A CASE STUDY ON
MARKET ANALYSIS OF HERBAL SHAMPOO PRODUCTS**

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ABSTRACT

This study addresses the limitations of traditional, time-intensive market analysis by introducing a comprehensive framework for AI-based product development and marketing specific to the herbal segment. Utilizing machine learning (ML) models, the research performs a granular market analysis, primarily focusing on two core AI applications: Natural Language Processing (NLP) for large-scale consumer sentiment analysis, and predictive time-series modeling for demand forecasting. The methodology involved scraping and processing millions of user reviews and social media data points related to herbal hair care ingredients (e.g., tea tree, hibiscus, neem) to identify nascent ingredient trends, consumer pain points, and specific unmet needs that inform new product formulation. Concurrently, predictive analytics were applied to sales data and competitor performance to optimize distribution strategies and inventory management. The resulting case study, centered on a hypothetical launch of a novel herbal shampoo line, demonstrates that AI-driven insights allowed for the identification of a significant market gap—shampoos targeting scalp microbiome health—and enabled the development of highly segmented, personalized marketing campaigns. Compared to a control group utilizing conventional market research, the AI-informed strategy showed a 35% faster time-to-market for product iteration and a projected 28% higher return on investment (ROI) from marketing expenditure. This research confirms the transformative utility of artificial intelligence in refining both the product lifecycle and promotional efficacy within the fast-moving consumer goods (FMCG) sector, offering a scalable, data-driven blueprint for subsequent product innovations in the natural healthcare space.

Keywords: AI-Based Product Development, Herbal Shampoo, Market Analysis,

GENE THERAPY, STEM CELL THERAPY, AND REGENERATIVE MEDICINE: AN INTEGRATED APPROACH TO TISSUE REPAIR AND REGENERATION

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ABSTRACT

Currently, mostly gene therapy approaches use viral or cellular carriers to deliver therapeutic genes; however, these methods can cause side effects or trigger immune responses. Non-viral delivery systems, such as plasmids or synthetic carriers, are generally safer but tend to be less efficient. Combining gene therapy with tissue engineering offers the potential to enhance treatment effectiveness by precisely controlling where and how genes are expressed. Mesenchymal stem cells (MSCs), a key type of stem cell, play a crucial role in tissue repair because of their ability to differentiate into various cell types and support the maintenance of healthy tissues. The effectiveness of stem cells largely depends on their surrounding environment, known as the stem cell niche. Understanding both the stem cells and their niche is essential for improving stem cell-based therapies. Recreating this microenvironment outside the body can further enhance the success of tissue engineering. MSC's also possess unique properties that help reduce inflammation and promote tissue repair. Some studies suggest that MSCs may be a form of pericyte, which could explain their widespread presence in different tissues and their ability to aid in the repair of multiple organ systems. This review discusses the integration of gene therapy and regenerative medicine, emphasizing how stem cells, their microenvironment, and tissue engineering can be combined to improve therapeutic outcomes. A deeper understanding of these interconnected systems will enable researchers to develop safer and more effective strategies for repairing or replacing damaged tissues and organs.

Keywords: Gene therapy, non-viral vectors, Regenerative medicine, Stem cell niche.

GENERATIVE AI IN DRUG DESIGN: FROM ALGORITHMIC MODELS TO CLINICAL INNOVATION

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ABSTRACT

This review aims to highlight how generative AI frameworks are transforming early-stage drug discovery — from computational algorithms to clinically relevant candidates — while improving efficiency, precision, and sustainability. Generative AI models such as Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and Diffusion Models autonomously generate and optimize molecular structures for enhanced pharmacological efficacy, bioavailability, and safety. These models, combined with chemo informatics, molecular docking, and deep reinforcement learning, enable computers to explore vast chemical spaces and propose drug-like compounds tailored for specific biological targets. Recent studies report that such AI-driven work flows can reduce lead identification time by up to 70% and improve molecular hit accuracy by nearly 50% compared to conventional virtual screening methods. Furthermore, advancements such as AlphaFold's protein structure prediction and AI-powered virtual screening platforms are redefining structure-based drug discovery. This review also discusses ethical, regulatory, and data-transparency challenges in implementing AI across pharmaceutical pipelines. Ultimately, Generative AI represents a transformative step toward intelligent, sustainable, and data-driven drug discovery, bridging computational innovation with translational medicine. Its integration into pharmaceutical R&D holds immense potential to accelerate discovery timelines, lower development costs, and enhance the precision of next-generation therapeutics.

Keywords: De Novo Drug Design, Generative Models, Deep Learning, Virtual Screening.

AI IN MEDICAL BIOTECHNOLOGY FOR SUSTAINABLE DRUG DISCOVERY

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ABSTRACT

Medical biotechnology has been used in drug discovery to identify and develop new drugs by understanding disease biology, discovering molecular targets, screening compounds, and optimizing leads. Various biotechnological tools such as genomics, proteomics, and high-throughput screening play a vital role in this process. In the current era of artificial intelligence (AI), it has become an essential component of innovation and sustainable drug discovery. The integration of AI with biotechnology has revolutionized scientific research and development by accelerating multiple tasks across fields such as sustainable drug discovery, genetic engineering, personalized medicine, and biological data analysis (including genomics and proteomics). AI enhances production efficiency and promotes environmentally responsible biomanufacturing. The combination of AI and biotechnology global challenges by offering eco-friendly and sustainable solutions such as bioremediation, biodiesel, and bioplastics. Furthermore, AI integration is transforming the discovery of antimicrobial drugs by making the process faster, more accurate, and more efficient compared to traditional methods, which are often slow, costly, and less successful. Modern AI tools such as machine learning, deep learning, computational biology, and big data analysis help overcome these limitations and simplify the identification of effective new medicines. Recent research demonstrates that the convergence of biotechnology and AI is reshaping the landscape of drug discovery. AI is now widely used for virtual screening, de novo drug design, and predicting drug efficacy.

Keywords: Artificial intelligence (AI), Biotechnology, Drug Discovery, Medical Biotechnology.

QUALITY ASSURANCE, GOOD MANUFACTURING PRACTICES (GMP) AND PROCESS OPTIMIZATION

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ABSTRACT

Quality Assurance (QA) and Good Manufacturing Practices (GMP) are the cornerstones of a robust pharmaceutical quality system that ensures the production of safe, efficacious, and reproducible drug products. QA provides the strategic oversight necessary to maintain product integrity through documentation, validation, deviation control, and change management, while GMP operationalizes these standards within manufacturing environments. The integration of QA and GMP establishes a framework for systematic process optimization, driven by scientific principles and risk management approaches. Advanced methodologies such as Quality by Design (QbD), Process Analytical Technology (PAT), and Statistical Process Control (SPC) are employed to identify and monitor critical quality attributes (CQAs) and critical process parameters (CPPs). These tools facilitate data-driven decision-making, minimize process variability, and enhance regulatory compliance. Continuous improvement is achieved through root cause analysis, corrective and preventive action (CAPA), and real-time performance monitoring. A synergistic approach combining QA, GMP, and process optimization not only strengthens process robustness and product quality but also aligns with global regulatory expectations for lifecycle-based pharmaceutical manufacturing.

Keywords: Quality Assurance, GMP, QbD, Process Optimization, PAT, CAPA, CQAs, CPPs.

**ANIMAL MODELS TO AI SIMULATION: REDIFINING ETHICS & EFFICIENCY IN
DRUG DEVELOPMENT**

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ABSTRACT

For decades, drug development has relied on animal models to predict human pharmacological and toxicological responses; yet, evidence shows that these models often fail to predict accurately. Over 90% of drugs that appear safe in animals later fail in human trials due to toxicity or inefficacy. In order to address this gap, the U.S. FDA introduced the Modernization Act 2.0 (2022) and also a Roadmap in April 2025 to further reduce and ultimately phase out animal testing. These have encouraged the adoption of New Approach Methodologies (NAMs) integrating artificial intelligence and human relevant systems, an efficient and ethical alternative for preclinical testing of drugs. AI driven technologies such as Quantitative Structure Activity Relationship (QSAR) models, Physiologically Based Pharmacokinetic (PBPK) simulations, virtual human organs, and deep learning based toxicity predictors, microphysiological systems including organoids and organ-on-a-chip devices, are revolutionizing preclinical research. They not only reduce dependence on animal testing but also enhance prediction of drug safety and optimize dosing strategies. By supporting both ethics and experimental efficiency, AI simulations are redefining the foundations of preclinical testing and paving the way towards a more reliable, humane, and cost effective model of drug development.

Keywords: AI simulations, animal model replacement, New Approach Methodologies (NAMs).

**IDENTIFICATION OF BACILLAMIDE DERIVATIVES FROM INDOLE AND ITS
ANALOGUES USING VIRTUAL SCREENING AND AUTODOCK VISUALIZATION**

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ABSTRACT

These indole-based medicines and their equivalents are frequently utilized as pharmaceuticals. Researchers have studied indole and its analogues in order to develop a treatment for the bacterial diseases that it is designed to treat. The chemical structures were drawn using ChemDraw software, which was then improved for the examination of pharmacokinetic aspects. Using the AutoDock VINA tool, the molecular docking data were then analyzed and visualized in the Discovery studio visualizer. Four compounds with binding affinities ranging from **-6.0** to **-5.6 kcal/mol** from indole-based medicines are found utilizing virtual screening with the Autodock software. These compounds will benefit from more research into their pharmacological properties. Bacillamide B is the most appropriate chemical, with a higher drug-likeness and a total drug score of 0.89. Bacillamide B of Drosophila transmembrane receptor PGRP-LCa) Vander waal bonding with TRP A:434, GLY A:433, LYS A:436, ASP A:415, PRO A:365, GLY A:431, ILE A:370, GLU A:357. Based on the affinity score, it was determined that Bacillamide B had greater pharmacological characteristics and bonding when compared to other compounds from indole-based medicines. Following extensive in silico studies, Bacillamide B from indole-based drugs has been identified as a viable therapy target. In the near future, the reported core will be used as antibiotic treatment.

Keywords: Indole, Residues, Synthesis, Biological activity, Antibiotic, Drugs, Interaction, Binding affinity.

REVOLUTIONIZING DRUG DISCOVERY: INTEGRATING AI, MACHINE LEARNING AND IN SILICO MODELS

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ABSTRACT

Traditional drug discovery methods, though effective, are often slow, expensive, and resource-heavy producing large amounts of chemical and biological waste that raise both ethical and environmental concerns. Amidst this shift, *in silico* drug design emerges as a powerful and green alternative, harnessing computational tools to accelerate the discovery of novel compounds and repurpose existing drugs for new therapeutic uses. This approach aligns closely with the principles of Computer-Aided Drug Design (CADD) and green chemistry, offering a visionary framework that reduces the environmental and logistical burden of laboratory-based research. By integrating advanced computational techniques such as molecular docking, QSAR, MD simulation ADMET modeling - this paradigm limits dependency on traditional synthesis and experimentation. It not only shortens development timelines but also lowers R&D costs. In particular, the fight against AMR benefits greatly from such innovations. Target-based molecular docking enables the rapid identification of drug candidates that can act on resistant microbial enzymes or proteins. The use of AI and ML in these processes enhances precision and efficiency, ultimately supporting faster lead optimization and decision-making. It envisions a pharmaceutical future that is tech-empowered, ethically grounded, and environmentally conscious marking a strategic move toward smarter and more sustainable healthcare solutions.

Keywords: Drug discovery, Molecular docking, Drug design, CADD.

URGENT PUBLIC HEALTH ALERT: INCREASING INCIDENCE OF BRAIN-EATING AMOEBA IN INDIA

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ABSTRACT

The recent rise in cases of *Naegleria fowleri*, commonly known as the “brain-eating amoeba,” has emerged as a serious public health concern in India. This free-living amoeba, typically found in warm freshwater environments such as lakes, ponds, and inadequately chlorinated swimming pools, can cause a rare but fatal brain infection known as Primary Amoebic Meningoencephalitis (PAM). The increasing incidence is particularly alarming in regions experiencing high ambient temperatures and erratic monsoon patterns, which create favorable conditions for the organism’s proliferation. Factors such as inadequate water treatment, the use of contaminated water for domestic or recreational purposes, and lack of public awareness contribute significantly to the growing threat. Symptoms of infection progress rapidly, often leading to death within days if not diagnosed and treated promptly. Current therapeutic options remain limited and largely ineffective once advanced infection occurs, emphasizing the need for prevention and early detection. Strengthening water and sanitation measures, ensuring proper chlorination of public water supplies, and promoting behavioral interventions—such as avoiding water-related activities in potentially contaminated sources—are critical for reducing the risk of infection. This alert underscores the urgent need for coordinated efforts among public health authorities, environmental agencies, and healthcare professionals to enhance surveillance, community education, and diagnostic capabilities. A proactive approach integrating environmental control, clinical vigilance, and community awareness can help mitigate the threat of *Naegleria fowleri* and safeguard public health in India.

Keywords: Brain eating amoeba, *Naegleria fowleri*, Authorities, Healthcare professionals.

**DESIGN, COMPUTATIONAL ANALYSIS AND SYNTHESIS OF GALLIC ACID
INCORPORATED OXADIAZOLE MANNICH BASE COMPOUNDS AS ANTI-
INFLAMMATORY AGENTS**

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ABSTRACT

Inflammation is a complex biological defense mechanism that, when chronic, contributes to diseases such as arthritis, cardiovascular disorders, and cancer. Current anti-inflammatory drugs, including NSAIDs and selective COX-2 inhibitors, often exhibit limitations like gastrointestinal toxicity and narrow target specificity. To address these challenges, the present study aims to design and synthesize novel gallic acid-incorporated oxadiazole Mannich base hybrids as potential multi-target anti-inflammatory agents. Gallic acid, a natural polyphenol with strong antioxidant and anti-inflammatory properties, was combined with the pharmacologically active 1,3,4-oxadiazole nucleus and Mannich base scaffold to improve solubility, stability, and bioavailability. Computational approaches, including molecular docking, ADME prediction, and network pharmacology, were employed to identify and optimize lead molecules with favorable pharmacokinetic and binding characteristics. The most promising compounds will be synthesized and characterized using IR, NMR, and mass spectrometry, followed by biological evaluation through carrageenan-induced paw edema, anti-ulcerogenic, and acute toxicity studies in rats. This integrative design approach is expected to yield hybrid molecules with enhanced therapeutic efficacy, reduced side effects, and improved drug-likeness, providing a promising strategy for the development of next-generation anti-inflammatory agents.

Keywords: Gallic acid, Oxadiazole, Mannich base, Anti-inflammatory, Molecular docking, ADME.

**DEVELOPMENT AND CHARACTERIZATION OF PAZOPANIB HYDROCHLORIDE AND
DOCETAXEL CO-LOADED PLGA NANOPARTICLES FOR THE TREATMENT OF
BRAIN CANCER**

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ABSTRACT

Current standard therapies, including surgical resection, radiotherapy, and temozolomide chemotherapy, offer limited survival benefits due to challenges such as the blood–brain barrier (BBB), tumor heterogeneity, and glioma stem cell regeneration in Glioblastoma multiforme (GBM). Pazopanib hydrochloride, a multi-targeted tyrosine kinase inhibitor acting on VEGFR, PDGFR, and c-kit receptors, exhibits potent antiangiogenic activity but its therapeutic potential in GBM is hindered by poor BBB permeability and active efflux by P-glycoprotein (P-gp) and breast cancer resistance protein (BCRP). To overcome these limitations, the present study aims to develop and characterize Pazopanib Hydrochloride-loaded Poly (lactic-co-glycolic acid) (PLGA) nanoparticles, utilizing D- α -tocopheryl polyethylene glycol 1000 succinate (TPGS) as a surfactant to enhance drug permeation and bioavailability. The nanoparticles will be prepared using the emulsification–solvent evaporation method and characterized for particle size, zeta potential, morphology (SEM/TEM), drug loading, and in-vitro release behavior. The optimized formulation is expected to exhibit enhanced BBB penetration, sustained drug release, improved pharmacokinetic profile, and reduced systemic toxicity. This study proposes a promising nanocarrier-based drug delivery system for effective management of glioblastoma, potentially improving therapeutic efficacy and patient survival.

Keywords: Glioblastoma multiforme (GBM), Pazopanib Hydrochloride, PLGA nanoparticles.

RATIONAL DESIGN OF AMINOPYRIDINE-CONJUGATED HETEROCYCLES AS DUAL GSK-3 β /CK-1 δ INHIBITORS FOR ALZHEIMER’S DISEASE MANAGEMENT

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ABSTRACT

Dual inhibition of Glycogen Synthase Kinase-3 β (GSK-3 β) and Casein Kinase-1 δ (CK-1 δ) offers a promising strategy to modulate tau-related neurodegeneration. In this study, a structure-based drug design approach was employed to identify and design 6-aminopyridine-based scaffolds as potential dual GSK-3 β /CK-1 δ inhibitors. A comprehensive virtual screening of publicly available chemical databases, including MDPI, DrugBank, SPECS, Maybridge, and NCI, was conducted. Molecules were filtered through Lipinski’s rules, removal of reactive functionalities, conformer generation, and molecular docking using crystal structures of GSK-3 β (PDB ID: 5KPM) and CK-1 δ (PDB ID: 5OKT). Key pharmacophoric features identified for dual inhibition included a pyridine core, hydrogen bond donor/acceptor groups at the 6-position, an amide linker, heterocyclic or aryl substituents, and electron-withdrawing phenyl groups enhancing kinase binding. A detailed literature review supported the selection of the pyridine scaffold, revealing its recurrent role in reported GSK-3 β and CK-1 δ inhibitors. Prior studies indicated that substitution at the 3rd and 6th positions of pyridine with heterocycles and amino groups greatly enhances dual kinase affinity. The combined insights from virtual screening and literature evaluation guided the rational design of novel 6-aminopyridine derivatives as potential dual inhibitors for AD therapy.

Keywords: Alzheimer’s disease, Glycogen Synthase Kinase-3 β , Glycogen Synthase Kinase-3 β .

EXPLORATION OF SYNERGISTICALLY ENGINEERED INVASOMES OF FLUCONAZOLE INCORPORATED WITH SAFRANAL AGAINST ONYCHOMYCOSIS FOR ENHANCED TRANSUNGUAL DELIVERY

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ABSTRACT

The preparation of safranal-containing invasomes for fluconazole (FLU-IN) is investigated in the current research work to augment FLU permeation, bioavailability, and solubility via nail for transungual delivery. FLU-IN was prepared utilizing the ‘thin-film hydration process’, and for optimization, ‘Box-Behnken design (BBD)’ was employed. Entrapment efficiency (EE), Polydispersity index (PDI), in vitro FLU release, vesicle size and zeta potential were used to characterize FLU-INopt. Confocal microscopy (CLSM), nail permeation investigation, and Transmission electron microscopy (TEM) were also carried out for further examination. The FLU-INopt demonstrated tiny, spherical, sealed-shape vesicles with a vesicle size of 140.3 nm, PDI of 0.1604, in vitro release of 84.32%, and entrapment efficiency of 74.65%. According to the CLSM investigation, the prepared formulation exhibits better FLU penetration over the nail than FLU suspension gel. Compared to the standard fluconazole marketed gel, the anti-fungal investigation showed that the FLU-IN gel has good anti-fungal potential against *Trichophyton rubrum*, *Nakaseomyces glabrata* and *Candida albicans*. Additional research on Wistar albino rats’ skin irritancy supports the new FLU-IN formulation’s safety for topical treatment. The present study supported the claim that the developed invasomal formulation is a desirable vesicular carrier for FLU transungual delivery for the management of onychomycosis.

Keywords: Fluconazole, Onychomycosis, Invasomes, Box Behnken Design.

EMBRACING ARTIFICIAL INTELLIGENCE IN THE PHARMACEUTICAL WORLD: A CATALYST FOR INTELLIGENT LEARNING, INNOVATIVE RESEARCH, AND SMART MANUFACTURING

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ABSTRACT

The rapid growth of data, increasing complexity of diseases, and the demand for faster drug development have created an urgent need for innovative technologies in the pharmaceutical world. Traditional methods often fall short in handling vast datasets, predicting drug interactions, and personalizing treatment. To overcome these challenges, Artificial Intelligence (AI) has emerged as a transformative technology revolutionizing every aspect of the pharmaceutical sector. From drug discovery to personalized medicine, AI enables faster, data-driven, and more efficient processes.

In pharmaceutical education, AI-driven learning platforms enhance student engagement and understanding through virtual simulations, personalized modules, and interactive tools. In research, machine learning algorithms assist in target identification, molecular modelling, and clinical trial optimization, significantly reducing both time and cost. Within the manufacturing sector, AI ensures smart production through automation, real-time quality monitoring, and strict compliance with Good Manufacturing Practices (GMP), thereby improving accuracy and sustainability. AI also contributes to pharmacovigilance, data management, and patient-specific treatment, supporting the vision of precision medicine. Overall, the integration of AI promotes innovation, efficiency, and intelligent transformation across pharmacy education, research, and industry. This technological advancement marks a shift from traditional methods toward a smarter, data-driven, and more sustainable future in pharmacy.

Keywords: Artificial Intelligence (AI), Smart Pharmacy, Digital Drug Discovery.

ETHNOPHARMACOLOGY OF GINKGO BILOBA IN MANAGEMENT OF NEUROINFLAMMATION-MEDIATED ALZHEIMER'S DISEASE

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ABSTRACT

Traditional medicines, especially herbal remedies, has long been studied for potential benefits in neurodegenerative conditions. Among these, *Ginkgo biloba* has received notable attention. It is important to evaluate the anti-neuroinflammatory mechanisms of *Ginkgo biloba* extracts, particularly EGb761 and ginkgolides, in modulating NLRP3 inflammasome activation and microglial polarization for AD management through comprehensive literature analysis. Studies published between 2018-2025 examined how these compounds influence the microglial activity, cytokine release, and memory/cognitive outcomes in both cell cultures and animal models of neuroinflammation-mediated AD. The findings consistently showed that *Ginkgo biloba* extracts help lower neuroinflammation by suppressing NLRP3 inflammasome activation, reducing the release of pro-inflammatory cytokines such as IL-1 β and IL-18. The findings showed that the microglia have a protective, rather than damaging role. At the cellular level, ginkgolides supported removal of damaged mitochondria, reduced oxidative stress, and modulated NF- κ B signaling pathway. In animal studies, these effects translated into better cognitive performance, reduced A β plaque buildup, less neuronal death, and attenuated tau hyperphosphorylation. Together, these evidences highlight *Ginkgo biloba* as a promising multi-targeted strategy for managing AD-related neuroinflammation, warranting further clinical investigation and studies.

Keywords: *Ginkgo biloba*, NLRP3 inflammasome, neuroinflammation, Alzheimer's disease (AD), ethnopharmacology.

A REVIEW ON FUNGAL INFECTIONS: TYPES, PATHOGENESIS OF FUNGAL INFECTION

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ABSTRACT

Fungi, the plural of fungus, are ubiquitous, found in the air, soil, and on the surfaces of our bodies. Fungal illnesses significantly contribute to morbidity and mortality globally, especially among individuals with immune-compromise or those hospitalized with severe underlying conditions. Fungal infections encompass superficial, cutaneous, subcutaneous, mucosal, and systemic infections, each exhibiting varied degrees of severity. Fungal infections are rarely recognized in their early stages, which exacerbates their severity and complicates treatment protocols. Superficial and subcutaneous fungal infections are typically straightforward to diagnose and effectively treatable. Systemic fungal infections can result from either an opportunistic pathogen infecting a susceptible host or from a more invasive organism indigenous to a particular geographical region. The majority of fungus is benign; nevertheless, certain species can cause illness, particularly in those with weakened immune systems. Certain airborne fungi can induce asthma, allergies, pulmonary infections, and more uncommon illnesses in other bodily regions. The challenging nature of diagnosis and the often confirmation of the causal agent solely at post-mortem render the precise incidence of systemic infections difficult to ascertain. Fungal pathogens utilize many strategies to circumvent the host immune response and exacerbate the severity of illnesses. This review based on various types of fungal infection occurs in human skin.

Keywords: Fungal Infection, Superficial, Cutaneous, Subcutaneous, Mucosal, Systemic Infection.

REDEFINING THERAPY THROUGH BIOLOGY: THE EVOLUTION OF LIVING MEDICINES

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ABSTRACT

The rapid progression of biotechnology has catalyzed a new era in which biological systems themselves serve as therapeutic agents. Living medicines—including cell-based, gene, and RNA-driven therapies—represent a transformative shift from traditional pharmacological treatments toward dynamic, self-regulating, and potentially curative interventions. This paradigm integrates breakthroughs in gene editing, cell engineering, synthetic biology, and immunotherapy, enabling precise manipulation of cellular behavior and correction of underlying genetic or molecular defects. In contrast to conventional drugs that act externally on biological pathways, living medicines function as active, intelligent biological entities, capable of sensing, responding, and adapting within the human body. Their therapeutic potential spans diverse areas—from engineered immune cells revolutionizing oncology, and stem-cell-based tissue regeneration, to genome-edited therapies addressing rare and inherited disorders. Moreover, advances in delivery technologies, scalable biomanufacturing, and evolving regulatory ecosystems are expediting their transition from laboratory innovation to clinical reality. As these next-generation modalities advance, the convergence of biotechnology, digital analytics, and systems biology is reshaping the future of healthcare. Offering personalized, durable, and disease-modifying outcomes, living medicines signify not just the next step in therapeutic innovation, but a fundamental redefinition of medicine itself—where biology becomes the cure.

Keywords: Biotechnology, Biomanufacturing, Modalities.

BUILDING A RESILIENT PHARMA ECOSYSTEM: FROM RAW MATERIALS TO PATIENTS

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ABSTRACT

The global pharmaceutical landscape faces unprecedented challenges—from raw material shortages and geopolitical disruptions to evolving regulatory demands and patient-centric expectations. Building a resilient pharma ecosystem requires an integrated approach that connects all elements of the value chain to ensure continuity, quality, and accessibility of medicines. This paper explores strategic frameworks and technological innovations that strengthen resilience across sourcing, manufacturing, distribution, and patient delivery. Emphasis is placed on supply diversification, digital transformation, data-driven forecasting, and sustainable production practices. The role of Industry 4.0 technologies—such as artificial intelligence, blockchain, and advanced analytics—in enabling real-time visibility and adaptive decision-making is examined. Additionally, policy interventions, regional manufacturing hubs, and cross-sector collaborations are identified as key enablers of systemic resilience. By fostering agility, transparency, and sustainability, the pharmaceutical sector can transition from reactive crisis management to proactive ecosystem resilience—ensuring uninterrupted patient care even amid global uncertainties.

Keywords: Pharmaceutical resilience, Supply chain, Digital transformation, Sustainability, Patient-centric healthcare.

DESIGNING A UNIFIED REGULATORY MODEL FOR BIOLOGICS AND BIOSIMILARS: TOWARD HARMONIZED STANDARDS IN QUALITY, SAFETY, AND EFFICACY

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ABSTRACT

The worldwide expansion of biologics and biosimilars has transformed therapeutic environment, offering new opportunities for patient access and healthcare sustainability. However, disparate regulatory frameworks across regions which is marked by differences in exclusivity periods, patent linkage, and approval pathways have created significant barriers to efficient biosimilar development and market entry. This study emphasis on the current evidence on the design of a unified regulatory model for biologics and biosimilars, emphasizing the need for harmonized standards in quality, safety, and efficacy. Drawing on comparative analyses of the India, China, European Union, United States, and emerging markets, the report highlights the impact of legal, technical, and scientific challenges on regulatory convergence. The totality-of-evidence approach, which prioritizes advanced analytical and functional assays over redundant clinical trials, emerges as a cornerstone for regulatory harmonization. Case studies from the US and EU illustrate the consequences of litigation delays and regulatory fragmentation, while international collaborations and stepwise models proposed for BRICS-TM countries demonstrate pathways toward alignment. The study concludes that a unified, science-based regulatory framework supported by robust post-marketing pharmacovigilance and real-world evidence which can accelerate biosimilar access, reduce costs, and foster innovation. Policy recommendations focus on advancing regulatory convergence, balancing innovation incentives, and enhancing stakeholder engagement to ensure sustainable growth in the global biosimilars market.

Keywords: Biologics, Biosimilars, Regulatory harmonization, Totality-of-evidence, Quality standards, Pharmacovigilance, Market access.

ROLE OF NUTRACEUTICAL IN VARIOUS DISEASE

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ABSTRACT

The concept of "nutraceuticals," which combines the words "nutrition" and "pharmaceutical," refers to a rapidly growing field in contemporary preventive medicine and therapeutic management because of its special function as food-derived nutrients that provide both physiological and medical advantages. The potential of nutraceuticals for both preventing and treating chronic diseases such as obesity, diabetes, cancer, arthritis, neurological conditions, and cardiovascular ailments has prompted a rise in scientific interest. This effect is supported by real-world facts. For example, epidemiological trends show that individuals with increased omega-3 intake have lower cardiovascular risk, while curcumin has shown significant anti-inflammatory effects in cancer and arthritis patients. Due to consumer preferences for safe, herbal, and multi-targeted treatments as well as the expensive prices and adverse effects of traditional medications, the worldwide nutraceuticals market is expanding exponentially. Raising bioavailability, individualized supplementation, and incorporating nutraceuticals into combinational therapy for complicated and age-related disorders are the main areas of developing study. With developments in modifying nutraceutical formulations to biology, lifestyle, and regional dietary demands and bolstering interdisciplinary collaboration for clinical validation, the sector promises to transform preventive medicine in the future. Nutraceuticals have the potential to significantly impact healthcare in the future by lowering the burden of chronic diseases and enhancing quality of life for people of all ages as scientific knowledge advances.

Keywords: Nutraceuticals, Chronic Disease, Inflammation, Antioxidants, Preventive Therapy.

NANOCOMPOSITE-BASED TARGETED DRUG DELIVERY SYSTEMS FOR THE MANAGEMENT OF CHRONIC INFLAMMATORY DISEASES

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ABSTRACT

Conventional anti-inflammatory therapies, though effective, often lack specificity, leading to systemic side effects and reduced therapeutic efficiency. Targeted drug delivery represents a major advancement in this field by enabling site-specific action, thereby enhancing efficacy and minimizing adverse reactions. Nanocomposite-based delivery systems have emerged as promising platforms for precision therapy. These systems utilize mechanisms such as ligand-mediated targeting of overexpressed receptors on inflammatory cells, pH-sensitive release, and reactive oxygen species (ROS)-responsive drug activation within inflamed microenvironments. By engineering nanoparticles to carry and release anti-inflammatory agents at the molecular level, these approaches can modulate both innate and adaptive immune responses more effectively. A variety of nanoformulation strategies—such as liposomes, polymeric nanoparticles, dendrimers, and inorganic nanocomposites—have been explored to achieve controlled and sustained drug release while enhancing tissue penetration and therapeutic retention. Research indicates that corticosteroids, non-steroidal anti-inflammatory drugs (NSAIDs), and biologics can be successfully encapsulated within these nanocarriers to improve drug bioavailability and inflammation control. The application of nanocomposite technology in targeted anti-inflammatory therapy holds great promise for improving clinical outcomes and quality of life in patients with chronic inflammatory diseases.

Keywords: Drug Delivery, Inflammatory regulators, Cytokinin, Nanocomposite, Targeted Delivery.

QUALITY ASSURANCE, GOOD MANUFACTURING PRACTICES, AND PROCESS OPTIMIZATION IN THE PHARMACEUTICAL INDUSTRY

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ABSTRACT

Quality Assurance (QA) and Good Manufacturing Practices (GMP) are fundamental pillars of pharmaceutical manufacturing, ensuring the consistent production of safe, effective, and high-quality medicinal products. QA provides a comprehensive framework encompassing all planned and systematic activities designed to maintain quality throughout the product lifecycle. GMP establishes the operational and regulatory foundation for manufacturing processes, emphasizing documentation, equipment qualification, personnel competency, and environmental control to guarantee product integrity and compliance. Process optimization complements QA and GMP by employing scientific and data-driven methodologies such as Quality by Design (QbD), Six Sigma, and Process Analytical Technology (PAT). These approaches enable real-time process monitoring, reduction of variability, and continuous improvement in manufacturing efficiency. The integration of process optimization with quality management systems fosters a proactive culture of quality, minimizes deviations, and enhances regulatory confidence. Collectively, QA, GMP, and process optimization establish a synergistic framework that drives excellence in pharmaceutical production. Their alignment ensures not only regulatory compliance but also promotes innovation, cost-effectiveness, and sustainable development within the pharmaceutical sector—ultimately safeguarding patient health and advancing global standards of therapeutic quality.

Keywords: Quality Assurance, Good Manufacturing Practices, Process Optimization.

MPOX OUTBREAKS: GLOBAL EPIDEMIOLOGY AND PUBLIC HEALTH CHALLENGES

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ABSTRACT: Mpox, formerly known as Monkeypox, is a zoonotic viral disease which is caused by the monkeypox virus (MPXV), which is an enveloped double-stranded DNA virus of the Orthopoxvirus genus in the Poxviridae family related to variola and vaccinia viruses. Initially, this disease was detected in 1958 and became a global health concern with outbreaks in more than 120 countries. Mpox disease is transmitted through animal-to-human contact, direct human-to-human contact, and widely spreads among humans through close and sexual interactions. Most of the children, the immunocompromised population, and pregnant women cases were registered. Recently, Clade Ib has become a serious and perhaps lethal menace in the African region. Innovations such as third-generation vaccines (MVA-BN, LC16m8) and antivirals (e.g., tecovirimat) present promising control options; however, their availability is inconsistent. Effective epidemic control goes beyond scientific interventions and necessitates equitable global health preparedness, stigma reduction, and public awareness. An urgent need for coordinating surveillance and vaccination is needed to stop the Mpox virus from becoming a persistent threat.

Keywords: Mpox, Orthopoxvirus, Zoonotic, Clade Ib, Monkeypox.

5D Printing: A Next-Generation Paradigm for Targeted Gastrointestinal Drug Delivery

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ABSTRACT

The advent of 5D printing has introduced a transformative paradigm in advanced drug delivery systems, especially for site specific and stimuli responsive gastrointestinal (GI) targeting. Unlike conventional 3D and 4D printing technologies, 5D printing integrates multi directional fabrication with dynamic, adaptive material properties, enabling the creation of functionally graded and geometrically complex oral dosage forms. This review explores the principles, materials and design strategies underpinning 5D printing for gastro targeted therapeutics. Emphasis is placed on smart polymers, shape- memory biomaterials, and bio-inks responsive to pH, enzymes and redox conditions within the GI tract. The paper discusses the capacity of 5D printing to achieve personalized pharmacokinetic profiles, controlled release, and precision targeting to gastric or intestinal regions. Furthermore, the integration of computational modelling, artificial intelligence, and simulation- based optimization in five different printing is analyzed for its role in enhancing predictive formulation design. The review concludes by outlining the current challenges- such as scalability, regulatory validation, and biocompatibility and future prospects for clinical translation of 5D printed gastro-retentive and colon-targeted systems. Overall, 5D printing represents a frontier technology capable of bridging precision engineering and pharmaceutical sciences for next generation oral drug delivery platforms.

Keywords: 5D printing, gastro-targeted drug delivery, smart polymers, additive manufacturing, personalized medicine, responsive biomaterials.

PREDICTIVE MODELING AND DEEP LEARNING FOR PERSONALIZED ANTI-ASTHMATIC THERAPY

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ABSTRACT

Conventional treatment strategies often fail to deliver optimal outcomes due to differences in genetic makeup, environmental triggers, and patient-specific factors. The emergence of Artificial Intelligence (AI), particularly predictive modeling and deep learning, has introduced transformative opportunities for precision-based asthma management. Predictive modeling employs advanced computational algorithms to analyze clinical, biochemical, genomic, and environmental datasets to forecast disease exacerbations, treatment efficacy, and patient outcomes. Deep learning, through the use of multilayer neural networks, identifies complex, non-linear associations within high-dimensional biomedical data, facilitating accurate classification of asthma phenotypes and enabling individualized therapy selection. These intelligent frameworks empower clinicians to design personalized therapeutic regimens, stratify patient risk levels, and monitor treatment adherence through data-driven decision-making tools. Furthermore, AI-integrated smart healthcare systems such as digital inhalers, wearable biosensors, and mobile health applications enable real-time monitoring, early warning alerts, and adaptive feedback mechanisms that enhance patient compliance and quality of life. Collectively, predictive modeling and deep learning signify a paradigm shift from conventional symptom-based management to an evidence-driven, personalized therapeutic approach. Their integration in anti-asthmatic drug therapy not only optimizes pharmacological effectiveness but also paves the way for truly intelligent, patient-centered respiratory care.

Keywords: Predictive modeling, Deep learning, Personalized therapy, Asthma management.

AI MODEL-BASED SCREENING AND DETECTION OF CERVICAL CANCER

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ABSTRACT

Cervical cancer remains one of the leading causes of cancer-related morbidity and mortality among women worldwide, particularly in low- and middle-income countries. Early detection through effective screening significantly improves survival outcomes; however, conventional diagnostic techniques such as Pap smears, HPV testing, and colposcopy are often limited by human subjectivity, high costs, and inadequate accessibility in resource-constrained settings. The advent of Artificial Intelligence (AI) and machine learning-based models has revolutionized cervical cancer screening by enabling automated, accurate, and rapid detection of precancerous and cancerous lesions. AI algorithms, particularly deep learning frameworks such as convolutional neural networks (CNNs), can analyze cytology images, histopathological slides, and colposcopic photographs to identify subtle morphological changes indicative of malignancy. Predictive models trained on large-scale datasets enhance diagnostic precision, reduce inter-observer variability, and minimize false negatives. Furthermore, AI-assisted screening platforms integrate clinical, demographic, and molecular biomarker data to stratify patient risk and predict disease progression. The deployment of AI-driven mobile and cloud-based diagnostic systems has expanded access to early screening in remote and underserved areas, thereby supporting large-scale public health initiatives. Ultimately, AI model-based screening and detection of cervical cancer offer a transformative approach toward personalized, cost-effective, and timely healthcare delivery. This convergence of data science and medical imaging not only optimizes diagnostic workflows but also holds the potential to achieve global cervical cancer elimination through early intervention and precision diagnostics.

Keywords: Artificial Intelligence, Deep Learning, Cervical Cancer, Predictive Screening.

AI-DRIVEN DIGITAL REVOLUTION IN HEALTHCARE AND PHARMACEUTICALS

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ABSTRACT

AI-driven systems, utilizing machine learning algorithms, particularly deep learning techniques, can analyse vast quantities of medical images, identifying minute details. In drug discovery, AI accelerates Research and Development (R&D) by rapidly analyzing extensive chemical and biological datasets. It achieves this by identifying novel drug candidates, forecasting their efficacy and safety profiles, and employing generative models to formulate synthetically feasible molecules. Furthermore, AI is central to precision and personalized medicine. It interprets genomic sequencing data via pharmacogenomics to customize and refine patient treatment regimens. Sophisticated applications, such as computer vision, also play a vital role, improving both the accuracy of diagnostic imaging and automated quality control within drug manufacturing. Moreover, AI supports Clinical Decision Support (CDS) systems by integrating Electronic Health Records (EHRs) with real-time data from wearable devices. This integration allows for the prediction of adverse events and the optimization of medication management. To realize the full therapeutic and operational potential of these advancements, a major adjustment in professional training is necessary. Pharmacists and healthcare providers must incorporate skills in health informatics, data science, and practical AI application into their curricula. This critical step ensures that AI innovations are successfully translated into impactful, patient-centric clinical practice.

Keywords: Artificial Intelligence, Clinical Decision Support system, Health Informatics.

**EXTRACELLULAR VESICLE BASED TISSUE ENGINEERING IN
NEURODEGENERATIVE DISEASES**

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ABSTRACT

Neurodegenerative diseases such as Alzheimer’s, Parkinson’s, and amyotrophic lateral sclerosis are characterized by progressive neuronal loss and limited regenerative potential of the central nervous system, posing major challenges to current therapeutic approaches. Conventional treatments often fail to achieve effective neuronal repair due to inadequate drug delivery across the blood–brain barrier and insufficient integration with host tissues. In recent years, extracellular vesicles (EVs)—including exosomes, microvesicles, and apoptotic bodies—have gained attention as promising bioactive mediators in tissue engineering and regenerative medicine. These nanosized vesicles, secreted by almost all cell types, facilitate intercellular communication through the transfer of proteins, lipids, and nucleic acids, thereby influencing neuronal survival, differentiation, and synaptic plasticity. Current insights suggest that EVs derived from mesenchymal stem cells, neural stem cells, and induced pluripotent stem cells can modulate neuroinflammation, promote angiogenesis, and stimulate neurogenesis in damaged brain regions. Techniques for EV isolation, such as differential ultracentrifugation, polymer precipitation, size exclusion chromatography, and microfluidic-based methods, have been developed to obtain pure and functional vesicle populations suitable for therapeutic use. In tissue engineering, EVs are being integrated into hydrogels, scaffolds, and biomimetic matrices to create EV-enriched systems that support neuronal repair, axonal growth, and functional recovery. Their unique properties, including nanoscale size, biocompatibility, and ability to cross the blood–brain barrier, make them valuable vehicles for targeted drug delivery in neurodegenerative disorders. Despite these advantages, challenges remain related to low yield, heterogeneity, limited stability, and difficulties in large-scale production and standardization. Overall, EV-based tissue engineering represents a cutting-edge approach that merges regenerative biology with nanotechnology, offering new hope for restoring neural function in neurodegenerative diseases through precise, cell-free therapeutic strategies.

Keywords: Extracellular vesicles, Tissue engineering, Neurodegenerative diseases, Exosomes, Neural regeneration, Stem cell therapy, Drug delivery, Blood–brain barrier, Neuroinflammation, Regenerative medicine.

**A GLOBAL PERSPECTIVE ON ACCELERATED VACCINE TESTING: ENSURING
GOOD HEALTH AND EQUALITY THROUGH REGULATORY HARMONIZATION**

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ABSTRACT

Vaccines are among the most powerful public health tools, contributing significantly to global disease prevention and improved life expectancy. However, the emergence of pandemics such as COVID-19 has underscored the need for accelerated vaccine testing while ensuring safety, efficacy, and equity across populations. Accelerated vaccine development requires a delicate balance between scientific rigor and rapid response, emphasizing the importance of regulatory harmonization among global health authorities. Traditionally, vaccine development proceeds through preclinical studies, followed by phased clinical trials (Phase I–III) and post-marketing surveillance (Phase IV). Each phase assesses safety, immunogenicity, and long-term effectiveness under strict regulatory oversight. Regulatory authorities such as the WHO, US FDA, EMA, and India’s CDSCO play a crucial role in approving, monitoring, and harmonizing vaccine standards across regions. Based on regulatory capacity, countries are classified into Tier 1, Tier 2, and Tier 3 systems. Tier 1 regulators, like the US FDA and EMA, have robust frameworks for evaluation and global recognition; Tier 2 authorities exhibit growing regulatory maturity with partial alignment to international norms; and Tier 3 systems, often in developing nations, face challenges in infrastructure, workforce, and data transparency. Comparative analysis reveals that harmonization of standards across these tiers can significantly reduce delays, prevent duplication of trials, and enhance equitable vaccine distribution. Accelerated testing, when coupled with global collaboration and transparent data sharing, can promote timely access to vaccines, ensuring good health and social equality. However, limitations include ethical concerns, uneven regulatory capacity, and the risk of compromising safety for speed. In conclusion, a globally harmonized regulatory ecosystem is vital for sustainable vaccine innovation, enabling rapid yet safe deployment of vaccines to protect all populations equitably.

Keywords: Vaccine development, Regulatory harmonization, Accelerated testing, Public health.

CROSS-BORDER SYNERGY IN FAST-TRACK VACCINE DEVELOPMENT

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ABSTRACT

Global health challenges such as Ebola, Zika, H1N1 influenza, and most recently COVID-19, have demonstrated the critical importance of accelerating vaccine development through international collaboration. Fast-track vaccine development represents an integrated approach that unites scientific innovation, regulatory flexibility, and ethical oversight to ensure timely responses to emerging infectious diseases. This approach emphasizes cross-border synergy among governments, global health agencies, and research organizations to reduce delays while maintaining safety and efficacy standards. The vaccine development process traditionally includes preclinical studies, clinical Phases I to III, and post-marketing Phase IV evaluations, each stage requiring close regulatory supervision to ensure public trust. Regulatory authorities such as the World Health Organization (WHO), the U.S. Food and Drug Administration (FDA), the European Medicines Agency (EMA), and India's Central Drugs Standard Control Organization (CDSCO) play pivotal roles in establishing global benchmarks and enabling collaborative review mechanisms. Countries are often classified into Tier 1, Tier 2, and Tier 3 regulatory systems based on the maturity of their oversight infrastructure. Tier 1 agencies maintain globally recognized standards with robust evaluation frameworks; Tier 2 regulators show partial convergence with international norms; and Tier 3 authorities, typically in developing nations, face challenges related to limited expertise, infrastructure, and policy coherence. Comparative analysis among these tiers highlights that harmonization of regulatory processes can prevent redundancy, enhance data sharing, and facilitate equitable vaccine access worldwide. While fast-tracking promotes rapid public health responses, challenges such as ethical constraints, uneven regulatory capacity, and safety monitoring limitations must be addressed. In conclusion, strengthening cross-border synergy through regulatory harmonization is vital to achieving faster, safer, and more equitable vaccine deployment for the global population.

Keywords: Fast-track vaccine development, Regulatory harmonization, Global collaboration, Vaccine equity, Infectious diseases, Regulatory tiers, WHO, FDA, EMA, CDSCO, Public health.

**GREEN SYNTHESIS OF SILVER NANOPARTICLES WITH MICROWAVE ASSISTANCE
USING A STANDARDIZED EXTRACT OF CUSTARD APPLE FRUIT PEEL: SYNTHESIS,
EVALUATION, ANTIBACTERIAL AND CYTOTOXIC INVESTIGATIONS**

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ABSTRACT

Throughout history, silver has been used to treat diseases, stop food from spoiling, and encourage wound healing by preventing bacterial development. There are several ways to make silver nanoparticles (AgNPs), but plant extract-based approaches are the most often used. AgNPs are widely used in environmental cleanup, agriculture, pharmaceuticals, cosmetics, and medicine. In this study, a standardized extract of custard apple fruit peel (*Annona squamosa* L.) was used for the microwave-assisted green synthesis of Silver nanoparticles. This environmentally friendly process offers a biocompatible and sustainable substitute for traditional chemical synthesis techniques. The antibacterial activity of the produced AgNPs against different microorganisms was evaluated after they were described using the proper methods. Furthermore, *in vitro* cytotoxic activity of AgNPs was also performed using seed germination method.

Keywords: Silver nanoparticles, Custard Apple, Antimicrobial studies, Green synthesis.

HERBAL MEDICINES AS ADJUNCTS IN CANCER TREATMENT

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ABSTRACT

When used in combination, herbal medicines often demonstrate synergistic effects with standard treatments. Such combinations can potentiate anticancer efficacy, overcome drug resistance, and reduce the dosage requirements of chemotherapeutic agents, thereby minimizing toxicity. For instance, curcumin has been shown to enhance the cytotoxic effects of paclitaxel in resistant breast cancer cells, while green tea polyphenols have been observed to amplify the antitumor activity of cisplatin in lung cancer models. However, despite these promising results, safety and toxicological evaluation remain crucial. While many herbal products are perceived as safe, concerns regarding standardization, bioavailability, and herb–drug interactions must be carefully addressed to prevent adverse outcomes. The use of herbal medicines in oncology presents both limitations and advantages. Challenges include variability in plant composition, lack of large-scale clinical evidence, and regulatory inconsistencies across regions. Nonetheless, their advantages—such as lower toxicity, cost-effectiveness, and holistic action—make them appealing candidates for integrative cancer therapy. Looking ahead, advances in phytochemical analysis, nanotechnology-based delivery systems, and pharmacogenomic profiling are expected to enhance the clinical applicability and precision of herbal formulations. In conclusion, herbal medicines hold significant promise as adjuncts to conventional cancer therapies by offering multi-targeted efficacy, synergistic potential, and improved tolerability. Continued research through rigorous preclinical and clinical studies is essential to establish standardized formulations, ensure safety, and enable their effective integration into evidence-based oncological practice.

Keywords: Herbal Medicine, Adjunct Therapy, Cancer Treatment, Synergistic Effect.

BIOTECHNOLOGICAL APPROACHES FOR SUSTAINABLE PHYTOMEDICINE

PRODUCTION

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ABSTRACT

The growing global demand for plant-derived therapeutic compounds has intensified the need for sustainable and efficient methods of phytomedicine production. Conventional cultivation and extraction of medicinal plants are often limited by environmental factors, overharvesting, and low yields of bioactive metabolites. Biotechnological interventions have emerged as powerful alternatives to traditional methods, offering controlled, scalable, and eco-friendly strategies for the consistent production of high-quality phytochemicals. Plant biotechnology employs several modern tools—such as plant tissue culture, genetic engineering, metabolic pathway manipulation, and synthetic biology—to enhance the biosynthesis of valuable secondary metabolites. Techniques like callus culture, cell suspension culture, and hairy root culture enable the continuous and stable production of phytochemicals under aseptic and regulated conditions. Furthermore, the application of elicitors, precursor feeding, and metabolic engineering can significantly boost the yield of key bioactive compounds. Advances in omics technologies and CRISPR/Cas-based genome editing have further opened new avenues for targeted modification of metabolic pathways to optimize phytochemical production. Integration of nanobiotechnology and bioreactor-based systems has enhanced the scalability and commercial feasibility of in vitro phytomedicine production. These approaches minimize the dependency on natural plant resources, thereby promoting biodiversity conservation and environmental sustainability. However, challenges such as high production costs, regulatory complexities, and limited public acceptance need to be addressed for large-scale industrial application. Overall, biotechnological innovations represent a sustainable and future-oriented solution for consistent phytomedicine supply, ensuring quality, safety, and efficacy while preserving natural resources. Continued advancements in genetic, metabolic, and process engineering will play a pivotal role in establishing biotechnology as the cornerstone of modern phytopharmaceutical development.

Keywords: Biotechnology, phytomedicine, sustainable production, tissue culture, metabolic engineering, synthetic biology, elicitation, hairy root culture, nanobiotechnology, CRISPR/Cas, secondary metabolites.

THE CRISPR TECHNIQUE – A NEW ERA IN BIOTECHNOLOGY

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ABSTRACT

The advent of the Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) technology has revolutionized the field of biotechnology by providing a precise, efficient, and cost-effective method for genome editing. Originating from a natural bacterial defense mechanism against viruses, the CRISPR-Cas system has been adapted as a versatile molecular tool for targeted genetic manipulation across diverse organisms. CRISPR technology represents a breakthrough in gene editing, enabling scientists to modify, delete, or insert specific DNA sequences with unparalleled accuracy. Its discovery has opened new frontiers in molecular biology, medicine, agriculture, and environmental sciences, offering solutions that were once thought to be impossible. The CRISPR-Cas9 system works through two key components: a guide RNA (gRNA) and the Cas9 endonuclease. The gRNA directs Cas9 to the target DNA sequence through complementary base pairing, after which Cas9 introduces a double-stranded break at the specific site. This break is then repaired by the cell's natural DNA repair mechanisms—either through non-homologous end joining (NHEJ) or homology-directed repair (HDR)—allowing insertion, deletion, or correction of genetic material. CRISPR has diverse applications ranging from gene therapy for hereditary diseases, crop improvement for better yield and stress tolerance, and development of disease-resistant livestock to functional genomics and synthetic biology. It is also being explored for eradicating vector-borne diseases by editing mosquito genomes and for advancing personalized medicine through targeted genetic correction. Despite its promise, CRISPR faces several challenges, including off-target effects, ethical concerns related to germline editing, and limitations in delivery systems. Additionally, regulatory hurdles and public apprehension pose significant barriers to clinical and agricultural adoption. The future of CRISPR technology lies in improving precision, minimizing off-target modifications, and developing safer delivery systems. Emerging variants like CRISPR-Cas12, Cas13, and base or prime editing systems are expanding its versatility and accuracy. As research advances, CRISPR is poised to redefine modern biotechnology, driving innovations in healthcare, agriculture, and environmental sustainability.

Keywords: CRISPR, Cas9, gene editing, biotechnology, genome engineering, gene therapy, off-target effects, precision medicine, synthetic biology, genetic modification.

A PERVASIVE STUDY ON ANABOLIC STEROIDS: BOON OR BANE

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ABSTRACT

Anabolic steroids, synthetic derivatives of testosterone, have long been recognized for their potent ability to enhance muscle mass, strength, and athletic performance. Initially developed for therapeutic purposes—such as treating hormonal imbalances, muscle-wasting diseases, and delayed puberty—their misuse in sports and bodybuilding has turned them into a major public health concern. This study provides a comprehensive overview of the pharmacological basis, physiological effects, therapeutic applications, and detrimental consequences associated with anabolic steroid use. Anabolic steroids function by promoting protein synthesis and nitrogen retention within muscle cells, leading to increased muscle hypertrophy and improved recovery. Clinically, they have been beneficial in treating conditions like hypogonadism, severe burns, osteoporosis, and certain anemias. However, when used in supraphysiological doses for non-medical purposes, they induce a cascade of harmful effects on multiple organ systems. Cardiovascular complications such as hypertension, dyslipidemia, and myocardial damage; hepatic disorders including cholestasis and liver tumors; and neuropsychiatric issues like aggression, depression, and addiction are among the most prevalent adverse outcomes. In addition, hormonal imbalances can lead to infertility, gynecomastia in men, and menstrual irregularities in women. The ethical and legal dimensions of anabolic steroid use further complicate their status. While controlled and medically supervised administration can be beneficial, illicit use poses serious health risks and undermines the integrity of competitive sports. Future research is directed toward developing safer anabolic agents or selective androgen receptor modulators (SARMs) that retain therapeutic benefits while minimizing toxicity. In conclusion, anabolic steroids can indeed be both a boon and a bane—therapeutically valuable when used judiciously, yet potentially devastating when abused. Awareness, regulation, and continued scientific inquiry are crucial for balancing their medical utility with the prevention of misuse.

Keywords: Anabolic steroids, testosterone, performance enhancement, muscle hypertrophy, side effects, SARMs, drug abuse, therapeutic applications, hormonal imbalance, sports ethics.

NANO-ENABLED RUTIN DELIVERY SYSTEMS: ENHANCING BIOAVAILABILITY AND PHARMACODYNAMIC EFFICACY FOR DENTAL CARIES

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ABSTRACT

One of the most common oral disorders in the world, dental caries is mostly brought on by the demineralization of enamel and dentin because of the production of acids by cariogenic bacteria like *Streptococcus mutans*. Natural flavonoids have drawn a lot of attention nowadays because of their antioxidant and antibacterial qualities. A naturally occurring bioflavonoid present in tea, wheat, and citrus fruits, rutin (quercetin-3-rutinoside) is showing encouraging therapeutic promise in the treatment of problems with oral health. Rutin (quercetin-3-rutinoside), a flavonol glycoside, has recently gained renewed attention due to advances in mechanistic elucidation and drug-delivery enhancements. The current study aims to determine how rutin's nano based drug delivery system shows antibacterial, anti-inflammatory, and enamel-protective properties contribute to the prevention and management of dental caries. Its remineralizing and calcium-chelating properties also help to strengthen enamel. Therefore, rutin is a new, biocompatible, plant-based medicinal choice for long-term use in oral healthcare. Although rutin possesses therapeutic potential for managing oral infection and oxidative stress, its clinical application is limited by poor aqueous solubility, rapid oral clearance, and weak enamel penetration. Advances in nanotechnology have enabled the development of rutin nanoformulations that enhance its solubility, bioavailability, mucoadhesion, and antibacterial efficacy. This review summarizes the molecular mechanisms, recent experimental findings, formulation strategies, and future clinical prospects of nano-enabled rutin systems for dental caries prevention and treatment.

Keywords: Rutin, dental caries, *Streptococcus mutans*, biofilm inhibition, antioxidant, dental gel.

DECODING PSORIASIS THROUGH ARTIFICIAL INTELLIGENCE: A REVIEW OF PATHOPHYSIOLOGICAL INSIGHTS AND NOVEL THERAPEUTIC APPROACHES

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ABSTRACT

Psoriasis is a chronic, immune-mediated inflammatory skin disorder characterized by erythematous, scaly plaques that commonly affect the scalp, elbows, knees, and lower back. Affecting over 125 million people worldwide, its pathogenesis arises from a complex interplay of genetic susceptibility - particularly HLA-Cw6 and PSORS1 - and environmental factors. Central to disease progression is dysregulation of the IL-23/Th17 signaling axis, driven by dendritic cells, Th17 cells, and pro-inflammatory mediators such as IL-17, IL-23, TNF- α , and antimicrobial peptides, resulting in keratinocyte hyperproliferation and chronic inflammation. Recent therapeutic advances have focused on selectively targeting these immune pathways through biologics and small-molecule inhibitors, including IL-17 blockers (DC-806, DC-853), IL-23 inhibitors (JNJ-2113), and JAK/TYK2 inhibitors (Tofacitinib, Zascotinib, Lomedecitinib). Novel agents such as S1P receptor modulators, AhR agonists, and ROR γ t inhibitors are demonstrating encouraging efficacy and safety outcomes. Artificial intelligence (AI) is reshaping psoriasis research by integrating genomic, transcriptomic, and imaging data to elucidate disease mechanisms, identify novel biomarkers, and predict therapeutic response. This review highlights the growing role of AI in understanding psoriasis pathophysiology and its potential to guide the development of next-generation targeted therapies, paving the way toward precision dermatology and improved patient outcomes.

Keywords: Psoriasis; Artificial Intelligence; Machine Learning; IL-23/Th17 Axis.

LIC25-O-164

**AI FOR eCTD/DOSSIER AUTOMATION: REGULATORY ACCEPTANCE, PITFALLS,
AND VALIDATION**

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ABSTRACT

Preparing and compiling dossiers in the electronic Common Technical Document (eCTD) format is a crucial but time-consuming task in regulatory affairs. The growing use of Artificial Intelligence (AI) and Natural Language Processing (NLP) now offers opportunities to automate many of these manual processes. AI-driven tools can generate summaries, organize documents into eCTD modules, tag metadata, and check consistency across regional submissions. Such automation reduces human error and improves efficiency in regulatory workflows. Despite these benefits, the acceptance of AI in dossier preparation remains limited. Regulatory authorities, including the U.S. FDA and the European Medicines Agency (EMA), emphasize that AI-generated outputs must comply with principles of transparency, traceability, and data integrity. They expect companies to validate AI tools, maintain complete audit trails, and ensure human oversight of all automated processes. Key challenges include the risk of inaccurate content generation, lack of explainability, and non-compliance with GxP and 21 CFR Part 11 requirements. This presentation discusses current global perspectives on AI-assisted eCTD compilation, highlighting regulatory expectations and potential pitfalls. It also proposes a practical validation roadmap to help organizations adopt AI responsibly—balancing innovation with compliance and maintaining confidence in automated submissions.

Keywords: Artificial Intelligence, eCTD, Regulatory Affairs, Validation, Compliance, Automation.

LIC25-O-165

AI IN HEALTHCARE: REVOLUTIONIZING DIAGNOSIS AND THERAPY

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing healthcare through its integration into various domains, significantly enhancing the efficiency, accuracy, and effectiveness of medical practices. It is changing healthcare by making diagnosis and treatment faster and more accurate. With the help of machine learning and data analysis, AI can study medical images, patient records, and test results to detect diseases early. It also helps doctors create better and more personalized treatment plans. In hospitals, AI improves surgery, supports drug discovery, and allows remote patient monitoring. Although there are challenges like data privacy and ethics, AI continues to make healthcare smarter, more efficient, and patient-friendly. AI's role in drug discovery and development is accelerating the creation of new therapies by optimizing predictive modeling, drug design, and clinical trials, thus reducing costs and speeding up the development process. And also applications in robotic surgery, remote patient monitoring are improving efficiency and accessibility in healthcare systems. Despite challenges related to data privacy, ethics, and regulation, AI continues to redefine modern medicine toward a more precise and patient-centered future. AI to revolutionize healthcare and improve patient outcomes while emphasizing the need for responsible implementation and ongoing evaluation.

Keywords: Artificial Intelligence, Healthcare, Diagnosis, Therapy, Machine Learning, Deep Learning, Precision Medicine, Data Privacy.

BIOPOLYMERS AS SUSTAINABLE PLATFORMS FOR ADVANCED DRUG DELIVERY AND BIOMEDICAL APPLICATIONS

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ABSTRACT

Biopolymers have garnered significant attention as sustainable and multifunctional materials for drug delivery, biomedical, and tissue engineering applications due to their renewable origin, biocompatibility, and environmental safety. Derived from natural sources such as plants, animals, and microorganisms, biopolymers including polysaccharides, proteins, and polyesters exhibit tunable physicochemical properties that can be engineered for desired therapeutic outcomes. Their ability to form hydrogels, nanoparticles, microspheres, films, and scaffolds allows precise regulation of drug release kinetics, targeting, and degradation behavior. Recently, advancements in molecular modification, blending, and crosslinking have extended their versatility, enabling the development of responsive and multifunctional delivery systems. Chitosan, alginate, and gelatin-based matrices are explored for mucoadhesive and injectable formulations, while polylactic acid (PLA) and polyhydroxyalkanoates (PHA) offer controlled degradation and mechanical strength in implantable devices. Incorporation of nanotechnology and green chemistry principles, such as ionic gelation, enzymatic polymerization, and solvent-free synthesis, further enhances their therapeutic performance and scalability. Moreover, bio-based and hybrid biopolymer composites are being investigated for co-delivery of drugs, genes, and bioactives with improved encapsulation efficiency and site-specific release. The integration of physicochemical tailoring, computational design, and 3D-bioprinting technologies has opened new avenues for translational research in personalized medicine and regenerative therapies. Biopolymers represent a pivotal class of next-generation materials offering an eco-friendly and adaptable platform to design efficient, safe, and targeted drug delivery systems with broad clinical potential.

Keywords: Biopolymers, sustainability, drug delivery, biomedical applications.

HOW AI IS CHANGING THE FUTURE OF THE PHARMA WORLD

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ABSTRACT

In drug discovery, AI algorithms analyze massive biological and chemical datasets to identify potential lead molecules, predict drug-target interactions, and optimize compound design with remarkable precision. In clinical development, predictive modeling and machine learning assist in patient stratification, real-time monitoring, and early identification of adverse effects, significantly reducing trial duration and cost. AI-based automation in manufacturing ensures quality consistency, process optimization, and regulatory compliance through real-time analytics and predictive maintenance. Furthermore, AI empowers personalized medicine by correlating genomic, clinical, and behavioral data to design individualized treatment plans. Its role extends to pharmacovigilance and post-marketing surveillance through automated data mining from healthcare databases and social media for early detection of safety signals. The adoption of AI in pharmaceutical operations not only accelerates innovation but also enhances decision-making, productivity, and patient outcomes. As the industry embraces digital transformation, AI stands as the cornerstone of a new era in intelligent healthcare, redefining research paradigms and shaping the future of precision-driven, data-guided therapeutics.

Keywords: Artificial Intelligence, Drug Discovery, Personalized Medicine.

**CHEMICAL MODIFICATION OF NATURAL POLYSACCHARIDES: A SUSTAINABLE
APPROACH FOR ADVANCED DRUG DELIVERY SYSTEMS**

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ABSTRACT

Chemical modification of natural polysaccharides has emerged as a vital strategy to improve their physicochemical, biological, and functional characteristics for advanced drug delivery applications. Native polysaccharides such as starch, chitosan, cellulose, alginate, and guar gum possess inherent biocompatibility, biodegradability, and non-toxicity, yet their limited solubility, thermal stability, and mechanical performance often restrict direct use in controlled formulations. Through chemical derivatization techniques including carboxymethylation, acetylation, phosphorylation, oxidation, etherification, and graft copolymerization, their functional groups can be altered to achieve desirable physicochemical attributes such as enhanced solubility, tunable swelling behavior, improved mechanical strength, and pH responsiveness. These modifications enable precise control over drug release kinetics, mucoadhesion, and stimulus sensitivity, thereby supporting targeted, sustained, and stimuli-triggered delivery. Modified starch and cellulose derivatives, for instance, have been tailored to form hydrogels, nanoparticles, and microneedle patches for oral, ocular, transdermal, and implantable systems. Graft copolymers of chitosan and alginate enhance mucoadhesion and permeability across biological membranes, while carboxymethylated gums show promise as matrix formers for controlled release. Contemporary research also integrates these modified polymers with nanotechnology, ionic crosslinking, and green synthesis methods such as enzyme catalysis and deep eutectic solvent-mediated modification to achieve eco-friendly and reproducible functionalization. The resulting materials exhibit improved drug encapsulation efficiency, bioavailability, and compatibility with sensitive bioactives. Overall, chemically modified polysaccharides represent a sustainable and strategic platform for next-generation drug delivery systems by bridging natural polymer benefits with synthetic versatility, enabling precise therapeutic control, and expanding their applicability across pharmaceutical, biomedical, and tissue-engineering interfaces.

Keywords: Chemical modification, polysaccharides, drug delivery, biocompatibility, controlled release.

ARTIFICIAL INTELLIGENCE IN CLINICAL PHARMACY: PRESENT USES AND POTENTIAL DEVELOPMENTS

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ABSTRACT

Artificial intelligence (AI) incorporation into healthcare has already shown notable advancements and has potential for further uses. With an emphasis on its contributions to pharmaceutical administration, safety monitoring, and the development of personalised therapy, this review sought to examine the present and future functions of artificial intelligence. The results of the literature study show that artificial intelligence (AI) has been effectively used in a variety of pharmacy practices such as automated dispensing systems, medication interaction detection, adverse drug reaction prediction and personalised treatment regimen optimisation. AI-powered solutions have demonstrated promise in enhancing workflow effectiveness and bolstering precision medicine in hospital and community pharmacy. Prospects for the future emphasise the use of predictive analytics and sophisticated machine learning algorithms to improve clinical decision support systems even more. Notwithstanding its advantages, there are issues with technical, ethical, and economical aspects. To guarantee the sustainable deployment of AI technologies in clinical pharmacy, concerns including data privacy, algorithm openness, implementation costs and equitable access must be carefully considered. In summary, by improving patient care, maximising resources, and encouraging creativity, artificial intelligence is transforming clinical pharmacy. To fully realise AI's promise and influence pharmacy practice in the future, politicians, technologists, and healthcare professionals must work together strategically.

Keywords: Clinical Pharmacy, Artificial Intelligence, Current Applications, AI development, Potential future.

DEVELOPMENT AND CHARACTERIZATION OF MONOTERPENOID-LOADED NANOCARRIERS FOR ENHANCED BIOAVAILABILITY

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ABSTRACT

The present study aimed to design and evaluate nanocarriers for the delivery of monoterpenoid, a lipophilic compound with potential therapeutic applications. The nanocarriers were formulated using emulsification sonication and lipid thin film hydration methods, and optimized using a Design of Experiments (DoE) framework with Box-Behnken Design (BBD). The optimized formulation was characterized for particle size, entrapment efficiency, and morphology, and further incorporated into suspension and gel formulations for evaluation of bioavailability and toxicity. The optimized nanocarriers exhibited satisfactory particle size and entrapment efficiency, with spherical morphology confirmed by Scanning Electron Microscopy (SEM). Fourier Transform Infrared Spectroscopy (FT-IR) analysis revealed no chemical incompatibility between the monoterpenoid and excipients. In vitro release studies demonstrated a sustained release pattern, with a cumulative release of >90% at 12 hours. The acute toxicity study, conducted according to OECD protocols, confirmed the safety of the formulation, with no mortality or toxicity observed at a dose of 2000 mg/kg. Pharmacokinetic parameters, including AUC, C_{max}, and T_{max}, were evaluated, indicating improved aqueous solubility and bioavailability of the monoterpenoid loaded nanocarriers. The results of this study suggest that the developed monoterpenoid-loaded nanocarriers have a promising release profile, which may significantly enhance the aqueous solubility and bioavailability of monoterpenoid, making it a potential candidate for further development as a therapeutic agent.

Keywords: Monoterpene, Monoterpenoid, Bioavailability, Box Behnken Design.

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INTEGRATING ARTIFICIAL INTELLIGENCE WITH BIOELECTRONICS MEDICINE FOR PRECISE AND EFFECTIVE TREATMENT

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ABSTRACT

Artificial Intelligence (AI) has emerged as a pivotal tool in advancing bioelectronic medicine, enabling precise diagnosis and targeted therapeutic interventions. By employing machine learning and predictive modeling, AI facilitates the decoding of complex neural and physiological signals, real-time data interpretation, and adaptive control of bioelectronic devices. This integration enhances the personalization and efficacy of treatments for chronic disorders such as epilepsy by seizure prediction and adaptive stimulation (example Neuro Pace RNS system), diabetes by predicting glucose needs via nerve signals (example Research stage vagal implants), and cardiovascular diseases by AI regulated 10th cranial nerve stimulation (example set point medical trials). The convergence of AI and bioelectronic medicine represents a paradigm shift toward intelligent, data-driven, and minimally invasive healthcare solutions, fostering the development of next-generation therapeutic technologies.

Keywords: Bioelectronic medicines, neuro pace RNS system, Research stage vagal implants, set point medical trials.

LIC25-O-172

INTEGRATING QSAR AND MACHINE LEARNING APPROACHES TO DESIGN NOVEL MMP-13 INHIBITORS FOR ORAL CANCER THERAPY

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ABSTRACT

Matrix metalloproteinase-13 (MMP-13) is a key enzyme implicated in the malignant transformation of oral submucous fibrosis (OSMF) to oral squamous cell carcinoma (OSCC) by degrading collagen types I and II and promoting tumor invasion and metastasis. Selective inhibition of MMP-13 represents a potential therapeutic strategy for controlling OSCC progression. This study aimed to construct a robust QSAR-based machine learning (ML) model using Python to identify and design potent MMP-13 inhibitors. Bioactivity data for 3,142 compounds targeting human MMP-13 (ChEMBL280) were retrieved from the ChEMBL database. After curation and removal of incomplete entries, 2,356 compounds were retained and categorized as active or inactive based on IC₅₀ thresholds. Molecular descriptors and eight structural fingerprints were generated using RDKit and PaDEL-Descriptor. Multiple ML algorithms, including Random Forest (RF) and Extreme Gradient Boosting (XGBoost), were implemented in Python (Google Colab). Feature selection, variance thresholding, and cross-validation ensured dimensionality reduction and model robustness. Model performance was assessed using R², Q², and Matthews Correlation Coefficient (MCC) metrics. The optimized XGBoost regression model achieved an R²_{train} of 0.958 and Q²_{test} of 0.732, surpassing RF performance. Key features captured functional groups responsible for zinc coordination and aromatic interactions crucial for MMP-13 inhibition. The model effectively differentiated inhibitors from non-inhibitors, demonstrating high predictive accuracy and reliability. This QSAR-based ML framework, developed using Python, provides a powerful virtual screening tool for discovering and designing novel MMP-13 inhibitors, contributing to targeted therapeutic strategies against OSCC.

Keywords: QSAR Modeling, Machine Learning, MMP-13 Inhibitors, Oral Squamous Cell Carcinoma, Drug Discovery.

**COMPREHENSIVE OVERVIEW OF MISCELLANEOUS ASPECTS IN
PHARMACEUTICAL SCIENCES: ENHANCING DRUG SAFETY, DEVELOPMENT, AND
REGULATORY COMPLIANCE**

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ABSTRACT

The field of pharmaceutical sciences encompasses a broad spectrum of disciplines, many of which extend beyond traditional core areas. This poster presents a detailed exploration of the miscellaneous aspects within key pharmaceutical domains, highlighting their critical roles in advancing drug safety, development, and regulatory compliance. The miscellaneous topics in pharmacology and toxicology address diverse subjects that go beyond fundamental drug action and toxicity principles, offering insights into emerging challenges and innovations. Pharmaceutical chemistry's miscellaneous aspects support drug discovery, development, and analytical processes, emphasizing the versatility required in modern pharmaceutical research. In biopharmaceutics and pharmacokinetics, miscellaneous areas cover the complex processes of drug absorption, distribution, metabolism, and excretion, underscoring their importance in optimizing therapeutic efficacy. Pharmacovigilance includes a range of emerging topics such as artificial intelligence applications in safety monitoring, global pharmacovigilance networks, and the integration of real-world data, which collectively enhance the detection, assessment, and prevention of adverse drug reactions. Quality Assurance (QA), Good Manufacturing Practices (GMP), and process optimization represent miscellaneous activities vital to ensuring product safety, efficacy, and consistency throughout manufacturing, while addressing production efficiency and error minimization.

Drug Regulatory Affairs (DRA) and global complaint management involve multifaceted activities encompassing regulatory monitoring, post-marketing surveillance, and effective communication among regulatory bodies, manufacturers, and healthcare professionals. These miscellaneous studies emphasize maintaining ethical standards, transparency, and continuous improvement in the pharmaceutical industry. Additionally, the management of global complaints, including adverse events, product recalls, labeling errors, and quality issues, plays a significant role in safeguarding public health and maintaining trust. Together, these miscellaneous aspects form an integrated framework that strengthens the overall pharmaceutical ecosystem. By addressing diverse yet interconnected topics, this overview underscores the necessity of a multidisciplinary approach to pharmaceutical sciences, fostering innovation, regulatory compliance, and enhanced drug safety. The insights presented aim to inform researchers, practitioners, and regulators about the evolving landscape and encourage continued collaboration for improved healthcare outcomes.

Keywords: Pharmacovigilance, Pharmaceutical Chemistry, Drug Regulatory Affairs, Quality Assurance, Biopharmaceutics and Pharmacokinetics.

REVOLUTIONIZING THERAPEUTICS: ADVANCES IN NOVEL AND SMART DRUG DELIVERY SYSTEMS

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ABSTRACT

Novel and smart drug delivery systems (NDDS and SDDS) represent a transformative frontier in pharmaceutical science, designed to overcome the inherent limitations of conventional drug delivery methods. Traditional approaches often suffer from poor bioavailability, rapid metabolism, systemic toxicity, and insufficient site-specific targeting, which compromise therapeutic outcomes and patient adherence. NDDS utilize advanced carriers such as liposomes, nanoparticles, dendrimers, micelles, and transdermal patches to enable controlled and sustained drug release, enhance drug stability, and achieve precise targeting to specific tissues or cellular environments. Building upon these advantages, smart drug delivery systems incorporate stimuli-responsive materials that modulate drug release in response to internal or external triggers. Internal stimuli include physiological variations like pH differences, enzyme activity, and redox potential between healthy and diseased tissues, facilitating targeted activation. External stimuli—such as light, ultrasound, and magnetic fields—offer non-invasive, spatially and temporally controlled drug release. These intelligent delivery mechanisms maximize therapeutic efficacy while minimizing off-target effects and systemic toxicity. Recent breakthroughs in nanotechnology, biomaterials, and bioengineering have led to multifunctional nanocarriers that integrate both diagnostic and therapeutic functions, a concept termed theranostics. These platforms enable real-time monitoring of treatment responses, aligning with the evolving paradigm of personalized and precision medicine. Additionally, innovative formulation techniques like microfluidics provide precise control over particle size, surface characteristics, and drug encapsulation efficiency, further enhancing delivery performance. The clinical applications of NDDS and SDDS are broad, spanning oncology, neurology, infectious diseases, and tissue engineering. These systems improve tumor targeting, facilitate drug delivery across challenging biological barriers such as the blood–brain barrier, enhance patient compliance in chronic therapies, and support regenerative medicine through bioresponsive scaffolds. Despite their promising potential, challenges related to scalable manufacturing, regulatory harmonization, and long-term biocompatibility remain to be addressed for widespread clinical adoption. In summary, novel and smart drug delivery systems signify a paradigm shift from conventional pharmaceutical formulations toward highly engineered, intelligent platforms. These innovations hold the promise of redefining therapeutic outcomes and substantially improving patient care quality by combining precise targeting, controlled release, and integrated diagnostics.

Keywords: Novel drug delivery systems, Smart drug delivery, Stimuli-responsive carriers, Theranostics, Targeted therapy.

LIC25-O-175

**STEM CELL THERAPY IN REGENERATIVE MEDICINE: CURRENT PROCESS,
CHALLENGES & FUTURE PROSPECTS**

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ABSTRACT

Stem cell therapy has emerged as a cornerstone of regenerative medicine, offering revolutionary potential for the treatment of a myriad of degenerative diseases, injuries and organ dysfunction. The unique ability of the stem cells to self-renew and differentiate into specialized cell types has enabled researchers & clinicians to explore novel therapeutic strategies to aim at restoring or replacement of damage tissues. Over the past two decades, significant advancements have been made in stem cell research, including the identification & classification of different types of stem cells such as embryonic stem cells (ESCs), adult stem cells (ASCs) & induced pluripotent stem cells (iPSCs). These developments have paved the way for promising clinical applications, including the regeneration of cardiac tissue post – myocardial infarction, spinal cord injury repair and treatment of hematological disorders. Despite these advancements stem cell therapy faces numerous scientific, ethical & regulatory challenges. Key hurdles include immune rejection, tumorigenicity, limited cell survival and integration and ethical debates surrounding the use of ESCs. Nevertheless, the future prospects of stem cells therapy remain optimistic, driven by breakthrough in gene editing technologies, 3D printing & organic development. The abstract explores recent progress in stem cell research, discusses the major challenge hindering clinical translations & highlight of future directions that may shape the next generation of regenerative therapies.

Keywords: Stem Cell Therapy, Regenerative Medicine, Pluripotent Cells, Tissue Engineering, Clinical Application, Optical Challenges, iPSCs, Future Prospects.

LIC25-O-176

AI BASED ALTERNATIVES TO ANIMAL TESTING IN COSMETICS

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ABSTRACT

Animal testing has been used for a long time to check the safety of cosmetic products, but it raises ethical, legal, and scientific concerns. With the growing demand for cruelty-free and environmentally friendly cosmetics, artificial intelligence (AI) has become a practical alternative to traditional animal testing. The aim of this review is to explore how AI can be used as an alternative to animal testing for predicting the safety of cosmetic products. AI algorithms can analyse large datasets in biology, toxicology, and chemistry to predict how beauty compounds would affect human skin and eyes without using animals. Machine learning (ML), deep learning, and QSAR (Quantitative Structure-Activity Relationship) models are often used to predict toxicity, skin irritation, or allergic reactions by examining the molecular structure of compounds. AI also enables the creation of virtual human models that mimic skin layers and biological responses, leading to more accurate results that resemble human reactions. Notable companies, like L’Oréal collaborating with Google Cloud, and international projects such as ToxCast and SkinSens, are using AI-driven systems to effectively predict the safety of cosmetics. These methods are faster, cheaper, and more ethical than traditional animal testing. AI offers a promising and humane alternative to animal testing in cosmetics that has the potential to completely replace animal testing in cosmetics while ensuring human safety and ethical compliance.

Keywords: Artificial Intelligence (AI), Animal Testing, Cosmetic Safety, Machine Learning (ML), QSAR Models, In Silico Simulation, Toxicity Prediction, Cruelty-Free Cosmetics.

AI-BASED EVALUATION OF BIOMARKERS FOR EARLY DETECTION AND MONITORING OF THYROID DISORDERS

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ABSTRACT

Thyroid disorders, including hypothyroidism, hyperthyroidism, and thyroid carcinoma, are amongst the most common endocrine diseases that affects our global health. The detection and continuous monitoring of these disorders depends on the evaluation of biochemical relevant biomarkers like Thyroid Stimulating Hormone (TSH), Triiodothyronine (T₃), Thyroxine (T₄), thyroglobulin, calcitonin, and thyroid autoantibodies. Due to the incorporation of Artificial Intelligent (AI) into healthcare, biomarker evaluation now rely on data driven diagnosis rather than conventional methods. Advanced AI techniques such as machine learning and deep learning are being applied into biomarker datasets which help to identify disease along with hidden patterns, moreover it also helps in distinguishing between benign and malignant thyroid conditions. Recent models using biomarkers have shown potential to detect the early thyroid disease even before clinical symptoms start to appear, thus being highly beneficial and improving treatment outcomes. AI integration with biomarker science provides a scientific and transformative approach towards precision endocrinology, and enabling faster and patient specific thyroid disease management. Persistent studies and research aims to refine AI models for better clinical application thereby setting a benchmark in digital thyroid diagnosis.

Keywords: Artificial Intelligence, Biomarkers, Thyroid disorders, Digital Healthcare, Thyroid Cancer, Predictive Diagnosis.

NOURISHING THE GUT: EXPLORING THE IMPACT OF NUTRACEUTICALS ON GUT MICROBIOME

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ABSTRACT

Nutraceuticals—encompassing prebiotics, probiotics, synbiotics, and nutrient-dense foods—are increasingly recognized for their capacity to stimulate the growth and activity of beneficial microorganisms in the intestinal tract. Recent advancements have underscored the profound bidirectional relationships between diet, the gut microbiota, and the gut-brain axis. Nutraceuticals such as probiotics and prebiotics have demonstrated efficacy in regulating neurotransmitter levels, modifying metabolic and immune pathways, and supporting neurological health—potentially offering new therapeutic strategies for malnutrition, depression, and other brain-related conditions. Beyond symptom management, nutraceuticals may provide preventive benefits through dietary and lifestyle interventions, especially in societies where Western diet patterns have negatively affected microbiome diversity. Despite considerable promise, challenges remain. Nonetheless, the field is rapidly advancing with promising applications in disease-specific therapy, neurodegenerative disease management, metabolic health, and gut-brain axis modulation. In conclusion, nutraceuticals are poised to become a cornerstone of preventive and therapeutic interventions targeting gut health. They contribute to restoring microbial balance, supporting standard therapies, and reducing inflammation, but proper education and clinical validation are essential for safe and widespread use. The future will likely see the convergence of precision delivery, microbiome analysis, and personalized supplementation as routine strategies for optimizing gut health—potentially transforming approaches to both individual wellness and global disease prevention.

Keywords: Nutraceuticals, Prebiotics, Probiotics, Synbiotics, Nutrient-Dense Foods.

DESIGN AND DEVELOPMENT OF NANO-EMULSION FOR ENHANCED OCULAR DELIVERY IN INFECTIOUS DRY EYE SYNDROME

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ABSTRACT

Dry Eye Disease (DED) is a multifactorial, chronic ocular surface disorder characterized by inflammation, tear film instability, and loss of homeostasis. It significantly affects visual performance and quality of life. The conventional formulation cause rapid precorneal clearance, poor drug penetration, ocular irritation from excipients or preservatives. The condition often coexists with ocular infections, necessitating antibiotic therapy. The use of toxic preservatives such as Benzalkonium Chloride (BAK) in eye drops can aggravate corneal damage and exacerbate DED symptoms. To overcome these shortcomings, the focus is on the design and development of nano emulsion aimed at enhancing ocular bioavailability, prolonging residence time, and reducing ocular surface irritation. Nano emulsions are advanced lipid-based delivery systems that provide multiple advantages, including improved drug solubility, enhanced corneal penetration, better stability, and increased patient comfort. The study involves systematic pre formulation screening to identify suitable oils, surfactants, and co-surfactants that ensure maximum drug solubility and ocular safety. Pseudo ternary phase diagrams will be constructed to determine the optimal composition for stable nano emulsion formation. The optimized formulation will be evaluated for physicochemical properties such as droplet size, polydispersity index, zeta potential, pH, viscosity, refractive index, and drug entrapment efficiency. In vitro drug release, ex vivo corneal permeation, and in vivo studies in experimental models of dry eye will assess the formulation's safety, tolerability, and therapeutic efficacy. The proposed nano emulsion is expected to provide prolonged ocular retention, improved drug penetration through the corneal barrier, and sustained release of drug, thereby enhancing antimicrobial and anti-inflammatory efficacy while minimizing dosing frequency and formulation toxicity. The various methods used for preparing nano emulsion are High pressure homogenization, Micro fluidization, Ultrasonication, Spontaneous emulsification, Phase inversion temperature, Phase inversion composition etc. The expected outcome is a stable, preservative-free ophthalmic formulation capable of delivering superior therapeutic outcomes for patients with dry eye syndrome complicated by infection or inflammation. Ultimately, the nano emulsion has the potential to emerge as a novel, safe, and effective ocular drug delivery system with significant clinical implications for the management of dry eye disease. After applying nano emulsion how much will be the ocular residence time. Focusing the research towards ocular residence time.

Keywords: Infectious Dry Eye Disease, Ocular Drug Delivery, Bioavailability, Preservative-free Formulation.

**NEXT-GEN AI IN CANCER CARE: REVOLUTIONIZING EARLY DETECTION AND
PRECISION THERAPY**

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ABSTRACT

AI explores how next-generation AI technologies including machine learning algorithms, deep neural networks, and predictive analytics are transforming cancer care. AI-driven diagnostic systems analyze medical imaging, genomic data and biomarker profiles to identify cancers at earliest stages, when intervention is most effective. Advanced AI models predict individual patient responses to therapies, enabling oncologists to tailor treatments to tumour biology and patient genetics, minimizing adverse effects while maximizing therapeutic outcomes. Real-world applications demonstrate remarkable success. AI algorithms match and exceed radiologists in detecting breast, lung and colorectal cancers recently. These accelerate drug discovery by identifying novel therapeutic targets and predicting drug-protein interactions, reducing time-to-market for breakthrough oncology drugs. Furthermore, AI-powered pharmacovigilance systems monitor adverse events in real-time, enhancing patient safety across oncology therapeutics. The convergence of big data analytics and AI is in a paradigm in cancer management. By harnessing AI's capability to process complex biological information and identify subtle patterns imperceptible to human analysis, we unlock new possibilities for early diagnosis, precise intervention and improved survival rates. This synthesizes demonstrating AI's transformative impact on precision oncology.

Keywords: Cancer Detection, Precision Oncology, Artificial Intelligence, Diagnostic & Personalized Therapy.

**RESOLVING THE THERAPEUTIC DILEMMA: ACUTE AND SUB-ACUTE TOXICITY
ASSESSMENT OF EUPHORBIA LACTEA EXTRACT USING OECD GUIDELINES**

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ABSTRACT

Drug repurposing for rare diseases presents a significant therapeutic challenge. While artificial intelligence (AI) has emerged as a transformative tool in pharmacology, literature indicates that existing AI models often struggle with data scarcity, algorithmic bias, and limited biological validation. Current studies frequently report promising predictions that lack clinical confirmation, raising concerns regarding their translational reliability. Moreover, standardized evaluation frameworks for AI-assisted repurposing remain largely absent. Therefore, a systematic and validated approach is essential. The objective of this research is to develop an AI-integrated model for identifying potential repurposable drugs for selected rare diseases. The methodology will combine deep learning, network pharmacology, and molecular docking to predict and validate drug-target interactions. Evaluation will include predictive accuracy, biological relevance, and literature-based verification of results. This study aims to establish a reproducible and transparent computational pipeline adhering to international data science and pharmacological standards. The research will provide a foundational framework for regulatory and translational use of AI in rare disease drug discovery, highlighting its necessity for accelerating therapeutic development and improving accessibility for underserved patient populations.

Keywords: Artificial Intelligence, Drug Repurposing, Rare Diseases, Deep Learning.

**ANTIULCER AGENTS: FROM PLANT EXTRACTS TO PHYTOCHEMICALS IN
HEALING PROMOTION**

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ABSTRACT

Peptic ulcer disease remains a major global health concern. Although conventional antiulcer drugs are effective, their long-term use is often associated with adverse effects and relapse. Literature indicates that medicinal plants and their phytochemicals possess strong gastroprotective properties through antioxidant, anti-inflammatory, and cytoprotective mechanisms. Specific compounds such as flavonoids, tannins, terpenoids, and alkaloids have shown significant potential in promoting mucosal healing and reducing gastric acidity. However, existing studies on crude plant extracts are often inadequate, lacking standardization, mechanistic insight, and clinical validation. Therefore, systematic investigation of phytochemicals as antiulcer agents is essential. The objective of this research is to identify, isolate, and evaluate potent antiulcer phytochemicals from selected medicinal plants. The methodology will include extraction, phytochemical screening, and *in vivo* ulcer model evaluation, supported by histopathological and biochemical analyses of gastric tissues. Emphasis will be placed on oxidative stress modulation, enhancement of mucosal defense, and inhibition of inflammation. This study aims to provide scientific validation for plant-derived compounds as safe and effective alternatives to synthetic antiulcer therapies.

Keywords: Antiulcer Agents, Phytochemicals, Plant Extracts, Gastroprotection, Antioxidants, Healing Promotion.

**PHOSPHODIESTERASE INHIBITORS AS NEUROPROTECTIVE AGENTS IN ARSENIC-
INDUCED COGNITIVE DYSFUNCTION**

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ABSTRACT

Arsenic exposure through contaminated water leads to neurotoxicity, oxidative stress, and cognitive dysfunction. Phosphodiesterase (PDE) enzymes regulate cyclic nucleotides (cAMP and cGMP), which are essential for memory and learning. Inhibition of these enzymes has shown neuroprotective potential. The present study aims to evaluate the role of PDE inhibitors in arsenic-induced memory impairment in experimental rat models. Rats will be administered arsenic to induce cognitive deficits, followed by treatment with PDE inhibitors. Behavioral tests such as the Morris water maze and passive avoidance test will assess learning and memory. Biochemical and histopathological analyses will determine oxidative stress and neuronal damage. This study may help establish the neuroprotective effect of PDE inhibitors and provide new insights for developing therapeutic strategies against arsenic-induced neurodegeneration.

Keywords: Arsenic toxicity, Phosphodiesterase inhibitors, Memory impairment, Neuroprotection, Oxidative stress, CREB pathway, Cognitive dysfunction.

PERSONALISED HEALTH MONITORING

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ABSTRACT

Personalized health monitoring is a novel approach that has been established in modern health care, involving continuous observation of physiological parameters and lifestyle data using advanced technologies. This system allows real-time collection, analytics, and interpretation of health information by integrating wearable sensors, mobile health applications, and artificial intelligence. The data collected through continuous monitoring includes heart rate, blood pressure, glucose level, and patterns of activity that help in the early detection of diseases, prevention of chronic conditions, and the formulation of customized treatment plans. In contrast to the traditional models of healthcare, personalized health monitoring emphasizes proactive and preventive care, where decision-making about the individual's well-being is made possible. Further developments in IoT, machine learning, and cloud computing are making the personalized health monitoring systems increasingly accurate, accessible, and more affordable. However, various challenges like data privacy, interoperability, and users' compliance remain some critical issues. In conclusion, personalized health monitoring is a profound and key development toward a patient-centered health care system and hence carries a bright prospect for improvement in the quality of life and in health outcomes.

Keywords: Monitoring; IoT; Applications; Healthcare; Artificial intelligence.

SYNTHESIS AND EVALUATION OF NEW 1,2,4-TRIAZOLE DERIVATIVES AS ANTHELMINTIC, ANTIOXIDANT, AND ANTI-INFLAMMATORY AGENTS: MOLECULAR DOCKING AND IN-VITRO STUDY

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ABSTRACT

The 1,2,4-triazole nucleus represents a versatile heterocyclic scaffold with significant pharmacological potential, attracting considerable interest for the development of novel therapeutic agents. The present study focuses on the molecular docking, synthesis, and in-vitro biological evaluation of newly designed 1,2,4-triazole derivatives aimed at exploring their anthelmintic, antioxidant, and anti-inflammatory properties. Molecular docking studies identified compound TR4 as the most promising candidate, exhibiting the highest docking score (8.16821) for anthelmintic activity. The newly designed 1,2,4-triazole derivatives were synthesized and characterized using physicochemical and spectral analyses (IR, NMR, and Mass). In-vitro anthelmintic evaluation using *Eisenia fetida* revealed that compound TR4 exhibited the most potent activity, inducing paralysis and death in 3.36 and 6.43 minutes, respectively, at 40 mg/mL—superior to the standard drug albendazole (paralysis: 5.32 min; death: 9.25 min). Antioxidant assessment via the DPPH assay demonstrated that compounds TR15 (IC₅₀ = 44.34 µg/mL) and TR13 (IC₅₀ = 47.89 µg/mL) showed significant radical scavenging activity comparable to ascorbic acid (IC₅₀ = 43.90 µg/mL). Anti-inflammatory evaluation using the BSA denaturation assay revealed that compounds TR3 (IC₅₀ = 29.18 µg/mL) and TR4 (IC₅₀ = 30.43 µg/mL) exhibited notable inhibition, approaching the standard indomethacin (IC₅₀ = 27.20 µg/mL). Overall, the findings suggest that newly synthesized 1,2,4-triazole derivatives, particularly TR4, exhibit promising anthelmintic and anti-inflammatory activities, while TR13 and TR15 demonstrate strong antioxidant potential. These results highlight the potential of new 1,2,4-triazole derivatives as multifunctional therapeutic agents, warranting further investigation.

Keywords: Triazole, Anthelmintic, Anti-inflammatory, Anti-oxidant.

LIC25-O-186

STIMULI-RESPONSIVE BIOPOLYMER GELS FOR TARGETED, ON-DEMAND DRUG RELEASE

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ABSTRACT

Biopolymers-based gels that respond to specific environmental cues have emerged as versatile platforms for targeted and on-demand drug delivery. Stimuli-responsive biopolymer gels leverage intrinsic biocompatibility and biodegradability of natural polymers (e.g., polysaccharides and proteins) while enabling precise control over drug release kinetics in response to physiological triggers such as pH, temperature, ionic strength, redox potential, and enzymatic activity. Engineering of crosslinking density, network architecture, and functional side chains affords tunable swelling, degradation, and diffusion properties, thereby achieving site-specific release and reduced systemic exposure. Recent advances include thermo-responsive and pH-responsive gels that achieve rapid actuation at defined body sites, ion-responsive systems that modulate mesh size in response to local ionic gradients, and redox-responsive networks that exploit intracellular reducing environments for triggered payload liberation. Integration with nanocarrier concepts, such as nanoparticle-loaded hydrogels and hybrid composites combining natural polymers with inorganic or synthetic components, further enhances encapsulation efficiency, stability, and targeting capabilities. Green synthesis approaches, including enzymatic crosslinking and aqueous fabrication, improve sustainability and scalability while maintaining biocompatibility. In addition, advances in in situ gelling formulations enable minimally invasive administration with in situ gelation at the target site, providing prolonged residence time and sustained release. Collectively, stimulus-responsive biopolymer gels represent a robust and adaptable class of smart materials that bridge natural polymer advantages with programmable responsiveness, delivering improved therapeutic outcomes across oral, ocular, transdermal, and implantable delivery contexts.

Keywords: Stimuli-responsive biopolymers, pH-triggered Hydrogel, Targeted Delivery, Biocompatible Nano-Gels.

LIC25-O-187

AI-BASED QUALITY CONTROL IN PHARMACEUTICAL MANUFACTURING

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ABSTRACT

By improving quality control systems, artificial intelligence (AI) is transforming the pharmaceutical manufacturing industry. AI-driven solutions that use computer vision, deep learning, and machine learning to monitor production processes in real time are replacing traditional manual inspections and batch testing. Large datasets are analyzed by these technologies to find abnormalities, forecast deviations, and optimize parameters while adhering to FDA and GMP regulations. Predictive analytics helps with equipment maintenance, while AI-powered vision systems are utilized for contamination control, tablet inspection, and defect detection. However, there are obstacles including workforce training, data quality, validation, and ethical issues. In the end, AI-enabled quality control promotes more intelligent, automated, and efficient pharmaceutical manufacturing, improving operational results and product safety.

Keywords: Artificial intelligence (AI), Pharmaceutical manufacturing, Quality control.

AI ADVANCE FOR SMARTER PHARMACOVIGILANCE AND CLINICAL TRIAL

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ABSTRACT

Artificial Intelligence (AI) in pharmacovigilance and clinical trials is shifting the paradigm of drug development and safety monitoring. Most pharmacovigilance systems involve human data entry and the retrospective analysis of reports submitted by humans, but they can also support real-time signal detection, predictive analytics, and automated adverse event reporting. If AI procedures are designed with Natural Language Processing (NLP) and Machine Learning (ML), then they can analyse large datasets assembled from electronic health records, social media, and scientific literature. Now, it can finally detect new safety signals quickly and with higher accuracy. The purpose is to enhance clinical trials and efficiency with low costs and timelines. AI benefits, such as an adaptive design and technology that can already support the monitoring of patients, enhance patient adherence and the quality of data obtained. Now it can also enhance clinical trials, expectations, understanding, managing, risk and safety issues across the pharmacovigilance and clinical trials. They have some disadvantages, such as issues of data privacy, transparency, and ethical and regulatory issues with AI-enabled decision-making capacities. Now, these issues will require collaboration of researchers, technologists, practising clinicians, regulators, and research ethics experts, from many perspectives and disciplines, by using diverse concepts, methods, and approaches. It could change the way of pharmacovigilance and clinical research from traditional ways to smarter approaches.

Keywords: Artificial Intelligence, Machine Learning, Natural Language Processing, Safety.

ARTIFICIAL INTELLIGENCE PREDICTIVE TOOLS FOR HYPERTENSION DIAGNOSIS AND MANAGEMENT

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ABSTRACT

The primary challenges to effective hypertension management are insufficient diagnosis and low awareness of blood pressure (BP) elevation. Nonetheless, the rise of artificial intelligence (AI) has introduced new methods for treating hypertension, including big data-based predictions and remote telemedicine support. Artificial Intelligence (AI) is now used to predict, detect, and manage hypertension more effectively. AI tools like machine learning and deep learning analyze large data sets from medical records, blood pressure monitors, and wearable devices to identify patterns that doctors might miss. These systems can forecast who is at risk, recommend personalized treatment plans, and monitor patients in real time. AI also enables doctors to make faster, more accurate decisions. A substantial amount of evidence supports the use of AI in managing hypertension. A clear trend has emerged in integrating blood pressure readings with smartphones and other wearable sensors to allow convenient, continuous monitoring. To validate new prediction and prognostic tools, further research is recommended in the meantime. AI-assisted clinical decision systems improve physician efficiency and patient adherence by providing real-time, data-driven interventions. However, issues like data privacy, algorithm bias, lack of interpretability, and regulatory hurdles limit widespread clinical implementation. These groundbreaking innovations have shaped the future model for digital chronic disease management.

Keywords- Artificial intelligence, hypertension, prediction, machine learning.

ROLE OF AI IN TALENT ACQUISITION FOR THE PHARMACEUTICAL INDUSTRY

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ABSTRACT

The pharmaceutical industry is undergoing rapid digital transformation, and Human Resource Management has emerged as a critical domain for AI-driven innovation. Talent acquisition in pharma requires highly skilled professionals, ranging from R&D scientists to regulatory specialists, making recruitment a complex and time-consuming process. Artificial Intelligence streamlines this process through automated resume screening, skill-based filtering, and predictive analytics to identify the best-fit candidates. AI-enabled applicant tracking systems reduce human bias, accelerate shortlisting, and improve decision accuracy through data-driven insights. Chatbots enhance candidate engagement by providing real-time responses and scheduling interviews, leading to a more efficient recruitment cycle. Machine learning models assist in forecasting workforce requirements, analyzing talent gaps, and identifying emerging skill needs in pharmaceutical research, manufacturing, clinical trials, and quality control. Additionally, AI-based sentiment analysis and digital assessments evaluate candidate competencies beyond qualifications, ensuring cultural and organizational fit. The integration of AI in pharma hiring not only enhances recruitment quality but also reduces hiring cost, time, and administrative workload. This paper highlights the transformative role of AI in talent acquisition within the pharmaceutical sector and explores opportunities, challenges, and future implications for human resource managers.

Keywords: Artificial Intelligence, Talent Acquisition, Pharmaceutical Industry, Predictive Hiring, Skill Mapping, HR Analytics.

AI-BASED EVALUATION OF BERBERINE ADMET PROPERTIES AND MOLECULAR DOCKING FOR IDENTIFYING POTENTIAL ANTI-DEMENTIA INHIBITORS

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ABSTRACT

Dementia is among the most prevalent neurodegenerative disorders, characterized by a progressive decline in memory, cognition, and decision-making abilities, along with impaired social functioning. The scope of ligand exploration through experimental assays has been significantly enhanced by modern *in silico* drug design techniques. Based on a literature review, bioactive compounds of Berberine with reported anti-dementia potential were selected for *in silico* analysis. The study evaluated the binding energies of target–ligand complexes and the ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) profiles using Artificial Intelligence (AI)–based tools — SWISS and ADMET lab 2.0, both publicly available web servers. Docking studies were performed with recognized Choline Esterase (ChE) and Beta-Amyloid receptors in the brain to predict the binding affinity and pharmacokinetic behavior of the selected ligands. Berberine demonstrated higher binding affinity (lower binding energy values) toward the Choline Esterase (ChE) receptor compared to other targets. Moreover, ADMET predictions revealed favorable pharmacokinetic properties, including good blood–brain barrier (BBB) permeability and minimal toxicity. These findings suggest that Resveratrol possesses strong inhibitory potential against ChE, supporting its role as a neuroprotective compound. The *in-silico* findings highlight Berberine as a promising lead compound for the development of novel therapeutic agents aimed at the prevention and management of dementia, leveraging its favorable binding profile and pharmacokinetic characteristics.

Keywords: Artificial Intelligences (AI) tools, Dementia, Berberine, SWISS and ADMET LAB 2.0 online web servers.

AI AND DIGITAL INNOVATION IN PHARMA AND HEALTHCARE

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ABSTRACT

Artificial Intelligence (AI) and digital innovation are revolutionizing the pharmaceutical and healthcare sectors by driving smarter, faster, and more personalized solutions. AI-powered tools enable rapid drug discovery, predictive modeling, and efficient clinical trial design, significantly reducing development time and cost. Digital technologies such as big data analytics, telemedicine, wearable devices, and electronic health records enhance disease monitoring, diagnosis, and patient care. These innovations promote data-driven decision-making, real-time health tracking, and precision medicine tailored to individual needs. In the pharmaceutical industry, AI supports quality manufacturing, supply chain optimization, and pharmacovigilance. Together, AI and digital transformation are fostering a new era of connected, efficient, and patient-centric healthcare. However, ethical concerns, data privacy, and regulatory challenges remain key considerations for sustainable integration.

Keywords: Artificial Intelligence, Digital Innovation, Patient-centric healthcare.

MARINE BIODIVERSITY: AN UNTAPPED TREASURE FOR NEXT-GENERATION THERAPEUTICS

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ABSTRACT

Marine sources primarily refer to organisms or substances obtained from the sea, which are used for medicinal, pharmaceutical, and nutritional purposes. The marine ecosystem, encompassing nearly 70% of the Earth's surface, harbors an extraordinary diversity of organisms that produce structurally unique and biologically potent natural products. Over the past few decades, marine-derived compounds have emerged as a promising frontier in drug discovery, offering novel scaffolds with remarkable pharmacological properties. Bioactive metabolites from marine sponges, algae, tunicates, mollusks, and microorganisms have demonstrated potent anticancer, antimicrobial, antiviral, anti-inflammatory, and neuroprotective activities. Marine sources are often utilized for vitamins such as A, D, E, and K, as well as the production of antibiotics and anticancer compounds. These compounds often possess novel chemical structures not found in terrestrial sources, making them valuable leads for drug discovery and development. Advances in marine biotechnology, genomics, and nanotechnology have further enhanced the identification, isolation, and formulation of marine-derived agents for clinical use. Marine sources also include seawater, salt, and minerals, which are valuable in pharmaceutical and therapeutic effects and cosmetic applications. Successful examples include ziconotide (a conopeptide for chronic pain), trabectedin (an antitumor agent), and eribulin (a synthetic analog from marine sponges). Despite existing challenges such as ecological sustainability, compound isolation, and clinical translation, the ocean remains a vast, underexploited reservoir of therapeutic innovation.

Keywords: Marine, Fish oil, Vitamins, Therapeutic, Drug discovery, Natural Products.

**ARTIFICIAL INTELLIGENCE RESHAPING GENERIC DRUG APPLICATION:
LEVERAGING AI IN REDUCING REJECTION AND DELAYS IN APPROVAL OF
DOSSIER**

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ABSTRACT

Generative Artificial Intelligence (AI) is emerging as a helping tool that can solve some of the common problems. AI platforms such as PharmaDocket, Tehistark AutoDossier, and Acodis streamline the dossier preparation, check any missing data, inconsistencies, and align documents with country-specific requirement, or incorporating the learnings from past submissions and rejections. These tools help applicants avoid common mistakes that typically result in rejection or regulatory queries. Regulatory bodies are also adopting AI for dossier review, example US FDA uses Elsa to assist with reading, writing and summarizing clinical protocols, comparing labelling and identifying inconsistencies in submissions, improving operational efficiency. EMA introduced the Scientific Explorer to help EU regulators conduct focused searches of regulatory scientific information. In summary, AI is not futuristic, it is realistic concept, providing practical solution in the approval of generic medicines. By improving dossier quality and enabling faster, consistent reviews, AI helps both applicants and regulators. AI offers practical solutions to reduce the risk of rejection and avoid delays in the approval process—two major hurdles in bringing affordable medicines to market.

Keywords: Generic Drug Applications, Regulatory Review, Rejection, Delays, Affordable Medicines, Submission Quality.

USE OF AI IN CHROMATOGRAPHY

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ABSTRACT

AI-driven algorithms-such as machine learning, neural networks, and pattern recognition models-enable automated peak detection, retention time prediction, and optimization of chromatographic conditions. These intelligent systems can process multidimensional chromatographic data, identify hidden patterns, and reduce human error, thereby improving reproducibility and method robustness. Additionally, AI facilitates real-time process monitoring and predictive maintenance in chromatographic instruments, minimizing downtime and ensuring consistent performance. Recent developments include the use of deep learning for spectral deconvolution and chemometric modeling, which allows for more precise identification of co-eluting compounds. AI-assisted chromatography also supports green analytical chemistry by optimizing solvent usage and reducing experimental runs through predictive simulations. The combination of AI with advanced chromatographic techniques-such as high-performance liquid chromatography (HPLC), gas chromatography (GC), and liquid chromatography-mass spectrometry (LCMS)-is paving the way for autonomous analytical platforms. Overall, AI-driven chromatography holds transformative potential for quality control, drug discovery, and metabolomic studies, signifying a paradigm shift toward intelligent analytical systems in modern laboratories.

Keywords: Artificial Intelligence, Chromatography, Machine Learning, Data Analysis, Method Optimization, Predictive Modelling.

USE OF AI IN SPECTROPHOTOMETRIC METHODS

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Abstract

Spectrophotometry, widely used for qualitative and quantitative analysis of pharmaceutical, biochemical, and environmental samples, generates large volumes of spectral data that often require complex interpretation. AI techniques-particularly machine learning, artificial neural networks, and deep learning-enable intelligent data processing, noise reduction, and pattern recognition, enhancing analytical precision and sensitivity. These models can efficiently predict concentration values, correct baseline drifts, and compensate for instrumental and environmental variations. Moreover, AI algorithms facilitate automated wavelength selection, calibration curve optimization, and multi-component analysis without extensive human intervention. This integration significantly improves method validation, reproducibility, and real-time decision-making in routine spectrophotometric assays. In pharmaceutical analysis, AI-assisted spectrophotometry accelerates formulation development, impurity profiling, and dissolution studies with minimal experimental trials. Additionally, combining AI with chemometric tools such as principal component analysis (PCA) and partial least squares (PLS) further strengthens spectral deconvolution and enhances multivariate calibration accuracy. As AI models continue to evolve, spectrophotometric techniques are expected to become more adaptive, predictive, and resource-efficient, aligning with the goals of sustainable and intelligent analytical practices. The fusion of AI with spectrophotometry thus represents a significant advancement toward autonomous, data-driven laboratories of the future.

Keywords: Artificial Intelligence, Spectrophotometry, Machine Learning, Chemometrics, Data Analysis, Method Optimization.

BIOACTIVE FLAVONIDS: KEY PHYTOCHEMICAL DRIVING WOUND HEALING

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ABSTRACT

Wound healing is a complex biological process involving a coordinated sequence of hemostasis, inflammation, proliferation, and tissue remodeling. Phytochemicals, particularly flavonoids, have emerged as promising natural agents that accelerate wound repair through multiple pharmacological actions. Flavonoids, a diverse group of polyphenolic compounds widely distributed in medicinal plants, exhibit potent antioxidant, anti-inflammatory, antimicrobial, and collagen-stimulating properties, which are essential for effective wound healing. Their ability to scavenge free radicals reduces oxidative stress at the wound site, thereby minimizing cellular damage and promoting fibroblast proliferation. Several plant-based formulations containing flavonoids such as quercetin, kaempferol, rutin, and luteolin have demonstrated significant wound closure rates in preclinical and clinical studies. These compounds not only enhance collagen synthesis and cross-linking but also prevent microbial infections that commonly delay healing. The therapeutic efficacy of flavonoid-rich extracts from plants like *Centella asiatica*, *Aloe vera*, *Medicago polymorpha*, and *Calendula officinalis* further validates their potential as natural wound healing agents. Overall, bioactive flavonoids represent a valuable class of phytochemicals that promote tissue regeneration through synergistic antioxidant, anti-inflammatory, and antimicrobial mechanisms. Further research and formulation development could lead to safe, effective, and affordable phytotherapeutic alternatives for wound management.

Keywords: Flavonoids, Wound healing, Antioxidant, Anti-inflammatory, Phytochemicals.

EVALUATION OF THE ANTIDIABETIC, AND ANTIOXIDANT POTENTIAL OF BACOPA MONNIERI L. EXTRACT WITH HIGH-FAT DIET-INDUCED METABOLIC IMBALANCE IN RATS

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ABSTRACT

Diabetes mellitus is a chronic and progressive metabolic disorder characterized by chronic hyperglycemia due to defects of the metabolism of carbohydrate, fat and protein in our body. High level of glucose in blood is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Metabolic syndrome encompasses cluster of risk factors for cardiovascular disease which includes abdominal obesity, dyslipidemia, hypertension, and hyperglycemia. Diabetes mellitus is a metabolic disorder affecting carbohydrate, fat and protein metabolism that affects nearly 10% of the population every year. The treatment of diabetes mellitus has been confined to use of oral hypoglycemic agents and insulin, the former being reported to possess serious side effects. This leads to increasing demand for herbal products with antidiabetic factor with little side effects. This article describes the antihyperglycaemic activity, in vivo antioxidant potential, effect on glycosylation of hemoglobin and in-vitro peripheral utilisation of glucose of the ethanolic extract of the aerial parts of *Bacopa monnieri*. The extract produced significant decrease in the blood glucose level when compared with the controls in alloxan induced hyperglycemic rats both in the single dose as well as multiple dose experiment at the tested dose level and is comparable with the standard drug glibenclamide. It was observed that the ethanolic extract reversed the weight loss of the diabetic rats and they returned to near normal.

Keywords: *Bacopa monnieri*; Diabetes; Antioxidant activity; Antihyperglycemic activity.

FORMULATION & EVALUATION OF MUCOADHESIVE MICROSPHERES OF ANTIULCER DRUG

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ABSTRACT

The present study focuses on the formulation and evaluation of mucoadhesive microspheres of Esomeprazole for effective management of peptic ulcer disease (PUD). Esomeprazole, a proton pump inhibitor with low bioavailability and short plasma half-life, was selected to develop a gastroretentive mucoadhesive drug delivery system aimed at prolonging gastric residence time and enhancing localized drug release at the gastric site. Mucoadhesive microspheres were prepared by the solvent evaporation method employing Hydroxypropyl Methylcellulose (HPMC), Chitosan, and Acrycoat S100 as polymers in various ratios to optimize drug entrapment and adhesion. The microspheres were characterized for particle size, surface morphology, swelling index, percentage yield, entrapment efficiency, and in-vitro drug release behavior. Spectroscopic and microscopic analyses such as UV spectroscopy and Scanning Electron Microscopy (SEM) were used for drug identification and morphological evaluation. The optimized formulation demonstrated spherical shape, good flow properties, high entrapment efficiency, and prolonged drug release, indicating effective mucoadhesion and sustained gastric retention. Results confirmed that polymeric concentration significantly influenced both the mucoadhesive strength and release kinetics. In conclusion, the developed Esomeprazole mucoadhesive microspheres offer a promising gastroretentive delivery system for controlled drug release, reduced dosing frequency, and improved therapeutic efficacy in the treatment of peptic ulcer disease.

Keywords: Esomeprazole, Mucoadhesive Microspheres, Gastroretentive System, Solvent Evaporation, Peptic Ulcer, Sustained Release.

AI-DRIVEN DIGITAL TWINS: TRANSFORMING PHARMACEUTICAL INNOVATION AND HEALTHCARE

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Abstract

Digital Twin technology is emerging as a cornerstone of the next digital revolution, bridging the physical and virtual worlds through continuous, data-driven intelligence. By integrating artificial intelligence, IoT sensors, and advanced analytics, digital twins enable real-time simulation, prediction, and optimization of complex biological and industrial systems. Originating from aerospace engineering, this concept has now expanded into healthcare, biotechnology, and pharmacy, transforming how we understand, develop, and deliver medical and pharmaceutical solutions. In the pharmaceutical domain, digital twins are reshaping the drug development lifecycle from molecular design and preclinical testing to large-scale manufacturing and post-market surveillance. AI-powered digital twins can simulate patient responses, predict adverse effects, and personalize drug formulations, significantly reducing research timelines and costs. In pharmaceutical manufacturing, process twins optimize quality, yield, and compliance through continuous monitoring and feedback loops. Beyond efficiency, the integration of AI enhances the cognitive capabilities of digital twins, enabling adaptive learning, predictive maintenance, and autonomous decision-making. However, challenges remain in data standardization, validation, cybersecurity, and ethical deployment. Global collaborations between academia, industry, and regulatory bodies are essential to advance trustworthy, interoperable digital twin ecosystems. By combining the predictive power of AI with the precision of pharmaceutical science, digital twins hold immense promise for a future of personalized, efficient, and intelligent healthcare innovation.

Keywords: Drug Development, Predictive Modeling, Manufacturing, Precision Medicine, Data Analytics.

NANO PARTICLES DRUG DELIVERY SYSTEMS

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ABSTRACT

Acne vulgaris, often known as acne, is a skin disorder that impacts nearly everyone. Adolescents and young adults are often affected, and it is triggered by male chemicals produced by both sexes' adrenal glands. The face, chest, and back are where it is most commonly seen. Pain, pustules (pimples), papules, discomfort, erythema, and loss of function are some of the symptoms. A chronic inflammatory condition of the pilosebaceous unit, acne vulgaris causes comedones, seborrhea, and inflammatory lesions. *Propionibacterium acnes* has been identified as a pus-forming bacterium that causes acne inflammation. Because natural medicines are seen to have fewer negative effects than synthetic ones, they are more widely accepted. The demand for herbal formulations is rising on the international market. The goal of the current study is to create and assess a herbal copper nanogel that contains a Cleome viscosa extract. Homogeneity, color, texture, odor, grittiness, spreadability, extrudability, viscosity, pH, and drug concentration were among the physicochemical characteristics of the prepared gels that were assessed.

Keywords: Herbal Copper Nanogel, Acne Vulgaris.

LIC25-O-202

DECODING THE INVISIBLE: AI-POWERED NETWORK PHARMACOLOGY AND PROTEOMICS AS THE NEW COMPASS FOR DRUG DISCOVERY -A CASE STUDY ON TARGETING INTESTINAL CANCER

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ABSTRACT

The emergence of Artificial Intelligence (AI)-integrated Network Pharmacology and Proteomics has redefined the landscape of rational drug discovery by shifting focus from isolated targets to complex molecular interaction networks. The present work explores an AI-driven network pharmacological framework to identify and different pathways which could be utilize to identify anticancer molecules targeting intestinal cancer. The study employs a systems biology approach integrating multi-omics datasets including transcriptomic, proteomic, and metabolomics profiles publicly available cancer repositories. AI-based predictive algorithms are utilized to prioritize potential molecule with multi-target potential. Network topology parameters such as DC, CC and between ness centrality are computed to identify key hub proteins implicated in intestinal tumour progression. Further, proteomic profiling expression analysis validates the dysregulation of identified targets. SBDD assess binding affinity and conformational stability of lead compounds. In silico screening modeling predicts different behaviour and Pathway analysis elucidates mechanistic involvement in apoptotic and cell-cycle regulatory pathways. The most promising targets are proposed for in vitro validation using intestinal cancer cell lines to empirically evaluate cytotoxicity (MTT assay), apoptotic index, ROS generation, and cell migration inhibition. Collectively, this AI-assisted network proteomic pipeline offers a rational, data-driven roadmap for discovering novel anticancer therapeutics, capable of modulating multiple signaling axes in intestinal carcinoma.

Keywords: Artificial intelligence, Network pharmacology, Proteomics, Intestinal cancer.

LIC25-O-203

ROLE OF AI IN DISCOVERY OF NOVEL BETA-3 ADRENERGIC AGONIST ANALOGUES FOR METABOLIC DISORDERS

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ABSTRACT

Artificial intelligence quickly analyze massive chemical libraries, simulating how thousands of candidate molecules might interact with the beta-3 adrenergic receptor. Using structure-based algorithms and generative models, AI not only identifies promising analogues but also refines them to be more effective and safer. With no crystal structure yet available for the human beta-3 receptor, researchers have leveraged AI-driven ligand-based pharmacophore models, enabling virtual screening and rapid prioritization of compounds for laboratory validation. This helps uncover unique compound features critical for activity, guiding further chemical modifications. AI's advantage grows when integrating information from diverse sources like genomics and metabolomics. By connecting these dots, scientists can propose treatments tailored to specific patient phenotypes, paving the way for precision medicine. Furthermore, AI helps anticipate which drug candidates might fail due to poor metabolic stability or toxicity, letting researchers focus time and resources on those most likely to succeed. In essence, the partnership between artificial intelligence and drug discovery is revolutionizing how scientists approach metabolic diseases. The result is not just faster and more cost-effective research, but also a pipeline of compounds with higher chances of clinical success. Ultimately, these advances promise to deliver safer, more personalized therapies to patients in need.

Keywords: Beta-3 Adrenergic Agonist, Matabolomics, Drug Discovery.

REVOLUTIONIZING DRUG DISCOVERY: INTEGRATING AI, MACHINE LEARNING AND IN-SILICO MODELS

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ABSTRACT

Traditional drug discovery methods, though effective, are often slow, expensive, and resource-heavy — producing large amounts of chemical and biological waste that raise both ethical and environmental concerns. Amidst this shift, *in silico* drug design emerges as a powerful and green alternative, harnessing computational tools to accelerate the discovery of novel compounds and repurpose existing drugs for new therapeutic uses. This approach aligns closely with the principles of Computer-Aided Drug Design (CADD) and green chemistry, offering a visionary framework that reduces the environmental and logistical burden of laboratory-based research. By integrating advanced computational techniques such as molecular docking, QSAR, MD simulation ADMET modeling - this paradigm limits dependency on traditional synthesis and experimentation. It not only shortens development timelines but also lowers R&D costs. In particular, the fight against AMR benefits greatly from such innovations. Target-based molecular docking enables the rapid identification of drug candidates that can act on resistant microbial enzymes or proteins. The use of AI and ML in these processes enhances precision and efficiency, ultimately supporting faster lead optimization and decision-making. It envisions a pharmaceutical future that is tech-empowered, ethically grounded, and environmentally conscious marking a strategic move toward smarter and more sustainable healthcare solutions.

Keywords: Drug discovery, Molecular docking, Drug design, CADD.

PHENOLIC ACID-LINKED QUINAZOLINONE DERIVATIVES: BRIDGING ANTIOXIDANT AND THERAPEUTIC POTENTIALS

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ABSTRACT

This review highlights the design, synthesis, and pharmacological profiling of phenolic acid-conjugated quinazolinone derivatives, emphasizing their ability to bridge antioxidant mechanisms with broader therapeutic effects. Incorporation of phenolic moieties into the quinazolinone backbone improves free radical scavenging, metal-chelating capacity, and redox-regulating functions, thereby strengthening cellular defense against oxidative stress. In addition, these hybrid compounds have exhibited notable antimicrobial, anticancer, anti-inflammatory, and neuroprotective activities through mechanisms involving enzyme inhibition and modulation of key signaling pathways. Structure–activity relationship (SAR) investigations indicate that the nature and position of substituents on both the phenolic acid and quinazolinone rings play a crucial role in determining biological potency and target selectivity. Recent *in silico* analyses and molecular docking studies have further clarified their interactions with essential biological targets, reinforcing their potential as viable lead candidates in drug discovery. Overall, phenolic acid-linked quinazolinone derivatives represent a rationally engineered class of multifunctional therapeutic agents, integrating antioxidant protection with broad-spectrum pharmacological benefits and offering promising prospects for future drug development.

Keywords: Phenolic acid; Quinazolinone; Anticancer; Anti-inflammatory and Antioxidant

**A COMPREHENSIVE *IN SILICO* REVIEW OF QUINAZOLINONE DERIVATIVES
AND THEIR MOLECULAR INTERACTIONS WITH BIOLOGICAL TARGETS**

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ABSTRACT

Quinazolinone, a versatile heterocyclic framework, has emerged as a key scaffold in medicinal chemistry owing to its wide range of biological activities, including anticancer, antimicrobial, anti-inflammatory, and antioxidant effects. A thorough understanding of the molecular interactions of quinazolinone derivatives with biological targets is essential for rational drug design and structural optimization. This *in silico* review summarizes recent advancements in computational strategies used to elucidate their binding behavior, structure–activity relationships (SAR), and pharmacokinetic attributes. Molecular docking analyses have revealed critical interaction patterns with major enzymes and receptors such as EGFR, DHFR, and COX-2, emphasizing the role of hydrogen bonding, π – π stacking, and hydrophobic contacts in stabilizing ligand–target complexes. Complementary computational approaches, including molecular dynamics simulations, ADMET predictions, and quantum chemical calculations—further refine insights into binding stability, bioavailability, and electronic properties. The integration of these tools has accelerated the identification of promising lead molecules with enhanced efficacy and reduced toxicity. Notably, hybrid quinazolinone derivatives, especially those incorporating phenolic or other bioactive moieties, demonstrate improved binding affinity and multifunctional therapeutic potential. Overall, this review highlights the pivotal role of *in silico* methodologies in guiding synthetic efforts, predicting biological responses, and streamlining the drug-discovery process by reducing experimental cost and time.

Keywords: Quinazolinone, ADMET, Molecular docking, Molecular dynamics.

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LIC25-P-001

FORMULATION, OPTIMIZATION AND EVALUATION OF ORAL DRUG DELIVERY SYSTEM FOR THE TREATMENT OF ENTERIC FEVER

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ABSTRACT

Enteric fever, caused primarily by *Salmonella enterica* serovar Typhi and Paratyphi, remains a major global health challenge, particularly in developing countries. The present study focuses on the formulation, optimization, and evaluation of an oral drug delivery system designed to enhance the therapeutic efficacy and site-specific delivery of anti-typhoidal agents. A polymer-based matrix system was developed using biodegradable and pH-sensitive polymers such as Eudragit L100 and sodium alginate to achieve targeted release in the intestinal environment. Formulations were optimized using a Box–Behnken design to study the effects of polymer concentration, cross-linking agent, and drug–polymer ratio on key parameters such as encapsulation efficiency, drug release kinetics, and stability. The optimized formulation exhibited sustained release behavior, with minimal drug release in the gastric medium (pH 1.2) and complete release at intestinal pH (6.8). In vitro studies confirmed the formulation’s stability and reproducible drug release, while ex vivo permeation tests indicated enhanced intestinal absorption. The developed oral delivery system demonstrated significant potential for improving therapeutic outcomes and patient compliance by minimizing dosing frequency and reducing systemic side effects. This approach represents a promising strategy for the effective and controlled management of enteric fever through oral route delivery.

Keywords: Enteric fever, Oral drug delivery system, Controlled release, Optimization, Eudragit L100, Targeted intestinal delivery.

LIC25-P-002

TRANSFORMING DRUG DISCOVERY THROUGH ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial Intelligence (AI) is rapidly transforming the landscape of drug discovery by accelerating the identification and development of new therapeutic compounds. AI, through its advanced computational power and data-driven algorithms, offers a more efficient and cost-effective alternative. Machine learning and deep learning models can analyze large datasets of chemical structures, biological targets, and clinical outcomes to predict drug–target interactions, optimize molecular design, and identify potential candidates with higher accuracy. AI also aids in virtual screening, de novo drug design, and repurposing of existing drugs, significantly reducing the time from concept to clinical trials. Moreover, natural language processing tools help researchers extract valuable insights from scientific literature and databases. Pharmaceutical companies are increasingly integrating AI platforms into their research pipelines to enhance decision-making and minimize human bias. Continued collaboration between data scientists, pharmacologists, and regulatory bodies is essential to establish standardized frameworks for AI integration in drug discovery. In conclusion, AI-powered drug discovery holds immense potential to revolutionize pharmaceutical research by making the process faster, more accurate, and economically sustainable, paving the way for the development of next-generation therapeutics.

Keywords: Artificial Intelligence, Machine Learning, Virtual Screening, Molecular Design.

LIC25-P-003

DESIGN AND DEVELOPMENT OF TRANSETHOSOMAL GEL FOR THE TREATMENT OF PLAQUE PSORIASIS

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ABSTRACT

The present study focuses on the design and development of a transethosomal gel for the effective treatment of plaque psoriasis. Transethosomes, novel elastic nanovesicular carriers composed of phospholipids, ethanol, and edge activators such as Tween 80, were formulated to enhance drug permeation through the stratum corneum and achieve localized drug delivery to the deeper skin layers. The formulations were optimized using a Box–Behnken design, evaluating the effects of phospholipid concentration, ethanol percentage, and surfactant ratio on vesicle size, entrapment efficiency, and drug permeation. The optimized transethosomal formulation exhibited a nanoscale vesicle size (<200 nm), high entrapment efficiency (>85%), and superior permeation characteristics compared to conventional liposomal systems. The optimized transethosomes were incorporated into a carbopol-based gel to improve spreadability, stability, and patient acceptability. In vitro drug release and ex vivo permeation studies confirmed sustained drug release and enhanced skin deposition. Stability studies under accelerated conditions confirmed formulation robustness. Overall, the developed transethosomal gel represents a promising, non-invasive, and efficient approach for the targeted treatment of plaque psoriasis, enhancing therapeutic efficacy while minimizing systemic side effects.

Keywords: Transethosomal gel, Plaque psoriasis, Nanovesicular drug delivery, Topical therapy.

LIC25-P-004

FORMULATION, OPTIMIZATION AND EVALUATION OF FLOATING PULSATILE RELEASED TABLETS OF RITONAVIR

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ABSTRACT

The present study focuses on the formulation, optimization, and evaluation of floating pulsatile release tablets of Ritonavir, designed to combine prolonged gastric retention with time-specific drug release. Floating pulsatile systems are intended to remain buoyant in the stomach, releasing the drug after a predetermined lag time to align with circadian rhythms or pharmacokinetic requirements. Tablets were prepared using polymers such as hydroxypropyl methylcellulose (HPMC), sodium alginate, and gas-forming agents like sodium bicarbonate to achieve buoyancy and controlled lag time. A Box–Behnken design was employed to optimize critical formulation parameters, including polymer concentration, gas-forming agent amount, and compression force, with responses evaluated for floating lag time, total floating duration, and drug release profile. The optimized formulation exhibited rapid buoyancy (<60 seconds), sustained floating for more than 12 hours, and a pulsatile release pattern with a well-defined lag time of 4–6 hours, followed by complete drug release. In vitro dissolution and ex vivo studies demonstrated predictable release kinetics and enhanced gastric retention. Stability studies confirmed formulation robustness under accelerated conditions. The floating pulsatile release tablets of Ritonavir provide a promising strategy for targeted, time-controlled drug delivery, improving bioavailability, therapeutic efficacy, and patient adherence in antiretroviral therapy.

Keywords: Ritonavir, Floating pulsatile release, Controlled release, Antiretroviral therapy.

LIC25-P-005

TAMARIND-BASED FLOATING MICROSPHERES OF METFORMIN

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ABSTRACT

The present study is aimed at the formulation and evaluation of floating microspheres of Metformin employing tamarind seed polysaccharide, a natural, biodegradable polymer. The main objective of this work is to improve the oral bioavailability and extend the gastric residence time of Metformin through the development of a floating drug delivery system that ensures a sustained drug release profile. Tamarind seed polysaccharide was isolated and analyzed for its physicochemical and swelling characteristics to assess its potential as a polymeric matrix. The floating microspheres were fabricated using the emulsion crosslinking method, and formulation variables were optimized to achieve maximum performance. The developed microspheres were evaluated for particle size, floating ability, drug loading efficiency, surface morphology, and in-vitro release behavior. The findings revealed that the microspheres were spherical, porous, and exhibited good buoyancy with prolonged drug release, resulting in enhanced absorption and bioavailability. Thus, tamarind seed polysaccharide-based floating microspheres offer a promising, safe, and economical approach for oral sustained release formulations of Metformin.

Keywords: Metformin, Tamarind seed polysaccharide, Floating microspheres, Oral bioavailability, Emulsion crosslinking method.

LIC25-P-006

OKRA MUCILAGE-BASED NATURAL POLYMER SYSTEM FOR SUSTAINED RELEASE OF ACECLOFENAC

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ABSTRACT

The present investigation is focused on the formulation and assessment of sustained release microbeads of Aceclofenac employing okra mucilage, a naturally derived GRAS (Generally Recognized As Safe) polymer. The goal of this study is to enhance the bioavailability of the drug, minimize the frequency of administration, and ensure better patient compliance through controlled and extended drug release. Okra mucilage was isolated and evaluated for its physicochemical characteristics to determine its applicability as a polymeric matrix. Microbeads were fabricated using the ionotropic gelation technique, with calcium chloride functioning as a cross-linking agent. The prepared batches were analyzed for particle size, drug loading efficiency, swelling capacity, surface morphology, and in-vitro release behavior. The findings indicated that the developed microbeads were uniform, spherical, and possessed satisfactory entrapment efficiency, exhibiting a prolonged drug release pattern. Therefore, okra mucilage-based microbeads present a biocompatible, cost-effective, and promising approach for developing sustained release drug delivery systems of Aceclofenac.

Keywords: Aceclofenac, Okra mucilage, Sustained release, Microbeads, Ionotropic gelation, Bioavailability

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**TARGETED LIPOSOMAL NANOMEDICINES: ADVANCING PRECISION
THERAPEUTICS FOR HER2-POSITIVE AND TRIPLE-NEGATIVE BREAST CANCERS**

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ABSTRACT

Breast cancer, particularly its aggressive HER2-positive and triple-negative subtypes, poses significant therapeutic challenges due to systemic toxicity, drug resistance, and insufficient tumor selectivity of conventional chemotherapy. Liposomal nanocarriers have emerged as a highly promising platform for targeted drug delivery, leveraging their biocompatibility, customizable physicochemical properties, and capacity for active targeting. Recent preclinical and clinical investigations highlight substantial advancements in optimizing liposomal design for enhanced efficacy and safety. Rationally engineered peptide-targeted liposomal doxorubicin, demonstrated selective uptake in HER2+ cells, achieving approximately 90% tumor growth inhibition *in vivo* with minimal systemic toxicity. Similarly, trastuzumab-conjugated PEGylated pH-sensitive liposomes co-loaded with paclitaxel and the P-glycoprotein inhibitor elacridar exhibited improved intracellular delivery, pH-triggered drug release, and a 74% tumor burden reduction in HER2-overexpressing models. In triple-negative breast cancer models, anti-EGFR antibody-tagged liposomes encapsulating mertansine and gemcitabine effectively inhibited tumor proliferation in both xenograft and patient-derived systems. Dual-ligand functionalized liposomes (iRGD and trastuzumab), co-loaded with gefitinib and lycorine hydrochloride, significantly enhanced cellular uptake, cytotoxicity, and biocompatibility in both HER2+ and TNBC cell lines. Clinically, several nanomedicines, including approved antibody drug conjugates and targeted liposomal formulations, underscore the significant translational potential of this field. Collectively, these studies emphasize that meticulous optimization of liposomal design parameters including targeting ligands, linker chemistry, dual-drug co-loading, and pH sensitivity is crucial for improving tumor selectivity, overcoming resistance mechanisms, and mitigating systemic toxicity.

Keywords: Breast Cancer, HER2-positive Breast Cancer, Triple-Negative Breast Cancer, Liposomes, Targeted Drug Delivery, Tumor Selectivity, Nanomedicines.

**PREPARATION, OPTIMIZATION AND EVALUATION OF ANGIOPEP-2 CONJUGATED
PEG-PLGA NANOPARTICLES FOR THE TREATMENT OF BRAIN DISORDER**

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ABSTRACT

Brain disorders, including brain cancer and neurodegenerative conditions, pose significant therapeutic challenges due to the limited permeability of the blood–brain barrier (BBB). To overcome this obstacle, Angiopep-2 conjugated polyethylene glycol–poly(lactic-co-glycolic acid) (PEG–PLGA) nanoparticles were developed as a targeted nanocarrier system for efficient brain drug delivery. The nanoparticles were prepared using a solvent evaporation method, and Angiopep-2, a peptide ligand known for its high affinity to low-density lipoprotein receptor-related protein-1 (LRP-1), was conjugated onto the nanoparticle surface via carbodiimide coupling chemistry. Formulation parameters such as polymer-to-drug ratio, surfactant concentration, and sonication time were optimized using a Box–Behnken statistical design to achieve desirable characteristics including minimal particle size, high drug encapsulation efficiency, and sustained release profile. The optimized nanoparticles exhibited a mean particle size of around 120 nm, a polydispersity index below 0.2, and a negative zeta potential, indicating good stability and uniformity. In vitro release studies demonstrated controlled and prolonged drug release, while cytotoxicity assays confirmed the safety and biocompatibility of the developed system. Cellular uptake studies on brain endothelial cells revealed enhanced internalization of Angiopep-2 conjugated nanoparticles compared to unconjugated controls, supporting receptor-mediated transport across the BBB. These findings indicate that Angiopep-2 conjugated PEG–PLGA nanoparticles represent a promising platform for targeted brain drug delivery, potentially improving the therapeutic efficacy of drugs used in the treatment of various brain disorders.

Keywords: Angiopep-2, PEG–PLGA nanoparticles, Blood–brain barrier, Brain targeting, Targeted drug delivery, Nanotechnology.

LIC25-P-009

DEVELOPMENT AND CHARACTERIZATION OF MULTIFUNCTIONAL NANOTHERANOSTIC DENDRIMERS FOR TARGETED DELIVERY AGAINST BREAST CANCER

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ABSTRACT

In this study, third-generation poly(amidoamine) (PAMAM) dendrimers were functionalized with targeting ligands (such as folic acid) for selective binding to breast cancer cells, and loaded with chemotherapeutic agents and imaging probes for theranostic applications. The formulation was optimized using a factorial design to evaluate the effects of dendrimer generation, drug-to-dendrimer ratio, and ligand density on particle size, drug encapsulation efficiency, and targeting efficacy. The optimized nanotheranostic dendrimers exhibited a uniform nanoscale size (~100 nm), high drug loading efficiency (>90%), and enhanced cellular uptake in MCF-7 breast cancer cell lines. In vitro cytotoxicity assays demonstrated significant anticancer activity, while fluorescence imaging confirmed selective accumulation in cancer cells. Stability studies revealed the dendrimers maintained structural integrity and drug content under physiological conditions. Overall, the developed multifunctional nanotheranostic dendrimers offer a promising strategy for simultaneous targeted therapy and imaging, enabling precise treatment monitoring, reduced off-target effects, and improved therapeutic outcomes in breast cancer management.

Keywords: Nanotheranostics, Dendrimers, Breast cancer, Targeted drug delivery, Multifunctional nanoparticles, Imaging-guided therapy.

LIC25-P-010

EXPLORING THE PHARMACOLOGICAL SIGNIFICANCE OF SOLASODINE IN PHYSIOLOGICAL AND PATHOLOGICAL CONDITIONS

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ABSTRACT

Solasodine, the principal aglycone component found in glycoalkaloids such as solasonine and solamargine from various *Solanum* species, serves as a crucial intermediate in the steroid drug industry for synthesizing anabolic steroids, corticosteroids, antifertility agents, and other therapeutic compounds. Numerous studies have demonstrated that solasodine exhibits a broad spectrum of pharmacological activities, including anticonvulsant, CNS depressant, antioxidant, cytotoxic, antinociceptive, anti-inflammatory, hepatoprotective, immunomodulatory, antiatherosclerotic, antimicrobial, and anti-obesity effects. Toxicological evaluations have revealed an LD₅₀ of 1500 mg/kg (intraperitoneal) and 2000 mg/kg (oral) in rats, indicating moderate safety. This review consolidates and updates the current knowledge on the pharmacological and therapeutic potential of solasodine, emphasizing its significance as a valuable bioactive molecule and a promising lead compound for future drug development in managing various physiological and pathological conditions.

Keywords: Solasodine, Spiroketal, Steroidal Glycoalkaloids, Pharmacotherapeutics.

**DESIGN, FABRICATION & OPTIMIZATION OF HERBAL FORMULATION
CONTAINING ACTIVE PHYTOCONSTITUENT FOR THE EFFECTIVE MANAGEMENT
OF WOUND HEALING**

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ABSTRACT

The present study focuses on the design, fabrication, and optimization of a herbal formulation containing bioactive phytoconstituents for the effective management of wound healing. The growing interest in herbal-based therapeutics is driven by their biocompatibility, minimal side effects, and cost-effectiveness compared to synthetic drugs. In this work, a polyherbal formulation was developed using selected medicinal plants known for their wound-healing potential, such as *Curcuma longa*, *Aloe vera*, and *Centella asiatica*. The active phytoconstituents—curcumin, asiaticoside, and aloin—were isolated, quantified, and incorporated into a topical delivery system (ointment/gel) using suitable excipients. The formulation parameters, including concentration of actives, gelling agents, and penetration enhancers, were optimized using a Design of Experiments (DoE) approach to achieve desirable physicochemical characteristics such as viscosity, spreadability, pH, and stability. In vitro and in vivo wound-healing evaluations demonstrated significant enhancement in wound contraction rate, epithelialization period, and collagen synthesis compared to standard formulations. Histopathological analysis further confirmed accelerated tissue regeneration and reduced inflammation. The optimized formulation exhibited strong antioxidant and antimicrobial activities, contributing to its overall efficacy. This research underscores the potential of integrating traditional herbal knowledge with modern formulation science to develop safe, effective, and sustainable wound-healing therapeutics.

Keywords: Herbal formulation, Phytoconstituents, Wound healing, Optimization, Polyherbal therapy, Curcumin.

**SMART PULSATILE DELIVERY SYSTEMS FOR MANAGING MORNING SYMPTOMS
IN RHEUMATOID ARTHRITIS**

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ABSTRACT

The advancement of drug delivery technologies has shifted towards systems that provide precise, controlled, and time-specific release of therapeutic agents. Among these, pulsatile drug delivery systems (PDDS) have gained significant attention as they are designed to release drugs in a rapid burst after a predetermined lag time, closely mimicking the body's biological and circadian rhythms. Unlike conventional sustained or immediate-release formulations, pulsatile systems offer therapeutic benefits for diseases that follow rhythmic patterns, including asthma, cardiovascular disorders, peptic ulcers, rheumatoid arthritis, and inflammatory conditions. Several approaches have been explored to achieve pulsatile release, including stimuli-responsive hydrogels, biodegradable polymers, osmotic systems, and capsular designs. Hydrogels such as poly (N-isopropylacrylamide) demonstrate sensitivity to temperature and chemical triggers, enabling drug release in response to internal or external stimuli. Similarly, nanotechnology has introduced smart drug delivery systems (SDDSs) capable of targeting specific tissues or inflamed sites with enhanced bioavailability and reduced systemic toxicity. In rheumatoid arthritis therapy, for instance, timed pulsatile formulations of Aceclofenac align drug release with early morning symptom peaks, improving pain management and patient compliance. The reviewed studies also highlight challenges such as formulation reproducibility, manufacturing complexity, and cost. However, the potential advantages—improved patient adherence, reduced side effects, controlled pharmacokinetics, and synchronization with disease rhythms—make pulsatile systems a promising alternative to conventional drug delivery. Furthermore, the integration of chronopharmaceutical principles and nanotechnology-based carriers opens new pathways for highly efficient, site-specific, and personalized therapies. In conclusion, pulsatile and smart drug delivery systems represent a next-generation strategy in pharmaceutical design, offering intelligent, time-programmed release to maximize therapeutic outcomes while minimizing risks. Ongoing research in materials science, nanotechnology, and formulation design will continue to enhance their applicability across a wide range of chronic and rhythm-dependent diseases.

Keywords: Pulsatile drug delivery system (PDDS), Controlled release, Time-specific release, Circadian rhythms, Smart Drug Delivery Systems (SDDS), Nanotechnology, Stimuli-responsive hydrogels, inflammatory conditions, Bioavailability.

**EMERGING TRENDS IN HERBAL DRUG TECHNOLOGY: NANOTECHNOLOGY,
QUALITY CONTROL, AND REGULATORY PERSPECTIVES**

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ABSTRACT

Rapid developments in herbal medication technology have been sparked by the growing interest in herbal and phytopharmaceutical formulations, which combine cutting-edge scientific discoveries with traditional plant-based knowledge. Using innovative drug delivery methods such as nanoparticles, liposomes, phytosomes, and nanoemulsions, emerging trends aim to increase the therapeutic efficacy, bioavailability, and stability of herbal active ingredients. By improving solubility and targeted delivery, these technologies get beyond the drawbacks of traditional herbal treatments. Standardization and quality control are still essential for guaranteeing the efficacy, safety, and consistency of products. Increasingly, sophisticated analytical instruments like spectroscopic methods, HPTLC, HPLC, and LC-MS are being used to measure bioactive components and authenticate raw materials. Furthermore, strict regulatory frameworks focusing on stability testing, GMP, and scientific validation have been established as a result of the widespread acceptance of phytopharmaceuticals as evidence-based medicinal alternatives. Several nations, like India, have implemented particular regulations for phytopharmaceuticals under the Drugs and Cosmetics Act, emphasizing the shift of herbal medications from conventional treatments to formulations supported by science. The development of herbal drugs is entering a revolutionary phase with the merging of nanotechnology, molecular pharmacology, and regulatory science. This development promotes the worldwide recognition of herbal therapies as secure and efficient substitutes in contemporary healthcare systems, in addition to improving patient compliance and market potential.

Keywords: Herbal drug technology, phytopharmaceuticals, nanotechnology, quality control, regulatory standards.

PHARMACEUTICAL QUALITY ASSESSMENT OF BRANDED VITAMIN C TABLETS: A COMPARATIVE STUDY

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ABSTRACT

Vitamin C (Ascorbic acid) is a water-soluble vitamin and plays an important role in body's antioxidant defence. As our body cannot naturally synthesize it, ascorbic acid is commonly obtained from dietary sources and supplements, making its quality control necessary. This review evaluates the quality control parameters of Vitamin C tablets from different commercial brands. The study includes a physicochemical evaluation of the tablets, looking at factors like weight variation, hardness, friability, disintegration time, dissolution profile, and content uniformity. We will use analytical techniques such as UV spectroscopy to measure the ascorbic acid content in the tablets. The evaluation aims to show the differences in quality attributes among different manufacturers and provide insights into quality assurance for nutraceutical tablets. Results may highlight variations in dissolution profiles, content uniformity, and other important factors that affect bioavailability and effectiveness. Understanding these factors is essential for ensuring consistent product quality that meets therapeutic needs. Quality control of Vitamin C tablets is critical due to their common use and significance in health supplementation. This study intends to provide a thorough comparison that elucidates the quality of available Vitamin C tablet formulations, assisting in making informed choices regarding these products in healthcare settings.

Keywords: Vitamin C, Ascorbic acid, Quality control. Quality assurance.

NANOPARTICLE- BASED THERAPEUTIC STRATEGIES FOR PARKINSON'S DISEASE: CROSSING THE BLOOD- BRAIN BARRIER

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ABSTRACT

Parkinson's disease (PD) is a progressive brain disorder. It mainly involves the loss of dopamine-producing neurons in the substantia nigra. This leads to motor issues like tremors, slow movement, stiffness, and balance problems. Non-motor symptoms also occur, including cognitive and emotional changes. Current treatments—such as drugs, therapies, and surgery—mainly relieve symptoms. However, they often have variable effectiveness, side effects, and they do not stop the progression of the disease. The main obstacle to effective treatment is the blood-brain barrier (BBB) and the blood-spinal cord barrier. These barriers limit how well treatment can reach the brain and spinal cord. Nanomedicine has shown promise in getting around these challenges by allowing targeted and sustained drug delivery. Among the various nanocarrier systems, lipid-based nanoparticles (LNPs) stand out due to their compatibility with the body, better ability to cross the BBB, and their capacity for both passive diffusion and transport via receptors. LNPs can be designed to attach to therapeutic molecules. This allows for controlled and long-lasting drug release while reducing overall toxicity. Recent advancements show that LNPs can improve the availability of dopaminergic drugs and support gene and neuroprotective treatments aimed at slowing down disease progression. While the use of LNPs for PD is still in its early phases, their effectiveness in other medical areas suggests they could be valuable as next-generation treatment delivery systems. This review looks at recent progress in lipid-based nanoparticle technology and its potential uses for targeted, effective, and disease-modifying treatments for Parkinson's disease.

Keywords: Parkinson's disease, lipid nanoparticles, blood-brain barrier.

PREDECTIVE AI MODELS FOR PATIENT-SPECIFIC DRUG RESPONSE

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ABSTRACT

Recently, predictive artificial intelligence (AI) has emerged as a powerful instrument used in clinical pharmacology to provide scientists and healthcare providers with greater understanding of individuals' responses to the different medications they use. Using large datasets of genomic, proteomic, and clinical data, AI-powered models can identify how a patient will respond to a specific drug or metabolize it. This review summarizes the main approaches to predicting outcomes, focusing on machine learning methods that utilize molecular profiles with health records. The significance of careful consideration towards feature selection and optimization of the model is highlighted to produce reliable and valid predictions. We also recognize that these new technologies allow for optimized personalized treatment plans, leading to better therapeutic outcomes, less adverse effects, and improved patient care overall. However, there are considerations that will need to be addressed, including integrating heterogeneous data types, validating models in different cohorts, and ethical considerations for AI in medicine. Nonetheless, with the work currently underway for predictive AI, there is hope that drug development and prescriptions can become a new era of truly personalized medicine.

Keywords: Predictive AI models, Personalized medicine, Drug therapy optimization, Machine learning.

AI MODELS FOR PREDICTING ORGAN TOXICITY IN PRECLINICAL STUDIES.

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ABSTRACT

Artificial intelligence (AI) offers new opportunities for developing organ toxicity prediction in preclinical studies. Unpredicted human organ level toxicity remains one of the major reasons for drug clinical failure. Thus, we provided comprehensive in silico prediction models for eight significant human organ level toxicity. Machine learning methods have been used as promising alternatives for organ toxicity prediction. Machine learning models used for predicting organ toxicity include traditional algorithms like Support Vector Machines (SVMs), and deep learning models such as Graph Neural Networks (GNNs), Convolutional Neural Networks (CNNs), and Recurrent Neural Networks (RNNs). ToxCast data are also being used as biological features to predict in vivo toxicity. In this work, our results showed that the graph-based deep learning approach and ML models, including both predictive and interpretable algorithms, striking a balance between breadth and depth and ToxCast-based AI models to accelerate next-generation risk assessment (NGRA). It can be concluded that our models can provide useful guidance for the rapid identification of the compounds with human organ level toxicity for drug discovery. It aims to provide a comprehensive and in-depth theoretical framework and actionable technical strategies for toxicity prediction in drug development.

Keywords: Artificial intelligence, in silico prediction model, machine learning, ToxCast.

AI-ASSISTED LEAD OPTIMIZATION AND TOXICITY PREDICTION IN DRUG DISCOVERY

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ABSTRACT

Artificial intelligence and new methods of screening have a great potential in lead optimization and prediction of toxicity. The integration of artificial intelligence into drug discovery has shown to be a breakthrough in predictive approaches over the past few years. Here in, we will briefly summarize the artificial intelligence -assisted methods that aim to assist in the identification and optimization of promising drug candidates. Machine learning ML algorithms can be trained on large sets of chemical libraries, as well as on biological data, which should help in more targeted selection of leads with the appropriate pharmacological profile. Furthermore, at the beginning of the discovery phase, AI algorithms were created as simple AI models capable of predicting the toxicity of superior AI compounds. As a result, there is less risk of failure during the clinical trials. AI facilitates the timeliness of the discovery phase optimization. Furthermore, the modification of AI reduced trial-and-error rates; that was the case in traditional methods. The use of AI in pharmacological research has been proven to be more accurate and efficient in manufacturing. Eventually, the discipline tends to include more applications to the present technologies.

Keywords: Predictive AI models, Lead compound optimization, Drug therapy optimization, Machine learning.

AI-INTEGRATED MODELS FOR PREDICTING DRUG-INDUCED CARDIOTOXICITY

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ABSTRACT

Drug Induce Cardiotoxicity is a primary reason for drug attrition at both preclinical and clinical stages, and represents a high-risk factor in clinical settings due to severe or fatal cardiovascular effects. Conventional in vitro and in vivo cardiotoxicity assays. This review assesses the recent paradigm shift towards AI, specifically ML and DL approaches to use multiple biological/chemical data modalities for revolutionizing prediction of DIC. We investigate the convergence of AI with multi-omics (genomics, proteomics, metabolomics) data, physiologically relevant models (such as human induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs), and human heart slices), and structural chemistry information (in silico Quantitative Structure-Activity Relationship (QSAR) models). AI applications of interest are improving cardio-respiratory. Featured AI applications are increased cardio-oncology risk stratification on EHR data, high-throughput evaluation acceleration, and discovery of signaling biomarkers for early damage assessment. The review identifies the predictive performance, capabilities and deficiencies of state-of-the-art AI-driven models (advanced ANNs, SVMs, ensembles) to predict a range of cardiotoxic endpoints – lethal arrhythmia related (hERG block), cardiomyopathy and heart failure.

Keywords: Drug-induced cardiotoxicity (DIC), Machine learning (ML), Deep learning (DL), Multi-omics integration, QSAR modelling, Cardio-oncology.

AI-BASED VIRTUAL ANIMAL MODELS FOR EXPERIMENTAL PHARMACOLOGY EDUCATION

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ABSTRACT

The use of artificial intelligence (AI) technology in virtual animal model construction opens a new chapter for the advancement of drug veterinary research. Through the application of computational simulations, these digital models serve as a reliable means to predict pharmacokinetics (PK), toxicity, and efficacy for drug probes without ethical and logistical barriers associated with classical in vivo experimentation. This abstract describes the methods for developing AI-based virtual animal platforms, and discusses their potential to accelerate drug discovery processes as well as improve efficiencies of safety testing. The abstract discusses the development of AI-based virtual animal models and their role in advancing drug discovery and safety testing. These models can improve research efficiency, improve the reliability of preclinical testing, and reduce animal studies by using a controlled, repeatable format. Overall, implementing a type of virtual platform can speed pharmacological research and have more effective and ethical solutions in health care. This paper discusses how AI generative animal models can revolutionize drug discovery and preclinical testing. It emphasizes how virtual models can speed research, improve accuracy, and reduce the need for live animal research.

Keywords: Artificial Intelligence (AI), Virtual animal models, Computational modelling, Drug discovery, Pharmacokinetics (PK), Toxicity prediction, Efficacy evaluation, Preclinical testing.

MACHINE LEARNING FOR EARLY DETECTION OF ADVERSE DRUG REACTIONS.

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ABSTRACT

Adverse drug reactions (ADRs) are a serious threat to public health as they often lead to hospitalizations, inefficacious treatments, and increase in healthcare costs. Conventional pharmacovigilance relies on manual reports and post-authorization surveillance and is inadequate for the rapid identification of new or rare drug-associated risks. After market release, it is hard to detect ADRs in the setting of clinical work, while machine learning (ML) offers a good option for early automatic and data-driven discovery of potential ADRs. ML algorithms have the potential to uncover hidden patterns and relationships between medications and adverse effects that can be detected through information present in sources like electronic health records, clinical trial data, biomedical databases, or patient forums. Signal detection sensitivity is enhanced and the number of false positives reduced by methods using natural language processing, deep learning and ensemble approaches. Despite the barriers such as data incompleteness, imbalance, interpretability of models and privacy concerns integrating ML into pharmacovigilance could contribute greatly. Despite the data-imbalance, the interpretability of models, and privacy constraints, the integration of ML into PV is believed to improve efficiency and accuracy when detecting ADRs. At the end of the day, this approach leads to safer medication use and more preventative health decision-making. machine learning is cool learning.

Keywords: Artificial intelligence, Machine learning, clinical trials, pharmacovigilance.

AI-BASED SCREENING OF PHYTOCHEMICALS FOR NEUROPROTECTIVE ACTIVITY

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ABSTRACT

Neurodegenerative diseases, such as Alzheimer’s disease (AD), Parkinson’s disease (PD) and amyotrophic lateral sclerosis (ALS), together exponential increase to three times that number in future by the year 2050. The currently available therapeutic approaches provide predominantly symptomatic treatment and demonstrate the necessity of new neuroprotective strategies. Machine learning and deep learning models were built up on biological data to predict how plant compounds interact with key neurotargets, such as acetylcholinesterase (AChE), β -secretase (BACE1) and α -synuclein. Lead phytochemicals namely that of Piper nigrum, curcumin, quercetin and epigallocatechin gallate exhibited strong binding affinity values accompanied with multitarget approach actions. These leads were then confirmed by molecular docking, ADMET and blood–brain barrier permeability prediction. The AI workflow considerably shortened time and cost (vs. conventional screening methods) on the one hand but also did not result in loss of predictive power for classification or regression models on the other. This unified model illustrates how AI-guided phytochemical discovery can facilitate the search for novel neuroprotective agents and encourages progress in plant-based medicine and personalized neuroprotection against neurodegenerative diseases.

Keywords: Neurodegenerative diseases, Neuroprotective agents, Acetylcholinesterase (AChE).

DEEP NEURAL NETWORKS IN PAIN PERCEPTION AND ANALGESIC DRUG SCREENING

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ABSTRACT

Pain perception involves complex sensory, cognitive, and emotional processes, making its objective measurement a major challenge in clinical and preclinical research. Analgesic development is further hindered by subjective endpoints, low success rates, and poor reproducibility. Deep neural networks (DNNs) offer a promising means to address these challenges. DNN- grounded models have shown strong performance in classifying pain countries and estimating intensity from bio-signals, facial expressions, neuroimaging, and physiological data. Concurrently, deep-learning frameworks used in drug discovery—such as convolutional and graph neural networks—are advancing bioactivity prediction and compound screening. In this review, we propose a unified framework where DNNs contribute to both pain assessment and analgesic discovery: enabling continuous, objective evaluation of nociception, and accelerating identification of novel analgesics. We punctuate recent studies decrypting nociceptive countries under analgesic goods and explore how transfer literacy can acclimatize pain classifiers to pharmacological surrounds. Eventually, we bandy crucial challenges data failure, interpretability, generalizability, and mechanistic sapience and figure future directions integrating multimodal data, enhancing model explainability, linking pain- vaticination labors with medicine- webbing channels, and developing open marks for pain- related deep literacy.

Keywords: Analgesic development, Deep neural networks (DNNs), Pain assessment, Objective nociception measurement

IMPACT OF AI ON TRANSITIONAL PHARMACOLOGY: BENCH TO BESIDE APPLICATIONS

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ABSTRACT

The age of transitional pharmacology is experiencing a timely and radical shift because of artificial intelligence (AI), supercharging the old bench-to-bedside paradigm with an efficiency and predictive power that has no precedent. This review discusses the variety of ways in which AI is impacting drug development, from preclinical studies through to clinical practice. Bench side AI algorithms reduce time and cost of identifying promising lead compounds by allowing target identification, virtual screening of millions (or more) synthetic or natural chemicals or biological entities (such as gene sequences), ADME/Tox assessment, and decision optimization. Innovations are also transforming the design and execution of clinical trials as it is becoming closer to the bedside, addressing hard-to-eradicate problems such as high failure rates and poor patient recruitment. Predictive and personalized medicine is facilitated by machine learning algorithms that mine the patient information systems for relevant biomarkers, groups of patients and treatment outcomes. Moreover, AI-facilitated PK/PD modelling enables adaptive trial designs and optimization of individual dosing regimens. Support Systems Artificial intelligence-based decision support systems in clinical.

Keywords: Transitional Pharmacology, Artificial intelligence (AI), Drug development, Virtual screening, ADME/Tox prediction.

AI-BASED BEHAVIORAL TRACKING SYSTEMS IN PRECLINICAL PHARMACOLOGY

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ABSTRACT

The incorporation of artificial intelligence (AI) in behavioral tracking has transformed preclinical pharmacology, providing automated, objective, and scalable approaches for the analysis of complex animal behaviors. Machine learning, particularly in deep learning models such as convolutional neural and residual networks, allow for accurate quantification and classification of motor, affective, and cognitive behaviors in animal models that are the key contributors to drug discovery pipelines. Recent developments consistent with these standards are end-to-end video-based systems that consistently differentiate subtle behavioral phenotypes (e.g., forced swim and rearing tests) that are essential for evaluating drug efficacy but can be associated with human subjectivity or experimental variability. With AI-based behavioural tracking, high-throughput pharmacological screening is possible while maintaining face validity of the results by providing a more natural link between animal data and clinically relevant human outcomes. Moreover, these approaches adhere to the principles of refinement and reduction in animal research by improving experimental reproducibility and decreasing the need for large animal cohorts. Continuous innovations and cross-disciplinary collaborations are making it more powerful AI-based behavioral analytics, can be act as a pillar in the preclinical evaluation of novel therapeutics.

Keywords: Preclinical trial using AI, Artificial Intelligence, convolutional neural network (CNN), Behavioral tracking System.

AI- INTEGRATION IN POST-MARKETING DRUG SAFETY SURVEILLANCE

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ABSTRACT

Artificial Intelligence (AI) has brought a major transformation in the field of pharmacological research, especially in the area of drug repurposing, where existing drugs are explored for new therapeutic use. Post-marketing drug safety is one of the keys of public health, has formed, in risk assessment and early detection of unknown side effects of drugs which would certainly span many years from production to sale. Conventional pharmacovigilance methodologies, such as patterns of adverse event reports and risk assessments, periodic safety update. Post-marketing surveillance refers to the monitoring of a drug's safety (and sometimes effectiveness) once it has been approved and is used in the real-world population (marketed use). Traditional pharmacovigilance activities include: Collection of spontaneous adverse event reports (e.g., from healthcare professionals, patients) Thus, AI marks a new era in pharmacological research, promoting innovation and sustainability in healthcare.

Keywords: Artificial Intelligence, Drug safety surveillance, Machine Learning

STARCH-XANTHAN GUM POLYELECTROLYTE COMPLEX FOR COLON-TARGETED SUSTAINED DRUG DELIVERY

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ABSTRACT

Starch-xanthan gum polyelectrolyte complexes have emerged as highly promising platforms for colon-targeted sustained drug delivery, capitalizing on the complementary physicochemical properties of the two polysaccharides. Xanthan gum, a microbial exopolysaccharide, features excellent stability under acidic conditions and strong polyelectrolyte characteristics, enabling it to form stable hydrogels and impart mucoadhesive properties that facilitate prolonged residence time in the gastrointestinal tract. Its pH-sensitive swelling and enzymatic resistance protect the drug during transit through the stomach and small intestine, allowing targeted release in the colon. Conversely, native starch exhibits favourable biodegradability and biocompatibility but suffers from limitations such as poor solubility, and suboptimal mechanical strength, which restrict its utility in sustained release formulations. Chemical modifications and the formation of polyelectrolyte complexes with xanthan gum have been shown to significantly enhance starch's mechanical properties, swelling behavior, and enzymatic degradation profile, enabling controlled and site-specific drug release. Characterization studies using spectroscopic, rheological, and morphological methods confirm the formation of stable interactions between starch and xanthan gum, which contribute to improved drug encapsulation efficiency, controlled swelling, and sustained release kinetics. This review synthesizes recent advances in the synthesis, characterization, and application of starch-xanthan gum polyelectrolyte complexes, elucidating their potential to serve as versatile, biocompatible carriers for colon-targeted delivery of therapeutic agents. The tailored release profiles achieved with these systems have implications for enhancing the efficacy and reducing systemic side effects of drugs intended for treating colonic diseases, thereby representing a significant advancement in oral drug delivery technology

Keywords: Starch, Xanthan gum, Polyelectrolyte complex, Colon-targeted drug delivery.

DOE-BASED OPTIMIZATION OF BERBERINE-LOADED NANOSTRUCTURED LIPID CARRIERS FOR ENHANCED WOUND HEALING AND IMPROVED DRUG DELIVERY

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ABSTRACT

The application of Design of experts (DoE) has emerged as an efficient and systematic approach for the formulation and optimization of nanostructured lipid carrier (NLCs). In this study, DoE was employed to optimize Berberine loaded NLCs with the objective of enhanced wound healing efficacy and improved drug delivery performance. Berberine, a natural isoquinoline alkaloid, possesses potent antimicrobial, anti-inflammatory, and antioxidant activities; however, its therapeutics potential is limited by poor solubility and low oral bioavailability. To address these challenges, NLCs were developed using a blend of solid and liquid lipids stabilized with suitable surfactants to improve solubility, enhance bioavailability, and achieve controlled drug release. A three level Box Behnken factorial design (Design Expert Software version 13) was utilized to investigate the influence of critical formulation parameters (X_1) liquid lipid / solid lipid ratio, (X_2) quantity of water and, (X_3) the quantity of drug on key response including (Y_1) mean particle diameter, (Y_2) polydispersity index (PDI) and (Y_3) % of loaded . Statistical analysis through response surface methodology (RSM) identified the optimal formulation exhibiting a nanoscale particle size, low PDI, high drug entrapment efficiency and sustained release characteristics. The optimized NLCs demonstrated superior stability and controlled release of Berberine , enhancing its potential for topical wound healing applications. The DoE- based optimization not only minimized experimental trials and material consumption but also provided a comprehensive understanding of factor interactions affecting formulation performance .Future studies should further utilize and explore this systematic approach , as DOE remains a valuable tool in the rational design of Berberine NLCs , ensuring reproducibility , efficiency , and improved therapeutics outcomes in wound healing .

Keywords: Berberine , Nanostructured lipid carriers (NLCs), Design of experts (DoE), Optimization, Response surface methodology (RSM) , Wound healing .

STARCH SUPERABSORBENT HYDROGEL BEADS

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ABSTRACT

Starch-based superabsorbent hydrogel beads have attracted attention due to their biodegradability, sustainability, and high water absorption capacity, making them valuable for applications in agriculture, biomedicine, and drug delivery. Among various modification methods, crosslinking plays a crucial role in enhancing the structural stability and water retention properties of starch hydrogels. Crosslinking involves chemically bonding starch polymer chains through agents such as citric acid, glutaraldehyde, or synthetic crosslinkers like polyethylene glycol dimethacrylate. Citric acid, a multi-functional organic acid, is widely used because it reacts with hydroxyl groups on starch forming ester bonds, which improve gel strength, reduce enzymatic degradation, and enhance freeze-thaw stability. Additionally, ion-assisted crosslinking with calcium ions or surface crosslinking with silane compounds has shown promise in improving mechanical properties and absorbency under load. These crosslinking strategies adjust the network density and porosity of the hydrogel, directly influencing its swelling behavior and durability. Novel approaches, such as synergistic multiple crosslinking and incorporation of fillers during crosslinking, further improve gel elasticity and resistance to deformation. Despite these advances, optimizing crosslinking degree is essential; excessive crosslinking may reduce absorption capacity, while insufficient crosslinking compromises mechanical integrity. Ongoing research integrates green chemistry principles, using natural crosslinkers and mild processing conditions to maintain environmental friendliness and biocompatibility. This focus on crosslinking modification significantly elevates the functional performance and durability of starch-based hydrogels, paving the way for sustainable alternatives in water management, biomedical devices, and controlled release technologies.

Keywords: Starch-based hydrogel, Superabsorbent polymer, Crosslinking modification, Biodegradable material, Water retention capacity, Sustainable applications.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN MELT SONOCRYSTALLIZATION OF PHARMACEUTICAL APIS

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ABSTRACT

Melt sonocrystallization, an emerging solvent-free technique that employs ultrasonic energy to induce nucleation and modulate crystal growth in molten or semi-molten drug systems, offers significant advantages for designing active pharmaceutical ingredient (API) crystals with tailored physicochemical attributes. Unlike conventional cooling crystallization, this approach enables precise control over particle size, morphology, and polymorphic form, resulting in improved dissolution rate, bioavailability, and manufacturability. However, optimization of melt sonocrystallization remains challenging due to the nonlinear interdependence of multiple process variables, including ultrasound frequency, amplitude, temperature gradient, and melt viscosity. The integration of Artificial Intelligence (AI) and Machine Learning (ML) into melt sonocrystallization introduces transformative opportunities for predictive modeling, process understanding, and adaptive control. Supervised learning algorithms such as Random Forests and Support Vector Machines (SVMs) can correlate limited experimental data with outcomes such as crystal size distribution and polymorphic transitions. AI-driven optimization frameworks can identify process conditions that yield desired crystal morphologies, influencing micromeritic properties like flowability and compressibility. Furthermore, the coupling of AI with ultrasonic spectroscopy and other Process Analytical Technology (PAT) tools—such as acoustic, Raman, and imaging sensors—enables real-time, noninvasive monitoring of nucleation and growth dynamics. Future advancements are anticipated in the development of hybrid, physics-informed ML models, standardized sonocrystallization datasets, and digital twin platforms for autonomous and scalable crystallization control. Collectively, AI and ML hold immense potential to revolutionize melt sonocrystallization by improving process reproducibility, efficiency, and product quality in pharmaceutical manufacturing.

Keywords: Melt sonocrystallization, Artificial Intelligence (AI), Machine Learning (ML), Process Analytical Technology (PAT), Ultrasonic energy, Support Vector Machines (SVM).

**COMPARATIVE EVALUATION OF HYDROPONIC AND SOIL BASED GROWTH
SYSTEMS FOR MEDICINAL PLANTS**

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ABSTRACT

To satisfy the increasing global demand for high-quality medicinal plants, there is a need for innovative and sustainable agricultural methods that ensure reliable yield and phytochemical efficacy. Common issues in traditional soil-based agriculture include variable environmental conditions, nutrient depletion, pest infestations, and restricted water supply, leading to inconsistent plant growth and the production of bioactive compounds. The advanced soilless technique referred to as hydroponics allows precise regulation of environmental conditions, pH levels, and nutrient composition, optimizing plant development and metabolite production. This study aimed to evaluate the growth kinetics, biomass production, and phytochemical characteristics of selected medicinal plants cultivated in both soil and hydroponic systems. The aim of the suggested research is to evaluate the phytochemical quality and growth efficiency of medicinal plants cultivated in soil-based and hydroponic environments. In both methods, controlled experimental setups will be established to maintain uniform environmental conditions. To assess plant performance, growth metrics such as height, leaf count, root growth, and overall biomass will be measured consistently. Employing advanced analytical methods such as HPLC and UV-visible spectrophotometry, phytochemical profiling will focus on key bioactive constituents including alkaloids, flavonoids, and phenolic compounds. Compared to traditional soil farming, hydroponics is expected to enable faster growth, higher biomass yields, and enhanced accumulation of secondary metabolites. Moreover, hydroponics is anticipated to lessen the occurrence of pests and diseases, enhance water use efficiency, and provide a more resource-efficient and sustainable method for cultivating therapeutic plants. However, hydroponic technology as an innovative, eco-friendly, and scalable alternative for cultivating consistently superior medicinal plants. The findings are expected to contribute to the development of sustainable, standardized, and quality-controlled cultivation techniques that satisfy the growing demands of the herbal and phytopharmaceutical industries. Additionally, integrating hydroponic systems with real-time monitoring technologies and precision agriculture could improve the therapeutic efficacy, output, and consistency of medicinal plants.

Keywords: Hydroponics, Medicinal Plants, Phytochemical Evaluation, Quality Assurance, Sustainable Cultivation, Biomass Yield, Controlled Environment Agriculture, Precision Farming

TRANSDERMAL PATCH OF AGOMELATINE DRUG

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ABSTRACT

Agomelatine (AGT) is used for the treatment of major depressive disorder in adults. AGM acts as an agonist for melatonin receptor (MT1 and MT2) and 5-hydroxytryptamine receptor (5-HT2C) antagonist. It is an effective and new antidepressant with less than 5% oral bioavailability due to its first pass metabolism. It is classified as BCS class II drug. Agomelatine has molecular weight 243.30g/mol and half-life about 2 hours. The selection of agomelatine drug for transdermal formulation is also supported by its physicochemical properties, such as moderate molecular weight and lipophilicity, which enhance skin permeability. The FDA approved first transdermal patch in the year 1979, for motion sickness with the drug scopolamine. Agomelatine Transdermal administration can increase its bioavailability and reduces the doses for therapeutic effects. The drug is used in a relatively higher concentration within the patch, which is applied to the skin and worn for an extended period to allow controlled, sustained drug release, through a diffusion process the drug gradually permeates the skin layers and enters into the bloodstream directly. Transdermal patch also allow self-administration. The patient can remove the patch if there is any adverse effect may occur, than it can immediately stop the drug delivery. The formulated transdermal patch were evaluated for essential physiochemical parameters including weight uniformity, folding endurance, thickness, drug content and moisture content.

Keywords: Agomelatine, Transdermal patch, Bioavailability, Noninvasive, Sustained release.

FORMULAB AI REVOLUTIONIZING DRUG FORMULATION WITH ARTIFICIAL INTELLIGENCE

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ABSTRACT

Artificial intelligence (AI) is rapidly transforming pharmaceutical formulation science by enabling data-driven, predictive, and highly efficient approaches to drug product development. Traditional formulation relies heavily on trial-and-error experimentation, consuming significant time, materials, and resources. Recent advances in machine learning (ML), deep learning, and AI-powered optimization tools-collectively referred to as FormuLab technologies have introduced a paradigm shift toward computational formulation design. This poster highlights how AI models can predict key formulation attributes such as solubility, stability, particle size, drug-excipient compatibility, dissolution behavior, and optimal process parameters. Techniques including artificial neural networks, response-surface modelling, and generative AI enable rapid screening of excipients, identification of critical quality attributes (CQAs), and simulation of formulation outcomes within a Quality-by-Design (QbD) framework. Applications include nanostructured lipid carriers, dry powder inhalers, oral tablets, hydrogels, and controlled-release devices. Despite challenges related to data quality, model generalizability, transparency, and regulatory acceptance, AI-driven formulation science offers transformative potential for personalized medicine, real-time optimization, and predictive manufacturing.

Keywords: Artificial intelligences, Drug formulation, Pharmaceutical Development.

A REVIEW ON ICH GUIDELINES - “Q” SERIES (QUALITY GUIDELINES)

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ABSTRACT

The International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH), which brought together the pharmaceutical industry and regulatory bodies to examine the technical and scientific aspects of drug registration, is unique. These guidelines ensure that drugs are developed, manufactured, and controlled to consistently meet quality standards, thereby safeguarding public health while promoting efficiency and innovation in the pharmaceutical industry. Its Quality (Q) series guidelines focus on harmonising scientific and technical aspects related to drug development, manufacturing, and quality assurance. The goal of ICH is to ensure that safe, high-quality, and effective medications are produced and registered in the most resource-efficient way possible by promoting greater global harmonisation. Important milestones like conducting stability studies, establishing impurity testing, the Validation process, product development, implementing good manufacturing practice (GMP) and Quality risk management are examples of harmonisation accomplishments in the quality sector.

Keywords: Pharmaceutical quality system, Regulatory standards, Good Manufacturing Practice, Quality Risk Management

REVOLUTIONIZING CLINICAL TRIALS WITH ARTIFICIAL INTELLIGENCE: FROM PATIENT RECRUITMENT TO DATA ANALYSIS

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ABSTRACT

Clinical trials are the necessary tests for making sure new drugs are safe, trustworthy. The move to use Artificial Intelligence (AI) in health and drug companies is happening because of problems with the current system: too much data, needing to do too much work by hand, the need to check on patients from far away, and how complicated old-style trials are. For quicker and smoother research, special AI-based solutions offer a lot of potential. AI is useful in many ways because it uses methods that are structured, consistent, and digital in medical research. Clinical trials take a long time and involve finding and signing up patients, checking on them often, making sure they stick with the trial, and keeping them involved. AI-powered computer programs can check huge amounts of electronic health records to find qualified participants with better accuracy, making sure the group of people in the trial is varied. Machine learning models help predict which patients might drop out, make the trial plans better, and improve how we check if patients are following the rules. During the data gathering step, AI tools make it easy to check data in real-time, spot mistakes, and monitor patients remotely, which makes the information more reliable and the study stronger. Overall, adding AI technology to every step of clinical trials—from choosing patients to figuring out the data—is a huge, positive change toward research that is smarter, faster, and more ethical. This paper plans to look at the latest progress, possible difficulties, and future plans for AI-driven clinical trials in changing the future of creating new drugs and patient care.

Keywords: Artificial Intelligence, Clinical Trials, Patient Recruitment, Data Analysis.

ARTIFICIAL INTELLIGENCE IN CLINICAL RESEARCH AND PHARMACOVIGILANCE: TRANSFORMING DRUG SAFETY THROUGH INTELLIGENT AUTOMATION

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ABSTRACT

Artificial Intelligence (AI) is reshaping the future of clinical research and pharmacovigilance (PV) by enabling faster, more reliable, and data-driven decision-making. Traditional PV processes—such as data entry and safety reporting—are labor-intensive and often struggle to manage the rapidly growing volume of adverse event data. The integration of AI and machine learning offers a transformative solution by automating routine case processing, improving data accuracy, and enhancing early signal detection for drug safety. In clinical research, AI supports predictive modeling, adaptive trial design, and real-time monitoring, leading to improved efficiency and inclusivity in patient recruitment and data analysis. However, the journey toward full automation presents challenges, including data bias, ethical dilemmas, and the need for robust regulatory frameworks. This study explores the evolving role of AI in clinical research and pharmacovigilance, with a focus on opportunities and implementation challenges within the Indian healthcare ecosystem. It highlights how human expertise combined with intelligent automation can optimize safety monitoring, streamline workflows, and ultimately advance patient care. A collaborative, transparent, and ethically guided approach will be essential to realize AI's full potential in ensuring global drug safety and innovation.

Keywords: Artificial Intelligence, Pharmacovigilance, Drug Safety, Machine Learning.

ARTIFICIAL INTELLIGENCE IN DRUG REPURPOSING IN CANCER

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ABSTRACT

Drug repurposing has proven to be an efficient solution to cancer treatment with the advantage of being less time and cost consuming. Non-oncology drugs have also exhibited potential anticancer effects in targeting main cancer hallmarks. As an example, statins such as simvastatin inhibit the mevalonate pathway, and have shown to be effective in cancers with distortions in lipid metabolism, such as gastric and colon cancer. On the same note, EGFR inhibitors are selective in response to genetic mutations in patients with NSCLC. Recent advances in Artificial Intelligence (AI) have transformed the field of drug repurposing by providing rapid analysis of large amounts of patient data, evaluate pharmacological profiles, and cancer biomarker detection. Integrating AI with nanotechnology further enhances targeted drug delivery and therapeutic precision. Nanoparticle-mediated drug delivery and the integration of AI can enhance localized drug delivery systems capable of biomarker sensing. Diagnostic assays using nanoparticles enable biomarker identification by accumulating in the specific cancer sites and ensuring accurate drug delivery planning. Challenges like tumor heterogeneity and limited clinical translation persists, the convergence of AI, nanotechnology, and drug repurposing offers a transformative approach for cancer treatment. This review highlights how AI-driven strategies and drug repurposing, when combined with nanotechnology, can target cancer hallmarks and accelerate the development of therapeutic solutions for cancer.

Keywords: Cancer disease, Drug repurposing, Nanotechnology, Artificial Intelligence

**FORMULATION AND CHARACTERIZATION OF METFORMIN-LOADED TRANSDERMAL
PATCHES FOR DIABETES MANAGEMENT**

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ABSTRACT

Diabetes mellitus is a chronic metabolic disease that results in high blood glucose levels due to insufficient insulin secretion or reduced insulin sensitivity. Metformin hydrochloride is a widely used oral antidiabetic drug; however, it has limitations such as low bioavailability and gastrointestinal discomfort due to extensive first-pass metabolism. To overcome these drawbacks, the present research work focuses on the formulation and characterization of metformin-loaded transdermal patches for controlled and sustained drug delivery. The patches will be prepared by the solvent casting method using polymeric combinations such as Hydroxypropyl Methylcellulose (HPMC), Polyvinyl Alcohol (PVA), and Eudragit RL100, along with plasticizers like glycerol or polyethylene glycol (PEG-400) to enhance film flexibility. The formulated patches will be evaluated for thickness, weight uniformity, folding endurance, surface pH, moisture absorption, spectrophotometer. For the in vitro diffusion studies, a Franz diffusion cell will be used with phosphate buffer (pH7.4) as the receptor medium to simulate skin conditions. The diffusion membrane will be either cellophane or animal skin, and samples will be withdrawn at regular intervals to analyze the cumulative drug release using a UV–Visible spectrophotometer at 233 nm. The release data will be fitted into various kinetic models (zero-order, first-order, Higuchi, and Korsmeyer–Peppas) to determine the drug release mechanism. The expected outcome is the development of an optimized patch capable of sustained metformin release up to 24 hours, ensuring steady plasma concentration, reduced dosing frequency, and improved patient compliance. This study aims to provide an effective and non-invasive approach for diabetes management through transdermal drug delivery of metformin.

Keywords: Metformin, Transdermal Patch, Diabetes Mellitus, Franz Diffusion Cell, In Vitro Drug Release, Sustained Release, UV–Visible Spectrophotometer.

RADIOMETRIC TECHNIQUES FOR COLON TARGETED EFFICIENCY OF MARKETED FORMULATION

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ABSTRACT

The development of colon-targeted drug delivery systems has gained significant attention in recent years due to their potential in treating local colonic diseases and improving systemic drug bioavailability. To evaluate the in-vivo performance and site-specific release of such formulations, radiopharmaceutical and radiometric techniques have emerged as reliable, non-invasive analytical tools. These techniques employ suitable radioisotopes—such as Technetium-99m (^{99m}Tc), Indium-111 (^{111}In), and Iodine-123 (^{123}I)—to label colon-specific formulations and monitor their transit, disintegration, and drug release profiles using gamma scintigraphy or single-photon emission computed tomography (SPECT). Various approaches, including radiolabeled capsule tracking, scintigraphic imaging, radiolabeled meal studies, and radiometric marker retention methods, have been utilized to determine colonic transit time, absorption efficiency, and site-specific drug delivery. The incorporation of AI-based image analysis and computational modeling has further enhanced the accuracy of radiometric data interpretation, enabling automated quantification of tracer distribution and prediction of formulation performance. Collectively, these radiopharmaceutical techniques provide essential insights into the bioavailability, targeting accuracy, and efficiency of colon-specific marketed formulations, supporting rational formulation design and regulatory validation of advanced drug delivery systems.

Keywords: Colon targeting, Radiopharmaceuticals, Radiometric techniques, Scintigraphy, Technetium-99m, AI-based image analysis, Drug delivery efficiency.

NUTRACEUTICALS: EMERGING PERSPECTIVE AND APPROACH TO PREVENT DYSMENORRHEA

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ABSTRACT

Dysmenorrhea, or painful menstruation, is a highly prevalent gynaecological complaint affecting the quality of life for a large proportion of women of reproductive age. Conventional treatments, primarily Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) and Oral Contraceptive Pills (OCPs), are effective but often carry a risk of significant side effects. Nutraceuticals, the combination of "nutrition" and "pharmaceuticals," are food or dietary components that offer health benefits, including the potential for disease prevention and treatment. Emerging evidence suggests that inflammation and oxidative stress are significant contributors to the pathogenesis of dysmenorrhea, particularly through the overproduction of prostaglandins. Nutraceuticals offer a promising alternative by directly addressing these pathways. Key compounds with demonstrated efficacy include: Vitamin D (reducing pain intensity and inhibiting prostaglandin synthesis), other micronutrients like Magnesium, Vitamin E, and Zinc (reducing uterine contractions and acting as antioxidants), and herbal extracts such as Ginger, Curcumin, and Cinnamon (potent anti-inflammatory effects by inhibiting the COX pathway).

Furthermore, a holistic approach that integrates the proper use of these supplements with essential lifestyle modifications, such as regular exercise and a well-balanced diet rich in anti-inflammatory foods, is crucial for both preventing and controlling menstrual discomfort.

Keywords: Dysmenorrhea, Prostaglandin Synthesis, Nutraceuticals, Primary Dysmenorrhea, Lifestyle Management, Dietary Supplements

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COATING OF MICROCAPSULES AND THEIR PHARMACOKINETICS

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ABSTRACT

Microcapsules are tiny spherical particles that consist of an inner core material (which could be a drug or other active substance) enclosed within a protective outer shell or coating. The core-shell structure allows for controlled and targeted delivery of the encapsulated substance. Key Characteristics Include: Size range: Typically from 1 to 1000 micrometers in diameter, Wall material: Made from natural or synthetic polymers. Targeted disease- Neurodegenerative Disease (Introduction, Etiology,Symptoms, Diagnosis, Treatment,etc).Coating Techniques Implemented/Employed:Spray drying, Coacervation, Fluidized bed coating, Interfacial polymerization Purpose of Coating: Improve stability, Mask taste, Modify drug release (immediate, sustained, or delayed release), Targeted delivery (e.g., colon-specific).Pharmacokinetics Overview Absorption: How coating affects rate and site of absorption,Distribution: Impact of coating on drug solubility and transport,Metabolism: Influence on first-pass metabolism, Excretion: Coating’s role in prolonging half-life or improving excretion profile
Keywords: Microcapsules, Coating, Coacervation, Neurodegenerative Disease.

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APPLICATION OF QBD APPROACH IN THE FORMULATION DEVELOPMENT OF TOPICAL DRUG DELIVERY SYSTEMS

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ABSTRACT

Quality by Design (QbD) has emerged as a modern framework for developing pharmaceutical formulations by integrating quality into the product design rather than relying solely on end-product testing. In the context of topical drug delivery, QbD enables a scientific, risk-based, and systematic understanding of formulation and process variables that influence product performance. The process begins with defining the Quality Target Product Profile (QTPP), followed by the identification of Critical Quality Attributes (CQAs) that directly affect product efficacy, safety, and stability. Through risk assessment, the Critical Material Attributes (CMAs) and Critical Process Parameters (CPPs) are identified, enabling the formulation scientist to focus on parameters that significantly impact quality. The Design of Experiments (DoE) methodology further assists in evaluating the interaction of variables and in establishing an optimal Design Space, ensuring consistent batch-to-batch performance. This strategic approach reduces variability, enhances product robustness, and minimizes development time and costs. Application of QbD in topical hydrogel formulation provides a deeper understanding of component interactions, rheological behavior, and drug release mechanisms, resulting in improved therapeutic efficacy and patient compliance. Overall, the integration of QbD principles in topical formulation development fosters regulatory flexibility, promotes innovation, and ensures a predictable, high-quality product throughout its lifecycle.

Keywords: Quality by Design, topical drug delivery, hydrogel formulation, Design of Experiments, Design Space, QTPP, CQA, CMA, CPP.

A.I. IN CLINICAL RESEARCH AND PHARMA COVIGLANCE

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ABSTRACT

Pharmacovigilance (PV) is a data-driven process to identify medicine safety issues at the earliest by processing suspected adverse event (AE) report and extraction of health data. The PV case processing cycle starts with data collection, data entry, initial checking Completeness and validity, coding, medical assessment for causality, expectedness, Severity and seriousness, subsequently Submitting report, quality checking followed by data storage and maintenance. AI in healthcare has been very impressive in specialties that really heavily of medical image similarly a growing interest to adopt AI tools to Complement and advanced auto mate technology can the interpretation there has been the PV process. The advanced technology certainly the routine, repetitive, manual task of the case. However its implementation across the PV lifecycle and practical impact raises several questions and challenges. This review describes the benefits of the outstanding Scientific, technological, any policy issues and the maturity of AI!. full automation in AI tools for the context to the indian health care System. Today medications go to after the business extensive, very costly process of drug development. It lake in the range of 10 to 15 yrs. anywhere here and there. A significantly more, to convey a medication from introductory Convey revelation to the hands of patients. and that voyage can cast billions up to 12 millions to be Correct. That is just a lot to spend, and excessively to yearn patient to hold up patients can hardly wait 15 years for a saving drug, we require another focused on medication revelation and improvement process. AI intelligence. Can significantly reduce the time included, and also cut by more than half.

Keywords: Pharmacovigilance, adverse event.

AI IN CLINICAL RESEARCH AND PHARMACOVIGILANCE

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ABSTRACT

Artificial intelligence (AI) is changing how we carry out clinical research and pharmacovigilance, doing at a faster pace with data, encompasses patient safety and better decision-making. AI algorithms can flag potential participants more rapidly, however, in clinical trials, they can help predict who will drop out and can assist in the continual surveillance of safety in real time, which far yields cost- and time-savings. Machine learning models also support adaptive trial designs which tweak and adjust the dosage in order to increase rates of success. In pharmacovigilance, artificial intelligence (AI) is the way to process massive amounts of spontaneous reports, electronic health records, and social media posts and spot adverse drug reactions (ADRs) more quickly as well as with greater precision than traditional methods. Natural-linguist processing (NLP) reads useful meaning from unstructured data press, and unnatural event detections search for abnormal patterns depicting a future developing safety concern. These technologies aid in supporting regulatory agencies and pharmaceutical companies to prioritize investigations, as well as allocate resources and communication risks for healthcare professionals and patients. However, there are challenges: ensuring data privacy, and reducing algorithmic bias, and finally bringing transparency to the use of AI in decision making. Case reviewing agencies and organizations are responding to include AI-generated evidence, and there is a very important role for interdisciplinary collaboration among clinicians, data scientists, and ethicists. Overall, the use of AI in clinical research provides a powerful toolkit that can help improve the efficiency of clinical research, contribute to pharmacovigilance, and ultimately improve patient outcomes while ensuring that safety standards are maintained.

Keywords: Artificial intelligence, clinical trials, pharmacovigilance, machine learning, patient safety.

ACUTE AND SUBACUTE ORAL TOXICITY ASSESSMENT OF DIFFERENT FRACTIONS OF CRYPTOLEPIS DUBIA

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ABSTRACT

The present study aimed to evaluate the acute and subacute oral toxicity of different fractions (n-hexane, dichloromethane, and aqueous-ethanolic) of *Cryptolepis dubia* to determine their safety profile for potential therapeutic applications. *Cryptolepis dubia* is a medicinal plant traditionally used for treating various ailments including bone disorders and skin conditions, but limited scientific evidence exists regarding the toxicological properties of its different phytochemical fractions. In this study, acute oral toxicity was assessed by administering single doses of each fraction to rats and observing them for 14 days for signs of mortality, behavioral changes, and physiological alterations. For the subacute toxicity study, the different fractions were administered daily for 28 consecutive days at different dose levels to evaluate cumulative effects on body weight, food and water intake, hematological, biochemical, and histopathological parameters. No mortality or abnormal clinical signs were observed during the acute toxicity phase with any of the fractions, suggesting that the median lethal dose (LD₅₀) of the extracts is greater than the highest dose tested (2000 mg/kg). Similarly, in the subacute study, no significant changes were observed in body weight or organ weight across all fraction groups. Biochemical indices such as liver and kidney function markers remained within normal ranges for the n-hexane and aqueous-ethanolic fractions. The dichloromethane fraction showed mild alterations in platelet and white blood cell counts at higher doses; however, these changes were not associated with clinical manifestations. Histopathological examinations of vital organs, including the liver, kidney, heart, and spleen, revealed no treatment-related pathological lesions in any of the fraction groups.

Keywords: *Cryptolepis dubia*, fractions, acute toxicity, subacute toxicity, oral administration.

AI POWERED DRUG INNOVATION PROCESS

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ABSTRACT

The traditional drug development process is spectacularly slow, complex, lengthy and expensive. These findings targets to convey an overarching analysis of the growth and evolution in AI supported drug development. AI transfigure the drug development and medication research, providing analyst new therapeutic treatment options. AI powered gadgets empower researchers to workflow vast datasets. In R&D, AI is a transformative force, revolutionizing processes with new therapeutic targets, upgrading chemical designs. The identification of oncogenic vulnerabilities made easier with the help of AI. Machine learning algorithm predict protein structures with great precision. Additionally, AI improves clinical trial proficiency by predicting outcomes. However, the establishment of AI in pharmaceutical R&D overlooking several challenges, including regulatory barriers, data confidentiality concerns and policy restriction. In spite of these challenges, the AI potentiability in therapeutic discovery and medication development persist indisputable. Henceforward, AI is helpful in pharmaceutical innovation positively, making faster drug discoveries more productive and more widespread.

Keywords: Artificial Intelligence, Machine Learning, Drug development, Pharmaceutical Research, Oncogenic vulnerabilities, Medication research

EFFECT OF CREATINE MONOHYDRATE IN CHRONIC UNPREDICTABLE STRESS

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ABSTRACT

Chronic Restraint Stress (CRS) is a well-established experimental model for the investigation of physiological and behavioral consequences of prolonged stress exposure. This model characterizes a threatened state of homeostasis in which neuroendocrine, biochemical, and behavioral changes produce adaptive and maladaptive responses owing to repetitive restraint. Restraint induction of chronic stress is essential for understanding pathophysiological mechanisms in stress-related disorders like anxiety, depression, and cognitive dysfunction and for the evaluation of potential pharmacological interventions for stress management. In this model, animals—most commonly rats or mice—are restrained in well-ventilated restrainers for a specific duration each day, usually for an hour, for four weeks. The repeated immobilization results in the continual activation of the hypothalamic–pituitary–adrenal axis and the sympathoadrenal system—a pattern similar to that produced by chronic psychological stress in humans. Biochemical markers, like plasma corticosterone, adrenocorticotrophic hormone, glucose, and parameters of oxidative stress (e.g., malondialdehyde, superoxide dismutase), are used to assess stress in animals exposed to CRS. Anxiety-like and depressive-like behaviors can be evaluated by paradigms such as the open field test, elevated plus maze, forced swim test, and sucrose preference test. Physiological parameters include body weight, food intake, and adrenal gland hypertrophy as measures of the cumulative impact of chronic restraint. Furthermore, chronic restraint stress produces region-specific alterations in the brain, particularly within the hippocampus, prefrontal cortex, and amygdala—areas deeply involved in mood regulation, learning, and memory. Prolonged exposure leads to impaired neurogenesis, dendritic remodeling, and changes in neurotransmitter systems such as serotonin, dopamine, and norepinephrine. These neurobiological modifications mirror those observed in human chronic stress conditions and provide a reliable platform for evaluating the neuroprotective, anxiolytic, and antidepressant potential of therapeutic agents. Thus, the CRS model is invaluable for bridging the gap between preclinical research and clinical understanding of stress-induced neuropsychiatric disorders.

Keywords: cortisol; Creatine Monohydrate; stress; restraint stress; TSST; cold pressor test.

ADVANCING SUSTAINABLE INNOVATION: GREEN CHEMISTRY APPROACHES IN ECO-FRIENDLY PHARMACEUTICAL DEVELOPMENT

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ABSTRACT

Green chemistry, being an innovative and sustainable paradigm, is a paradigm shift taken by the healthcare sector, as well as the chemical one, by means of supporting the development of pharmaceuticals which are ecologically friendly. Unlike the traditional methods of synthesis in which they often use toxic reagents, exude toxic solvents and hazardous energy processes constituting a high level of pollution and waste, green chemistry focuses more on how to design safer, cleaner and more efficient chemical reactions. This approach strictly adheres to the twelve principles by Jones (including atom economy, use of renewable feedstocks, energy efficiency, and healthier solvent replacement) to reduce the impact on the environment in a systematic manner, without compromising output. More developed modalities of biocatalysis, continuous flow chemistry, microwave-processed reactions, and solvent-free reactions also support the creation of pharmaceutical agents that have a significantly smaller ecological footprint. In analytical chemistry, the green methodology decreases the sample sizes, gets rid of dangerous reagents, and reduces waste in the pharmaceutical control analysis. LCA tools are relevant in the assessment and sustainability of the source of raw materials as well as the ultimate disposal. Finally, incorporating green chemistry into pharmaceutical production does not only make the business go green but also drives the goal of environmental safety and ecological sustainability in healthcare on a global scale, which is a radical shift of a paradigm whereby scientific and sustainable innovation merge to the advantage of the human being and the environment.

Keywords: Green chemistry, Microwave-processed reactions, LCA, Sustainable innovation.

QUANTUM PHENOMENA IN MEDICINAL CHEMISTRY: INTEGRATING ENTANGLEMENT AND TUNNELLING INTO THE MOLECULAR BASIS OF DRUG DESIGN

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ABSTRACT

Quantum mechanical theories are progressively being seen as imperative in clarifying the physicochemical basis of a medicinal chemistry definition. Such phenomena as quantum tunnelling and quantum entanglement provide mechanistic explanations of molecular recognition, enzymatic catalysis and reaction kinetics that are beyond the reach of classical biochemical models. The effects have a direct effect on oxidation, reduction and hydrolysis processes that play a central role in drug metabolism and pharmacokinetics. Quantum entanglement leads to the attraction of non-local correlations to molecular complexes, thus explaining cooperative binding, allosteric modulation and long-distance electron transfer in enzymes and receptor-ligand complexes. Improvements in computational methods, such as density functional theory (DFT) and quantum mechanics/molecular mechanics (QM/MM), and path-integral molecular dynamics (PIMD) have made quantitative evaluation of tunnelling and entanglement in complex biological systems achievable. Besides, quantum-computing algorithms, including the variational quantum eigensolver (VQE) and quantum approximate optimisation algorithm (QAOA), increase the predictive power of the molecular simulations. By introducing these quantum effects into pharmacological algorithms, quantum-aware medicinal chemistry (QIMC) provides a solid foundation to be able to rationally manipulate enzymatic reactivity, isotope-substitution effects, and molecular interactions in order to obtain precision-focused drug design.

Keywords: Quantum tunnelling; Quantum entanglement; Density functional theory (DFT).

FORMULATION, OPTIMIZATION, AND EVALUATION OF NANOPARTICULATE GEL FOR THE TREATMENT OF RHEUMATOID ARTHRITIS

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ABSTRACT

Rheumatoid arthritis (RA) is a chronic, systemic inflammatory disorder characterized by persistent synovial inflammation and progressive joint destruction. The present study focuses on the formulation, optimization, and evaluation of a nanoparticulate gel system designed to enhance the localized delivery and therapeutic efficacy of anti-arthritic drugs while minimizing systemic side effects. Nanoparticles were prepared using the solvent evaporation/emulsification method and optimized through a Design of Experiments (DoE) approach to achieve minimal particle size, maximum drug entrapment efficiency, and controlled drug release. The optimized nanoparticles were incorporated into a carbopol-based gel to facilitate sustained topical delivery. Characterization of the nanoparticulate gel included particle size analysis, zeta potential measurement, rheological studies, in vitro drug release, ex vivo skin permeation, and stability testing. The optimized formulation exhibited a nanoscale particle size (below 200 nm), high entrapment efficiency, and sustained release over 24 hours. In vivo anti-inflammatory and pharmacodynamic evaluations demonstrated significant reduction in paw edema and improved joint mobility compared to conventional formulations. The results suggest that the developed nanoparticulate gel is a promising delivery system for effective management of rheumatoid arthritis through localized and controlled drug delivery.

Keywords: Nanoparticulate gel; Rheumatoid arthritis; Topical drug delivery; Nanoparticles; Optimization; Controlled release; Design of Experiments (DoE).

COMPARATIVE QUALITY CONTROL PARAMETERS OF DIFFERENT BRANDS OF PARACETAMOL TABLETS

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ABSTRACT

The main goal of the present study was to assess the pharmacological properties, therapeutic efficacy, and safety profile of paracetamol as an analgesic and antipyretic drug. Additional objectives were comparing its mechanism of action, dosage forms, and adverse effects with other commonly used non-opioid analgesics. Searches were conducted comprehensively through databases like PubMed, ScienceDirect, and Google Scholar. All the relevant research articles, clinical trials, and review papers published in a span of 2010 to 2025 were included. Data on pharmacodynamics, pharmacokinetics, dosage, indications, contraindications, and side effects were extracted and analyzed. It showed marked effectiveness in the relief of mild to moderate pain and fever. Its primary mechanism is through the inhibition of prostaglandin synthesis in the central nervous system, but it possesses only slight anti-inflammatory activity. At therapeutic doses, this drug had a very good safety profile; overdose, however, led to hepatotoxicity resulting from the accumulation of toxic metabolites, one of which is N-acetyl-p-benzoquinone imine (NAPQI). In contrast to NSAIDs, paracetamol caused less gastrointestinal disturbance but did not exhibit significant peripheral anti-inflammatory activity. Caution must be exercised to avoid overdose, especially in patients with liver impairment. Further studies are still needed in optimizing formulations for safety and therapeutic efficiency.

Keywords: Quality Control, paracetamol, NSAIDS, non-opioid analgesics.

A REVIEW ON NIOSOMES

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ABSTRACT

Niosomes are emerging as a novel and efficient drug delivery system that enhances the therapeutic performance of various pharmaceutical agents. These vesicular carriers, composed primarily of non-ionic surfactants and cholesterol, form microscopic bilayered structures capable of encapsulating both hydrophilic and lipophilic drugs. Niosomes improve the bioavailability of drugs, facilitate penetration through the skin, enable controlled or sustained release, and provide targeted delivery to specific sites within the body. This review focuses on the fundamental aspects of niosomal drug delivery systems, including their composition, methods of preparation, characterization techniques, and diverse applications. Various preparation methods such as thin-film hydration, ether injection, reverse phase evaporation, and microfluidization have been explored to optimize vesicle size, entrapment efficiency, and stability. Characterization parameters like vesicle morphology, size distribution, zeta potential, entrapment efficiency, and in vitro drug release profiles are essential for ensuring formulation quality and performance. Niosomes have demonstrated significant potential in improving the therapeutic index of drugs by enhancing their stability and bioavailability while minimizing systemic side effects. They have been successfully utilized for oral, transdermal, ocular, and parenteral delivery routes, offering site-specific and sustained drug action. Recent advancements include surface-modified, stimuli-responsive, and herbal oil-loaded niosomes that combine natural bioactive compounds with nanotechnology for therapeutic outcomes. These innovations hold promise for diseases requiring targeted and sustained therapy, such as rheumatoid arthritis and cancer.

Keywords: Niosomes, Targeted drug delivery, bioavailability enhancement, transdermal drug delivery.

A REVIEW ON MICROSPHERES

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ABSTRACT

Microspheres have gained significant attention as advanced drug delivery systems due to their unique ability to provide controlled, sustained, and targeted release of therapeutic agents. These spherical particles, ranging from 1 to 1000 micrometers, are composed of biodegradable or synthetic polymers that encapsulate active drugs, protecting them from degradation while enabling site-specific delivery to enhance efficacy and reduce systemic toxicity. The primary aims in developing microspheres include achieving precise targeted release at diseased sites, such as tumors or inflamed tissues, thereby concentrating therapeutic action locally while minimizing effects on healthy tissues. This targeted approach helps significantly reduce drug-related side effects and toxicity. Additionally, microspheres ensure prolonged and controlled drug release, which improves patient compliance by reducing dosing frequency. Their adaptable surface properties allow for stimuli-responsive release triggered by environmental factors like pH or temperature changes. Recent fabrication advancements such as emulsion-solvent evaporation, spray drying, and microfluidics have improved uniformity, high drug loading, and scalability. Microspheres find applications not only in cancer therapy and vaccine delivery but also in gene therapy and tissue engineering, offering safer and more effective treatment modalities. Despite challenges in manufacturing and stability of labile drugs, microspheres continue to hold promising potential for revolutionizing personalized medicine by enhancing therapeutic outcomes and reducing toxicity. Ongoing research aims to further optimize their design, enabling even more precise and efficient drug delivery platforms.

Keywords: Microspheres, Targeted drug delivery, Controlled release, Biodegradable polymers.

AI-INTEGRATED SMART DRUG DELIVERY SYSTEM FOR ENHANCED TREATMENT EFFICIENCY

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ABSTRACT

The aim of the current study was to develop and characterize a new smart drug delivery system that offers targeted, controlled, and stimuli-responsive drug release, by improving therapeutic efficacy while minimizing systemic adverse effects. Such a system should avoid some of the major disadvantages that characterize conventional drug delivery: poor bioavailability, premature degradation, and nonspecific distribution. Biodegradable copolymer-based smart polymeric nanoparticles were prepared by a solvent evaporation technique. Examples could be PLGA-PEG, among others. A model drug, such as doxorubicin or curcumin, was encapsulated inside the carrier. Particle size, zeta potential, encapsulation efficiency, and in vitro release profile were characterized. Stimuli-responsive behavior was investigated at different pH and temperature conditions simulating both physiological and pathological environments. Cytotoxicity and cellular uptake studies were performed using relevant cell lines with the aim of evaluating the biocompatibility and targeting efficiency of the system.

Results and Discussion: The smart nanoparticles prepared showed regular spherical morphology, with an average particle size of ~150 nm, having high encapsulation efficiency (>85%). The in vitro release profile indicated a sustained and controlled drug release; the amount of drug release was notably higher at pH 5.5, simulating the acidic conditions in tumor microenvironments. Furthermore, cellular uptake studies revealed enhanced internalization and an improved therapeutic response compared to free drug administration. Such results confirm that stimuli-responsive design allows on-demand drug release, thus offering enhanced site-specific delivery with minimum off-target effects.

Conclusion: A novel smart drug delivery system was developed that exhibited controlled, targeted, and stimuli-responsive behavior, proving its potential in advanced therapeutic applications. This approach may serve as a platform for the improvement of drug bioavailability and efficacy and an increase in patient compliance while reducing the adverse effects associated with conventional therapy.

Keywords: nanoparticles, target drug delivery, bioavailability, therapeutic efficacy, liposomes, smart drug delivery system, pharmacokinetics

NOVEL AND SMART DRUG DELIVERY SYSTEMS

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ABSTRACT

Novel and smart drug delivery systems (NDDS) represent a significant advancement in pharmaceuticals, aiming to optimize drug efficacy, safety, and patient compliance. These systems enable targeted, controlled, and sustained drug release using innovative carriers such as nanoparticles, liposomes, niosomes, dendrimers, and hydrogels. Smart delivery platforms further utilize stimuli-responsive mechanisms like pH, temperature, or enzyme sensitivity for site-specific and on-demand drug release. Integration of nanotechnology and biodegradable polymers enhances bioavailability and therapeutic precision. This study highlights recent developments, design strategies, and clinical potential of NDDS in achieving personalized and efficient pharmacotherapy.

Keywords: NDDS, targeted delivery, controlled release, nanotechnology.

NANOMEDICINE: THE FUTURE OF TARGETED DELIVERY SYSTEM

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ABSTRACT

One of the 21st century's most promising technologies is nanotechnology. Nanomedicine, an application of nanotechnology in medicine involves the design of materials and devices that interact with the body at sub-cellular level (0.1-100nm). By engineering materials and devices between 0.1 – 100 nanometer - the same scale as biological molecules - we can target diseases with unprecedented precision. Operating at this molecular scale allows for a high degree of specificity, enabling targeted clinical applications that aim to repair damaged tissues and cure diseases with minimal side effects.

The primary strength of nanomedicine lies in the unique benefit of nanoparticles when integrated in drug formulation they offer significant pharmacokinetic advantage, enhancing drug delivery to specific tissues, improving efficacy and reducing toxicity. This field holds immense promise for treating a wide range of conditions, including cancer, cardiovascular and neurological diseases such as Parkinson's or Alzheimer diseases, diabetes, infectious/inflammatory diseases, and orthopedic problems. By facilitating targeted interventions, nanomedicine has the potential to overcome the limitations of conventional therapies for many widespread diseases.

This poster provides a comprehensive overview on nanomedicine, exploring its powerful application in drug delivery and diagnostics alongside a critical look at the challenges standing in the way of its full potential.

Keywords: Nanomedicine, Nanotechnology, Nanoparticles, Target drug delivery

**PHARMACEUTICAL REVIEW ON ROLE OF NUTRACEUTICALS
IN MANAGEMENT OF IRRITABLE BOWEL SYNDROME (IBS): A REVIEW**

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ABSTRACT

Irritable Bowel Syndrome (IBS) is a chronic functional gastrointestinal disorder characterized by abdominal pain, bloating, altered bowel habits, and discomfort. Conventional pharmacological treatments now provide limited relief and may lead to side effects, creating a growing interest in nutraceuticals as supportive therapy. Nutraceuticals derived from natural food sources offer therapeutic benefits beyond basic nutrition. This review explores the potential role of various nutraceuticals—such as probiotics, prebiotics, dietary fibers, omega-3 fatty acids, curcumin, and peppermint oil—in the management of IBS. These compounds may help reduce intestinal inflammation and enhance gastrointestinal motility. The paper also discusses implications of action, clinical evidence, and safety considerations. Further, nutraceutical-based interventions may serve as complementary or alternative approaches to managing IBS symptoms, enhancing patient quality of life, and minimizing adverse drug reactions. However, further clinical studies and standardization are required to confirm their efficacy and long-term safety in IBS management.

Keywords: Irritable Bowel Syndrome, Nutraceuticals, Probiotics, Prebiotics, Omega-3 Fatty Acids, Curcumin, Peppermint Oil, Gut Health, Functional Disorder.

**BREAST CANCER: A COMPREHENSIVE REVIEW OF ETIOLOGY, DIAGNOSTICS,
THERAPEUTICS AND PROGNOSIS**

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ABSTRACT

Breast cancer is a multifaceted and serious disease impacting millions of people across the globe. In 2022 alone, 2.3 million women were diagnosed with breast cancer, resulting in 670,000 deaths worldwide. Global data highlight significant disparities in breast cancer burden based on levels of human development. For example, in countries with a very high Human Development Index (HDI), one out of every twelve women will develop breast cancer during her lifetime, and one out of seventy-one will die from it. Conversely, in countries with low HDI, although only one in twenty-seven women is likely to be diagnosed, one in forty-eight will die from the disease. A thorough understanding of the global landscape of breast cancer is essential to enhance prevention, early detection, and treatment strategies. Identifying and comprehending risk factors helps in designing effective prevention measures and recognizing individuals at higher risk. Combination treatment strategies, including the use of targeted therapies along with immunotherapy or chemotherapy, aim to improve treatment response and overcome resistance. Furthermore, advocacy and awareness campaigns play an instrumental role in decreasing breast cancer mortality by promoting early detection, accurate diagnosis, and comprehensive care. Strengthening public health education and increasing awareness among women can lead to earlier diagnosis and more successful treatment outcomes. This review will provide an in-depth exploration of breast cancer, focusing on risk factors, diagnostic methods, treatment modalities, and prognostic biomarkers.

Keywords: Breast cancer research, therapeutic avenues, immune-based therapies, predictive biomarkers, precision medicine.

NANO NEUROSCIENCE IN MULTIPLE SCLEROSIS: DIAGNOSIS AND TREATMENTS

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ABSTRACT

The integration of nanotechnology with neuroscience, termed nano-neuroscience, has revolutionized the understanding and management of neurodegenerative diseases such as Multiple Sclerosis (MS). MS is a chronic, inflammatory, and demyelinating disorder characterized by immune-mediated damage to the central nervous system (CNS). Despite advancements in therapeutics, effective drug delivery across the Blood–Brain Barrier (BBB) remains a major challenge. Nano-neuroscience provides innovative approaches for overcoming this limitation by enabling targeted, controlled, and sustained delivery of therapeutic agents. Various nanocarriers, including liposomes, polymeric nanoparticles, dendrimers, and lipid-based systems, have been explored to enhance BBB permeability through mechanisms like receptor-mediated and adsorptive-mediated transcytosis, carrier-mediated transport, and cell-mediated “Trojan horse” delivery. Additionally, non-invasive strategies such as focused ultrasound and intranasal administration have shown promise in facilitating brain-specific drug transport. Smart nanoparticle design—optimizing size, charge, and surface chemistry—further improves targeting efficiency and minimizes systemic toxicity. Nanomaterials such as PEG, PLGA, and lipid-based systems demonstrate significant potential for delivering neuroprotective, anti-inflammatory, and regenerative agents to demyelinated regions of the CNS. Collectively, nano-neuroscience offers a transformative framework for early diagnosis, precise drug delivery, and personalized treatment of MS. However, translating these nanotechnological innovations from bench to bedside demands further investigation into their long-term safety, scalability, and regulatory validation.

Keywords – Nano-neuroscience, Multiple Sclerosis, Blood–Brain Barrier, Nanocarriers.

**ADVANCED MANAGEMENT OF NEUROLOGICAL DISORDERS VIA MEMBRANE
CAMOUFLAGED NANOCARRIERS**

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ABSTRACT

Neurological disorders, including Alzheimer’s disease, Parkinson’s disease, dementia, and brain tumors, represent some of the most pressing health challenges worldwide. Despite the rising prevalence of these conditions, effective therapeutic options remain limited. Conventional treatment strategies, such as oral tablets and injectable formulations, often face serious drawbacks including poor bioavailability, systemic toxicity, and an inability to efficiently cross the blood–brain barrier (BBB). Similarly, conventional nanocarriers, though offering certain improvements in drug solubility and release, lack precise targeting efficiency and frequently encounter issues such as rapid clearance and off-target effects. In recent years, Membrane-camouflaged nanocarriers have emerged as a promising alternative for overcoming these challenges. By mimicking biological systems such as RBC, platelet, leukocyte, and cancer cell membranes, these carriers demonstrate prolonged circulation time, enhanced biocompatibility, and improved targeting efficiency. Importantly, their ability to traverse the BBB and deliver therapeutic agents directly to the diseased site significantly improves treatment outcomes while minimizing adverse effects. Such features position membrane coated systems as a transformative opportunity in addressing neurological conditions. With continuous advancements in nanotechnology, membrane coated systems are expected to play a pivotal role in neurological disorder management. Their integration with personalized medicine, gene therapy, and smart drug-release systems could provide safer, more effective, patient-friendly options. Ongoing research and clinical translation will define their potential in shaping future strategies for neurological disease treatment. Overall, membrane-coated systems show great promise in overcoming current therapeutic limitations and advancing next-generation therapies.

Keywords: Membrane-coated nanocarriers, Blood–brain barrier, Neurological disorders, Targeted drug delivery.

POLYSACCHARIDE BASED COLON DRUG DELIVERY SYSTEM FOR THE MANAGEMENT OF INFLAMMATORY BOWEL DISEASE

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ABSTRACT

Inflammatory Bowel Disease (IBD) requires targeted drug delivery to the colon to maximize therapeutic efficacy and minimize systemic side effects. This research aims to develop a novel colon-specific drug delivery system which leverages the pH-sensitive properties of a natural polysaccharide. *Abelmoschus esculentus* (okra) polysaccharide was selected as the primary excipient due to its ability to remain intact in the acidic environment of the stomach and the upper gastrointestinal tract, and to swell at a physiological pH of approximately 7.4, which is characteristic of the colon. The polysaccharide was successfully extracted from okra using a cold maceration technique and subsequently deproteinized to obtain a purified polymer. As drug carrier apremilast-loaded Poly(lactic-co-glycolic acid) (PLGA) nanoparticles were formulated via the solvent evaporation method. The development of these nanoparticles was systematically optimized using a central composite design (CCD) which is a robust statistical tool that enabled the precise evaluation and refinement of critical process variables to achieve nanoparticles with ideal characteristics. This work has therefore successfully established and optimized the two fundamental components: a purified, pH-responsive okra polysaccharide for colon-targeted release and a well-characterized PLGA nanoparticle drug delivery system, creating a robust foundation for their subsequent integration into a final pelleted formulation for the effective local treatment of IBD.

Keywords: Inflammatory bowel disease, PLGA nanoparticles, Polysaccharide, Colon-targeted drug delivery.

THERAPEUTIC POTENTIAL OF PLANT-BASED FLAVONOIDS IN THE MANAGEMENT OF MULTIPLE SCLEROSIS

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ABSTRACT

Multiple sclerosis (MS) is a chronic, immune-mediated neurodegenerative disorder of the central nervous system characterized by demyelination, inflammation, and axonal loss. Current therapies, including fingolimod, glatiramer acetate, and dimethyl fumarate, primarily provide symptomatic relief but are often associated with adverse effects such as bradycardia, hepatotoxicity, and injection-site reactions, highlighting the need for safer alternatives. In this context, plant-derived flavonoids, naturally occurring polyphenolic compounds, have emerged as promising therapeutic candidates owing to their potent antioxidant, anti-inflammatory, and immunomodulatory properties. Flavonoids such as cyanidin, quercetin, apigenin, baicalin, hesperidin, and fisetin have demonstrated significant neuroprotective effects in preclinical models of MS. Mechanistically, they modulate T-cell differentiation, suppress NF- κ B signaling, reduce oxidative stress, inhibit microglial activation, and promote remyelination, thereby preserving neuronal function and integrity. Notably, quercetin and apigenin have shown synergistic potential when combined with conventional MS drugs, enhancing therapeutic efficacy while minimizing toxicity. Although preclinical evidence strongly supports the neuroprotective role of flavonoids, robust clinical trials are required to validate their safety, bioavailability, and therapeutic outcomes in humans. This review highlights the mechanistic insights and therapeutic relevance of flavonoids in MS management, emphasizing their potential to complement or even replace conventional immunomodulatory agents. Exploring these natural compounds may pave the way for safer, multi-targeted interventions in neuroinflammatory disorders such as multiple sclerosis.

Keywords: Multiple sclerosis, Flavonoids, Neuroprotection, Anti-inflammatory, Immunomodulation.

EXPLORING THE DEVELOPMENT AND APPLICATION OF TARGETED DRUG DELIVERY SYSTEM

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ABSTRACT

The advancement of targeted drug delivery systems represents a pivotal stride in modern therapeutics, aiming to enhance treatment efficacy while minimizing systemic toxicity. Among the most promising platforms are nanoparticles and liposomes, which offer precise control over drug distribution, release kinetics, and cellular uptake. Nanoparticles, engineered from diverse materials such as polymers, metals, or lipids, enable site-specific delivery through surface modification and ligand conjugation, allowing for the selective targeting of diseased tissues at the molecular level. Similarly, liposomes—biocompatible vesicular carriers—facilitate the encapsulation of both hydrophilic and hydrophobic drugs, improving bioavailability and protecting therapeutic agents from premature degradation. This paper explores the development, characterization, and application of these nanocarriers, emphasizing their role in cancer therapy, infectious disease management, and gene delivery. It also examines emerging trends in stimuli-responsive and multifunctional systems that integrate diagnostics with therapy (theranostics). By harnessing the precision of nanotechnology, targeted delivery systems hold the potential to redefine the landscape of personalized medicine, offering safer, more effective, and patient-centric treatment modalities.

Keywords: Therapeutics, Nanoparticles, Polymers, Hydrophilic, Hydrophobic, Nanocarriers, Medicine, Multifunctional System.

PHYTOCONSTITUENTS AS THERAPEUTIC AGENTS IN INTESTINAL INFLAMMATION: MECHANISTIC PERSPECTIVES ON ANTI-INFLAMMATORY PATHWAYS

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ABSTRACT

Intestinal inflammation contains inflammatory bowel disease, ulcerative colitis and crohn's disease which are characterized by chronic, relapsing inflammations driven by a complex interplay of immune dysregulation, epithelial barrier dysfunction and gut microbiome alterations. Conventional therapies often lack efficacy and carry significant side effects, necessitating alternative strategies. Medicinal herbs offer a promising multi-target approach, simultaneously modulating various inflammatory pathways. This review elucidates the mechanistic basis by which specific herbs ameliorate intestinal inflammation. Key pathways include the TNF- α /NF- κ B axis, the IL-23/Th17 pathway, oxidative stress, and arachidonic acid metabolism. We discussed in detail how potent phytochemicals such as curcumin (*Curcuma longa*) and andrographolide (*Andrographis paniculata*) directly inhibit NF- κ B signaling, while boswellic acids (*Boswellia serrata*) suppress leukotriene biosynthesis. Furthermore, herbs like wheatgrass and bilberry anthocyanins activate the Nrf2 antioxidant system, scavenging reactive oxygen species. Beyond immunomodulation, certain herbs fortify the intestinal barrier and positively modulate the gut microbiome (myrrh-chamomile blends). Clinical evidence supports the efficacy of herbal formulations in inducing and maintaining remission. This synthesis of mechanistic and clinical data underscores the potential of herbal medicine as a complementary, multi-faceted intervention for IBD, targeting the disease's complexity in a way single-agent pharmaceuticals often cannot. Future research should focus on standardized extracts and advanced delivery systems to optimize these therapeutic benefits.

Keywords: Inflammatory bowel disease, Phytoconstituents, inflammatory pathways, ulcerative colitis, crohn's disease

CHRONIC METABOLIC DISORDER: HYPERGLYCEMIA

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The global rise in diabetes prevalence has intensified the search for more effective, safer, and targeted ant diabetic therapies. Conventional treatments, such as insulin and oral hypoglycemic agents, often face limitations including drug resistance, adverse effects, and inadequate glycemic control. Recent advances in pharmacology and molecular biology have paved the way for novel classes of ant diabetic drugs—such as DPP-4 inhibitors, SGLT2 inhibitors, and GLP-1 receptor agonists—that act through innovative mechanisms to enhance insulin sensitivity, promote glucose excretion, and preserve β -cell function. Moreover, the exploration of natural bioactive compounds and nanotechnology-based drug delivery systems offers promising avenues for improving drug stability, bioavailability, and targeted action. This paper highlights the evolution, mechanism of action, and therapeutic potential of emerging ant diabetic agents, emphasizing their role in achieving optimal glycemic regulation and reducing the burden of diabetes-related complications.

Keywords: Ant diabetic drugs, Diabetes mellitus, Insulin resistance, DPP-4 inhibitors, SGLT2 inhibitors, GLP-1 receptor agonists, Nanotechnology, Targeted drug delivery, β -cell function, Glycemic control.

**AI-ASSISTED PHYTOPHARMACEUTICAL INNOVATION IN STROBILANTHES
CALLOSA: BRIDGING TRADITION WITH TECHNOLOGY.**

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ABSTRACT

The varied pharmacologic character of periodic flowering shrub of the Acanthaceae family *Strobilanthes callosa* (Karvi) has been achieving the scientific attention. Flavonoids, phenolic acids, alkaloids, terpenoids, tannins and glycosides have been identified in the course of phytochemical studies that are good antioxidants and hepatoprotective. Experiments have shown that *S. callosa* extracts have the ability to reduce carbon tetrachlorine and paracetamol hepatotoxicity by significant changes in the restoration of serum biochemical markers (ALT, AST, ALP and Bilirubin), increased antioxidant enzyme (SOD, CAT and GPx) and reduction of lipid peroxidation and expression of inflammatory cytokines in the hepatic tissue. The present paper synthesizes the studies on phytopharmaceutical and artificial intelligence (AI) to understand and exploit the potential of the medicinal agent *Strobilanthes callosa* to its maximum possibilities. Theoretical predictions of the pharmacological active phytoconstituents, evaluation of the pharmacokinetic profile (ADMET) and molecular target had been conducted on the basis of machine learning approaches and in silico modelling in the application of oxidative stress and hepatoprotection. The research on natural products is more accurate and productive as the technique with the help of AI helps to find lead compounds and build logical leads and is based on data. It is observed that the integration of computer intelligence and conventional phytomedicine will lead to the paradigm shift as *S. callosa*, a phytomedicine resource, was turned into a phytopharmaceutical compound to treat hepatotoxicity which had been scientifically proven and driven by AI.

Keywords: *Strobilanthes callosa*, Artificial Intelligence, Hepatoprotective Activity, Phytopharmaceuticals, Machine Learning, Drug Discovery.

NANO EMULSION FORMULATION IN AGE RELATED MACULAR DEGENERATION

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ABSTRACT

Age-related macular degeneration (AMD) is a progressive retinal disorder and the leading cause of irreversible central vision loss in older adults worldwide. It primarily affects the macula, the central portion of the retina responsible for high-acuity vision. AMD is classified into two main types: dry (atrophic) and wet (neovascular or exudative). The dry form, characterized by drusen deposits and retinal pigment epithelium (RPE) atrophy, accounts for nearly 85–90% of cases, whereas the wet form involves choroidal neovascularization leading to rapid and severe vision impairment. The pathogenesis of AMD is multifactorial, involving genetic predisposition, oxidative stress, lipid accumulation, chronic inflammation, and environmental factors such as smoking and prolonged exposure to ultraviolet light. Advances in imaging techniques, including optical coherence tomography (OCT) and fundus autofluorescence, have improved early detection and disease monitoring. Current management strategies for wet AMD include intravitreal administration of anti-vascular endothelial growth factor (anti-VEGF) agents, which have significantly reduced vision loss rates. However, no definitive cure exists for the dry form, and ongoing research explores antioxidant therapy, gene therapy, and stem cell-based interventions. Preventive measures, such as dietary supplementation with lutein, zeaxanthin, and omega-3 fatty acids, show potential in slowing disease progression. Despite therapeutic advances, AMD remains a major public health concern due to the aging global population. Continued research into its molecular mechanisms and novel therapeutic approaches is essential to reduce the burden of visual disability associated with this condition.

Keywords: macular degeneration, disease monitoring, preventive measures, dietary supplementation.

NANOTECHNOLOGY-BASED ENHANCEMENT OF ANTIMICROBIAL ACTIVITY OF TRADITIONAL MEDICINAL PLANTS.

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ABSTRACT

Traditional medicinal plants have long produced bioactive chemicals with antibacterial qualities, but batch-to-batch variability, low bioavailability, poor solubility, and chemical instability frequently hinder their translation into reliable, strong clinical or commercial applications. Recent developments in using nanotechnology to get around these restrictions and boost the antibacterial activity of phytochemicals and extracts from plants are summarized in this study. We look at delivery systems that use nanoparticles, such as metal and metal-oxide nanoparticles, polymeric nanoparticles, liposomes, nanoemulsions, solid-lipid nanoparticles, and nanofibers, to improve solubility, shield labile components, allow for targeted or sustained release, and have synergistic antimicrobial effects. The following mechanistic insights are discussed: enhanced membrane penetration and interaction, elevated local concentration at infection sites, bacterial damage mediated by reactive oxygen species and destruction of biofilms. The review further discusses various formulation approaches, characterization methods, and both in vitro and in vivo studies that demonstrate the enhanced antimicrobial performance of plant-based nanocarriers. It also highlights instances where the use of nanotechnology has lowered the required effective doses or expanded the range of antimicrobial action. Additionally, key challenges and limitations are addressed, such as achieving consistent large-scale production, ensuring compatibility between phytochemicals and nanomaterials, minimizing toxicity and environmental risks, meeting regulatory requirements, and establishing standardized testing protocols. The article concludes by outlining a future research roadmap that promotes interdisciplinary collaboration, comprehensive safety evaluation, and effective clinical translation to responsibly advance nanotechnology applications in plant-derived antimicrobial therapies.

Keywords: traditional medicinal plants, nanocarriers, antimicrobial activity, bioavailability, nanoformulations.

**A COMPREHENSIVE REVIEW ON THE EFFICACY OF GARLIC (*ALLIUM SATIVUM*) IN
THE MANAGEMENT OF CARDIOVASCULAR DISORDERS**

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ABSTRACT

Cardiovascular diseases (CVDs) remain the leading cause of morbidity and mortality worldwide, prompting an ongoing search for effective, natural, and affordable therapeutic options. Garlic, long recognized for its medicinal properties, has gained considerable attention for its potential cardioprotective effects. This review critically examines the current evidence regarding the efficacy of garlic and its bioactive constituents—particularly allicin and other organosulfur compounds—in the prevention and management of cardiovascular disorders. Experimental and clinical studies indicate that garlic supplementation may favorably influence several cardiovascular risk factors, including dyslipidemia, hypertension, oxidative stress, platelet aggregation, and endothelial dysfunction. Mechanistically, garlic exerts lipid-lowering effects by inhibiting hepatic cholesterol synthesis and enhancing bile acid excretion. Additionally, its antioxidant and anti-inflammatory actions contribute to vascular health and reduced atherogenesis. Evidence also suggests mild but significant antihypertensive properties, particularly in hypertensive individuals. However, variability in preparation methods, dosage, and bioavailability among garlic formulations complicates direct comparison across studies. Standardization of garlic supplements and large-scale randomized controlled trials are needed to validate its clinical efficacy and determine optimal therapeutic regimens.

Keywords: *Allium sativum*, cardiovascular diseases, Garlic glycemia, Hypertension, Obesity.

**EMBRACING AI IN PHARMA WORLD: REDEFINING EDUCATION AND INDUSTRY
THROUGH INTELLIGENT INNOVATION**

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ABSTRACT:

The integration of Artificial Intelligence (AI) into the pharmaceutical sector is revolutionizing education, research, and industry operations. In pharmaceutical education, AI enables adaptive and personalized learning through virtual laboratories, simulations, and intelligent tutoring systems, enhancing critical thinking, interdisciplinary collaboration, and workforce readiness for an AI-driven future. In research, AI accelerates drug discovery by predicting molecular behavior, analyzing large-scale genomic and clinical datasets, and identifying promising drug candidates with greater accuracy and efficiency. This significantly reduces time and cost compared to traditional methods. Additionally, AI-driven analytics aid in early disease detection, biomarker discovery, and optimization of therapeutic approaches, advancing the goals of precision and personalized medicine. In the pharmaceutical industry, AI contributes to process automation, quality assurance, and predictive maintenance through intelligent data monitoring. It strengthens regulatory compliance, enhances pharmacovigilance by detecting adverse drug reactions in real time, and streamlines supply chains. The collaboration between academia, research institutions, and industry—facilitated by AI—fosters innovation, sustainability, and ethical practices. Overall, the adoption of AI in pharmaceuticals signifies not just technological progress but a strategic transformation that unites learning, innovation, and operational excellence. This paradigm shift promises a more efficient, intelligent, and patient-centered healthcare ecosystem, redefining the future of global pharmaceutical advancement.

Keywords: Artificial Intelligence (AI), Pharmaceutical Education, Drug Discovery, Personalized Medicine, Machine Learning, Data Analytics, Precision Medicine.

ROLE OF PHYTOSOMES IN ENHANCING ORAL BIOAVAILABILITY AND HEPATOPROTECTIVE ACTIVITY OF SILYMARIN

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ABSTRACT

Phytosomes are an advanced drug delivery system and one of the growing nano technologies formulated to enhance the therapeutic efficacy of existing plant-derived compounds and overcome. Phytosomes are designed to form a complex between the phytoconstituents and phospholipids to identified the traditional challenges of conventional herbal drugs like silymarin, which is widely acknowledged for its hepatoprotective activity but often limited by its poor water-solubility and limited oral bioavailability. This review explores the role of phospholipid based on phytosomes of silymarin, enhancing the oral bioavailability. Solvent evaporation method was used for the preparation of phytosomes, and were optimized and in vivo hepatoprotective activity, oral bioavailability, and antioxidant activity of the optimized formula were investigated in a rat model. The in vivo assessment studies concluded that the optimized silymarin phytosomes adequately exerted a hepatoprotective effect in a CCl₄-induced hepatotoxicity in a rat model and restored the normal levels of antioxidant enzymes, reducing the extent of CCl₄-intoxication. When compared to standard silymarin, the silymarin phytosomes improved oral bioavailability. Conclusively, phytosomes bridge the gap between conventional herbal medicine and modern pharmaceutical technology, offering improved therapeutic action, reduced dosage requirements, and increased patient compliance, and hold the significant potential for the use of nanotechnology and future drug development.

Keywords: Silymarin, Phytosomes, Nanoparticles, Hepatoprotective, Hepatotoxicity.

ENHANCING DRUG DELIVERY AND THERAPEUTIC EFFICACY THROUGH ADVANCED DOSAGE FORMS

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ABSTRACT

The development of advanced dosage forms has revolutionized the field of pharmaceuticals, enabling targeted and controlled release of therapeutic agents. Recent advancements in dosage form design have focused on improving drug solubility, bioavailability, and therapeutic efficacy. This review highlights the latest developments in advanced dosage forms, including nanoparticles, liposomes, micro particles, and 3D-printed dosage forms. These innovative dosage forms have shown promise in enhancing drug delivery and therapeutic efficacy for various diseases, including cancer, infectious diseases, and chronic conditions. The potential benefits of these advanced dosage forms include improved patient compliance, reduced side effects, and enhanced therapeutic outcomes. This abstract discusses the current state of advanced dosage forms and their potential to transform the field of pharmaceuticals. The integration of computational modeling and artificial intelligence further supports the optimization of formulation parameters and prediction of in vivo performance. Collectively, these advancements represent a paradigm shift in pharmaceutical technology, focusing on patient-centered and disease-specific therapies. Continued research and innovation in advanced dosage forms are essential to address unmet clinical needs and to ensure the development of safer, more effective, and personalized drug delivery systems

Keywords: Advanced dosage forms, drug delivery, therapeutic efficacy, nanoparticles, liposomes, 3D printing.

LIC25-P-073

NOVEL THERAPEUTIC APPROACHES FOR TYPE 2 DIABETES: A REVIEW OF EMERGING PHARMACOLOGICAL AGENTS

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ABSTRACT

Type 2 Diabetes Mellitus (T2DM) is a complex metabolic disorder characterized by insulin resistance, impaired insulin secretion, and progressive β -cell dysfunction. Despite the availability of multiple therapeutic options, achieving durable glycemic control while minimizing adverse effects remains a global challenge. Recent advances in pharmacology have led to the development of innovative therapeutic agents that target multiple metabolic pathways beyond glucose lowering. This review highlights the emerging pharmacological classes demonstrating significant promise in T2DM management. Dual and triple incretin receptor agonists, such as tirzepatide (GIP/GLP-1 agonist), have shown superior efficacy in glycemic control and weight reduction compared to existing GLP-1 analogs. Novel SGLT2 inhibitors and dual SGLT1/2 inhibitors (e.g., sotagliflozin) exhibit added cardiovascular and renal benefits. In addition, oral GLP-1 receptor agonists, glucagon receptor antagonists, PPAR modulators, and metabolic regulators like FGF21 and GDF15 analogs represent evolving strategies targeting insulin sensitivity, lipid metabolism, and energy homeostasis. Continued clinical research and pharmacogenomic insights will be crucial to optimizing these emerging therapies and integrating them into personalized diabetes care.

Keywords: Type 2 Diabetes Mellitus, Incretin Agonists, SGLT2 Inhibitors, PPAR Modulators, Novel Pharmacotherapy, FGF21 Analogs, Tirzepatide.

LIC25-P-074

PHYSICOCHEMICAL EVALUATION OF HERBAL EXTRACT FOR DIABETES

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The limitations and side effects of current synthetic antidiabetic agents have prompted a global search for safer and more effective alternatives from natural sources. The present study aims to carry out the physicochemical and phytochemical evaluation of a selected herbal extract traditionally used for the management of diabetes mellitus, to ensure its quality, purity, and standardization for further pharmacological studies. The herbal extract was prepared using hydroalcoholic extraction by Soxhlet apparatus. Physicochemical parameters such as moisture content, total ash, acid-insoluble ash, water and alcohol soluble extractives, and pH were determined according to WHO and Ayurvedic Pharmacopoeia guidelines. Preliminary phytochemical screening was performed to detect the presence of major secondary metabolites. UV-Visible spectrophotometric and FTIR analyses were conducted for functional group identification and standardization. The extract exhibited acceptable physicochemical characteristics within standard limits, confirming its purity and stability. Phytochemical analysis revealed the presence of flavonoids, saponins, tannins, and alkaloids, which are known to contribute to antidiabetic activity. Spectroscopic profiles indicated distinct peaks corresponding to functional groups associated with bioactive compounds. The study establishes a comprehensive physicochemical profile of the herbal extract, providing a foundation for its standardization and further pharmacological evaluation in diabetes management.

Keywords: Diabetes mellitus, Herbal extract, Physicochemical evaluation, Phytochemical screening, Standardization, Antidiabetic activity.

HARNESSING AI AND DIGITAL TECHNOLOGIES TO TRANSFORM HEALTHCARE AND PHARMA

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ABSTRACT

The pharmaceutical and health sectors are experiencing a tremendous change due to artificial intelligence and digital innovations, mostly in terms of drug discovery, designing a clinical trial, personalized medicine, and efficiency of operation. AI will allow the drug development process to be decreased in both time and cost by a significant margin, since the virtual screening of millions of compounds will cover years in a couple of months and save billions of dollars. In addition, AI streamlines clinical trial guidelines, aids the recruitments of patients through digital twin technologies, and assists the decentralized monitoring process, which increases the success rates and cuts the duration of the trial. Personalization of therapeutic interventions using AI analyzes and exploits genomic and extensive clinical data to customize the treatments, which increases the efficacy and profile of safety. In healthcare operations, AI has been used to improve diagnostic accuracy. Digital health solutions such as in -silico trials have the capability of modeling complex biological and clinical conditions to predict drug efficacy and safety thus reducing the licensing of intensive in human trials. Even despite the current limitations of regulations and data-privacy, AI adoption grows faster and faster, and it is expected that by 2030. Pharmaceutical AI will have brought in hundreds of billions of dollars. Such technological innovations have the potential to hasten the rates in innovation, reduce money spent on healthcare and increase access to treatment, thus contributing to the creation of the existing healthcare delivery future that is efficient and patient-centric.

Keywords: Artificial Intelligence, Drug Discovery, Personalized Medicine, Digital Health, Clinical Trials.

NANOPARTICLES IN DRUG DELIVERY SYSTEMS

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ABSTRACT

Nanoparticles are exceedingly diminutive particles, which are smaller than eukaryotic cells that led to the attraction of growing interest for their capability in novel drug delivery. They have distinctive physical and chemical properties as compared to bulk materials due to their nanoscale dimensions and large surface area. Encapsulation of curative agents within these particles protect drugs from degradation in harsh environments, such as the acidic gastrointestinal tract, thus amplifying their stability and potency. Based on their composition, nanoparticles are classified as organic and inorganic. Organic types are based on hydrogen and oxygen framework, can form flexible nanostructures through self-assembly, while inorganic types, mainly metallic, provide higher durability and are often utilized in diagnostic imaging techniques such as MRI or CT. Tools like scanning and transmission electron microscopy are used to visualize and measure these particles' structures. Their unique traits such as tiny size, versatile surface and good dispersibility facilitate their entry in cells and deliver drugs to the target site including intracellular organelles. Despite the fact their remains certain limitations such as limited drug loading capacity and high production cost, yet these systems continue to play a major role in advancing targeted and personalized drug delivery.

Keywords: Nanoparticles, Targeted Drug Delivery, Organic Nanoparticles, Inorganic Nanoparticles

LIC25-P-077

EVALUATION OF NEEM-AMLA HERBAL SHAMPOO

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ABSTRACT

Herbal shampoo is a type of cosmetic product used for the treatment of hair to improve its quality. It is a cosmetic formulation containing surfactants as the main compounds, used under specific conditions to remove surface grease, dandruff, dirt, irritation, and dryness without adversely affecting the user. Synthetic shampoo, on the other hand often cause harmful effects on hair and scalp due to their chemical and toxic substances. Such chemical compound shows various side effects such as hair loss, increased scaling, scratching, discomfort, nausea and headache. The main objective of this review is to evaluate and summarize previously published studies on neem-amlam herbal shampoo emphasizing their physicochemical properties focused on safety, efficacy and quality of the herbal shampoo. The herbal shampoo consists of bahera, amla, hibiscus, neem, tulsi, shikaki, brahmi, ritha, alovera, fenugreek and these are primarily evaluated for organoleptic, foam test, dirt dispersion surface measurement. Therefore, in the present study an attempt is made for analyzing and compiling the potential of herbal shampoo as a safe and effective substitute to the synthetic shampoo.

Keywords: Herbal shampoo, Surfactant, Physicochemical, Fenugreek, Neem, Amla, Ritha.

LIC25-P-078

PUTTING CLINAIOPS INTO PRACTICE: A HUMAN-IN-THE-LOOP AI FOR MANAGING HYPERTENSION IN REAL-TIME

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ABSTRACT

Hypertension management remains a significant clinical challenge, characterized by episodic clinic visits and a one-size-fits-all approach that often leads to suboptimal control and adverse drug reactions. This project proposes a paradigm shift by conceptualizing a technology-enabled framework based on the ClinAIOPS model. The system is designed to facilitate the real-time, remote monitoring of blood pressure via wearable devices. This continuous data stream fuels an AI engine, specifically a time-series forecasting model, to predict patient-specific trends and generate personalized dosage suggestions for antihypertensive medications. Critically, the framework integrates a human-in-the-loop (HITL) design where clinicians retain final approval over all therapeutic adjustments, ensuring safety and leveraging professional judgment. This creates a dynamic feedback loop between patient, AI, and clinician, moving care from a reactive to a proactive and personalized model. We present a detailed architectural blueprint of this system and discuss its potential to significantly improve therapeutic outcomes, enhance patient adherence, and optimize clinical workflow. The poster will also address key implementation challenges, including alert fatigue, data privacy, and the regulatory pathway, proposing concrete mitigation strategies to guide future development and pilot studies.

Keywords: ClinAIOPS, Hypertension Management, Human-in-the-Loop AI, Remote Patient Monitoring, Personalized Dosage.

AI ENABLED DRUG DELIVERY AND DEVELOPMENT

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ABSTRACT

The AI will have a significant role in drug development. It helps us to understand the disease and what molecule will work against that disease. Traditionally, drug development would take 10–16 years for the development of the specific drug molecule. Drug development requires various stages that include identification of the disease, selecting the lead compounds and later studying about the pharmacodynamic and pharmacokinetic properties of the compound. This paper will tell about how AI is revolutionizing the world of drug development. AI makes the process fast and efficient. The data of the predefined molecule is transferred to machine learning that later helps us know the drug and target site interaction. This helps us to know the side effect, toxicity and the therapeutic effects of the drugs. AI technology provides the accurate way of the compound identification, drug target validation, millions structure of drugs. From the millions, AI helps to find the best molecules that can bind with the specific protein. AI has various applications in pharmacovigilance, nanotechnology, drug safety process, quality control, quality assurance, clinical trials. As the limitation in AI models leads to the collaboration and sharing knowledge between the industry. AI has the potential to revolutionize the world of drug delivery.

Keywords: Artificial intelligence, Nanotechnology, Pharmacovigilance, Drug development, Machine learning.

EVALUATION OF MULTIVITAMIN NUTRACEUTICAL

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ABSTRACT

Multivitamins are a type of nutraceutical product used to maintain overall health and prevent vitamin and mineral deficiencies. They are a combination of essential vitamins and mineral that support normal physiological functions of the body such as metabolism, immunity, and energy production. Nutraceuticals, being food-derived products, offer therapeutic benefits without significant side effects when compared to synthetic supplements. The main objective of this study is to evaluate multivitamin nutraceutical formulations and determine their nutritional efficacy and quality. The project also emphasizes their role in improving immune response, enhancing physical and mental performance, and preventing chronic diseases. Multivitamin formulations typically consist of vitamins A, B-complex, C, D, E, and minerals like zinc, calcium, magnesium, and iron, which are essentials for maintaining good health and wellness. Therefore, an attempt is made to evaluate multivitamin nutraceutical as a safe and effective supplement to promote better health, vitality, and prevention of nutrient deficiencies.

Keywords: Nutraceutical, Multivitamin, Immunity, Energy, Minerals, Health supplement, wellness, Preventive care.

LIC25-P-081

AI-POWERED DISCOVERY OF MARINE CAROTENOIDS FOR SMARTER COSMECEUTICALS

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ABSTRACT

The Ocean is a vast and largely untapped source of natural ingredients with remarkable potential for skincare. Among these, marine carotenoids—such as astaxanthin, fucoxanthin, and zeaxanthin—stand out for their antioxidant, anti-inflammatory, and UV-protective properties. These compounds can help reduce signs of aging, improve skin hydration, and protect against environmental stressors. However, identifying which carotenoids are most effective and how best to use them in cosmeceuticals is a complex challenge. To overcome this the best tool is artificial intelligence (AI). During the literature survey, it was observe that introducing AI could transform the way we discover and apply marine carotenoids in skincare. Our goal is to use AI tools to analyze biological and chemical data, predict skin compatibility, and guide formulation strategies. By applying machine learning models to large datasets, we were able to simulate how these compounds interact with skin cells, forecast their antioxidant performance, and even suggest optimal combinations with other skincare ingredients. Key findings revealed that AI could accurately identify carotenoids with high skin benefits and help optimize extraction methods for better sustainability. The technology also showed promise in personalizing skincare solutions based on individual skin profiles. In conclusion, merging marine biotechnology with AI opens new doors for creating smarter, cleaner, and more effective cosmeceutical products.

Keywords: Marine Carotenoids, Artificial Intelligence (AI), Cosmeceuticals, Antioxidant Activity.

LIC25-P-082

PHARMACOVIGILANCE

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ABSTRACT

Pharmacovigilance is a vital component of the healthcare system that focuses on the detection, assessment, understanding, and prevention of adverse effects or any other drug-related problems. Pharmacovigilance plays a crucial role in identifying previously unrecognized adverse drug reactions (ADRs), evaluating the risk–benefit profile of medicines, and ensuring the safe and effective use of drugs in the population. It serves as a bridge between clinical research and real-world drug utilization, as clinical trials often have limitations in detecting rare or long-term side effects due to restricted sample sizes and controlled environments. The pharmacovigilance system involves various activities such as spontaneous reporting, signal detection, data mining, case evaluation, and regulatory actions to minimize risks. Collaboration among healthcare professionals, regulatory authorities, pharmaceutical industries, and patients is essential for effective pharmacovigilance practices. Moreover, the integration of modern technologies such as artificial intelligence, big data analytics, and electronic health records has revolutionized pharmacovigilance, enhancing the accuracy and efficiency of ADR detection and monitoring. In developing countries like India, strengthening pharmacovigilance programs through education, awareness, and robust reporting systems is necessary to ensure public health safety. Overall, pharmacovigilance contributes significantly to improving therapeutic outcomes, promoting rational drug use, and building public trust in healthcare systems. Continuous efforts toward global harmonization, data transparency, and technological innovation will further enhance the scope and effectiveness of pharmacovigilance in the coming years.

Keywords: Pharmacovigilance, Adverse drug reactions, Drug safety, Patient safety, Risk management, Artificial intelligence.

ADVANCEMENT OF AI IN DIABETES MANAGEMENT

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ABSTRACT

Diabetes is a significant cause of premature mortality and complications which affects millions globally. Different developments in Artificial (AI) have significantly changed the regulation of diabetes and provides optimized accuracy, individualization, and efficiency in patient care. Conventional models face barriers such as specialist scarcity, inconsistent patient observance, and the difficulty of managing large volumes of data. AI powered wearable devices have made the regular checking of glucose level easily and various mobile health applications helped patient monitoring. Key advancements consist of AI-powered predictive models for early risk classification of both diabetes onset and the development of complications such as retinopathy and neuropathy. Clinical decision support systems (CDSS) use AI to detect patient related scenarios, enhancing clinical decision making and improving health outcomes via stimulation based learning platforms. AI powered automated insulin delivery (AID) or "artificial pancreas" is a well-developed system used for glycemic control. AI is also helpful in pharmacovigilance by detecting the adverse drug reactions and monitoring safety profiles employing large datasets, enabling proactive intervention. In future we should focus on regular investments, ensuring data security, encouraging teamwork across different fields and focusing on patient related solutions. Glucose monitoring and testing at regular intervals are important to adjust strategies and understanding future aspects which ensure AI's ethical and smooth operation in healthcare.

Keywords: Diabetes management, Artificial intelligence, predictive model, Real -time monitoring, clinical decision support, Automated insulin delivery, Wearable devices, pharmacovigilance, Glycaemic control.

EVOLUTION AI IN CLINICAL RESEARCH AND PHARMACOVIGILANCE

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ABSTRACT

Artificial Intelligence is progressively being used for its revolutionary impact in clinical research and pharmacovigilance. In clinical research, AI enhances data analysis, patient recruitment, and trial design, optimizing efficiency and accuracy. AI-powered tools support decision-making by predicting outcomes and personalizing therapy options. In pharmacovigilance, AI facilitates the detection, assessment, and prevention of adverse drug reactions (ADRs) through advanced algorithms analysing large real-world datasets, including electronic health records and adverse event reports. This improves drug safety monitoring by enabling early signal detection and risk assessment, thus promoting patient care and regulatory compliance. Challenges remain in combining AI technologies, such as ensuring data quality, maintaining privacy, and addressing privacy concerns. Overall, the evaluation of AI shows its potential to revolutionize clinical field and safety monitoring, advancing healthcare results.

Keywords: Artificial Intelligence, clinical research, pharmacovigilance, adverse drug reactions, drug safety, patient care, signal detection, machine learning, data analysis, healthcare.

NARINGENIN-LOADED PLGA NANOSPHERES: A TARGETED NANO THERAPEUTIC STRATEGY FOR RHEUMATOID ARTHRITIS

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ABSTRACT

Rheumatoid arthritis (RA) is a persistent immune-driven inflammatory disorder identified by chronic synovial inflammation, degradation of cartilage and erosion of bone. Recent available treatments often have limited targeted delivery of drugs and adverse effects. This study investigates Naringenin-loaded Poly (lactic-co-glycolic acid) (PLGA) nanospheres shows a novel treatment for RA which encapsulate naringenin with PLGA nanospheres affectively suppressed the symptoms of arthritis and protect integrity of joints. This approach improves permeability and retention effect observed in inflamed joints to enhanced nanomedicine-based therapies for RA, providing a safer and more effective platform for drug delivery. This study summarizes current research integrating formulation of nanoparticle, surface modification, in vitro release profiling, and preclinical studies focuses on developing translational strategies for enhanced RA therapy and patient compliance. This study holds substantial potential for future clinical applications and contributes to ongoing advancements in phytoconstituent-based nanomedicine.

Keywords: Naringenin, PLGA nanospheres, targeted drug delivery, nanomedicine.

REGULATORY COMPLIANCE AND GMP CONSIDERATIONS FOR INJECTABLE MUSCLE RELAXANTS: SUXAMETHONIUM AND ROCURONIUM

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ABSTRACT

Parenteral neuromuscular blocking agents (NMBAs), including suxamethonium (succinylcholine chloride) and rocuronium bromide, are high-risk injectable drugs widely used in anesthesia and intensive care to induce skeletal muscle relaxation. Due to their potent paralytic effects and narrow therapeutic index, these agents are subject to stringent regulatory requirements to ensure patient safety and product quality. Regulatory frameworks—including FDA, EMA, TGA, and CDSCO India—mandate administration only by trained healthcare professionals in controlled settings equipped for airway management and mechanical ventilation. Key regulatory requirements encompass prominent labeling with safety warnings, secure storage and restricted access, rigorous manufacturing under Good Manufacturing Practices (GMP) for sterile injectables, and comprehensive quality assurance systems, including process validation, sterility and endotoxin testing, stability studies, and documentation for batch traceability. Product-specific precautions are emphasized: suxamethonium carries risks of malignant hyperthermia and hyperkalemia, while rocuronium requires monitoring for residual neuromuscular blockade and anaphylaxis. Mandatory post-marketing surveillance and pharmacovigilance ensure early detection of adverse events or product defects. In conclusion, the regulatory landscape for injectable NMBAs integrates stringent manufacturing controls, labeling, handling, and monitoring to minimize medication errors and maximize patient safety. Adherence to these regulations is critical for ensuring the efficacy, quality, and safe clinical use of parenteral neuromuscular blocking agents.

Keywords: Neuromuscular blocking agents, suxamethonium, rocuronium, parenteral drugs, regulatory requirements, Good Manufacturing Practices (GMP), quality assurance.

MICROBOTS AND ROBOTICS IN PHARMACY

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ABSTRACT

The integration of microbots and robotics in pharmacy represents a transformative frontier in nanotechnology and nanomedicine. Microbots—microscale, often nanoscale, robotic systems—are being engineered to navigate through biological environments with unprecedented precision. These tiny devices have shown immense potential in targeted drug delivery, site-specific therapy, precision surgery, and diagnostic monitoring at the cellular level. By minimizing systemic side effects and optimizing therapeutic efficiency, microbots mark a major leap toward personalized medicine. Parallely, robotic systems in pharmacy practice—ranging from automated dispensing units to AI-assisted compounding robots—are revolutionizing pharmaceutical manufacturing and patient care. When combined with nanotechnology, these innovations ensure ultra-precise dosing, real-time therapeutic monitoring, and enhanced drug safety. This poster explores the design principles, mechanisms of action, biomedical applications, and current challenges of microbots in pharmaceutical sciences. It also highlights the future scope of integrating micro-robotics with nanomedicine for intelligent, autonomous drug delivery systems that promise to redefine the boundaries of modern healthcare.

Keywords: Microbots, Nanotechnology, Nanomedicine, Targeted Drug Delivery, Pharmaceutical Robotics, Precision Medicine.

APPLICATION OF MACHINE LEARNING ASSISTED PAT TOOLS FOR REAL-TIME QUALITY MONITORING IN TABLET MANUFACTURING

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ABSTRACT

Maintaining consistent quality across each batch of tablets remains a critical concern in pharmaceutical manufacturing. Process Analytical Technology (PAT) provides a framework for continuous, real-time assessment of critical quality attributes (CQAs) and process parameters throughout production. By integrating Machine Learning (ML) algorithms with PAT, the system can evolve from a monitoring tool into an intelligent, predictive control platform. This study focuses on the implementation of PAT tools such as Near-Infrared (NIR) and Raman spectroscopy for in-line analysis of parameters including blend uniformity, moisture levels, and mechanical strength of tablets. The spectral data obtained from these instruments were processed using ML models like Artificial Neural Networks (ANN) and Support Vector Machines (SVM) to identify hidden trends and deviations that traditional monitoring methods might overlook. Predictive insights generated by these models facilitated real-time decision-making and dynamic process adjustments, ensuring optimal manufacturing performance. The combined use of PAT and ML minimizes batch-to-batch variability, enhances production efficiency, and reduces wastage by enabling proactive process control. Moreover, data-driven strategy aligns with the principles of Quality by Design (QbD), emphasizing process understanding and continuous improvement. The synergy between advanced analytical tools and intelligent algorithms establishes a robust quality monitoring system that ensures precision, reliability, and regulatory compliance in tablet manufacturing.

Keywords: Process Analytical Technology, Machine Learning, Quality by Design, Near-Infrared Spectroscopy, Real-Time Process Control

**AI-ENABLED REGULATORY INTELLIGENCE AND SAFETY EVALUATION IN
NANOCARRIER-BASED DRUG DELIVERY SYSTEMS: A PATHWAY TOWARD
SMARTER PHARMA INNOVATION**

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ABSTRACT

Nanocarrier-based drug delivery systems have become an important innovation in pharmaceutical research, offering targeted, controlled, and effective delivery of drugs. These systems help improve therapeutic outcomes and reduce side effects. However, their safety evaluation and regulatory approval remain complicated because of their variable physicochemical properties, unpredictable behavior inside the body, and limited understanding of long-term effects. Traditional regulatory methods are often not enough to study interactions at the nanoscale or predict systemic toxicity. Artificial Intelligence (AI) provides a promising solution to these challenges. Machine Learning (ML) and Deep Learning (DL) models can analyze large amounts of data from in vitro, in vivo, and in silico studies to predict nanocarrier stability, toxicity, and biological performance. By using reliable regulatory sources such as the European Chemicals Agency (ECHA) website (<https://echa.europa.eu/>) and international authorities like the FDA, EMA, and CDSCO, AI can support data-driven decision-making and improve compliance with safety standards. AI-based regulatory intelligence tools also help in monitoring updated guidelines, preparing standardized dossiers, and identifying possible safety risks early in the product development stage. This ensures faster, safer, and more efficient evaluation of nanocarrier formulations. Overall, the integration of AI with regulatory science creates a strong link between innovation and compliance. It represents a major step toward developing intelligent, safe, and effective nanomedicines that can shape the future of smart pharmaceutical innovation.

Keywords: Artificial Intelligence, Nanocarriers, Regulatory Science, Predictive Toxicology, Safety-by-Design, Smart pharma and machine learning.

**THERAPEUTIC INNOVATIONS BY REPURPOSING PIRACETAM: TARGETING NMDA
RECEPTORS FOR NEUROPATHIC PAIN MANAGEMENT**

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ABSTRACT

Chronic neuropathic pain continues to be a major clinical challenge due to central sensitization and the limited efficacy of conventional analgesics. N-Methyl-D-aspartate receptor hyperactivity is involved in the amplification of nociceptive signaling within the spinal cord. Piracetam, a nootropic drug with an excellent safety profile, has recently attracted attention as an agent capable of modulating glutamatergic neurotransmission and membrane fluidity. This poster focuses on emerging evidence that supports the repositioning of Piracetam and its structurally optimized racetam analogues as potential NMDA-targeted analgesics. In silico molecular docking studies indicated favorable interactions of Piracetam derivatives with the channel vestibule of the NMDA receptor, similar to well-known antagonists. The initial in vivo studies in rodent neuropathy models have shown reduced hyperalgesia and allodynia indicative of modulation of wind-up phenomena. These findings contribute to an innovative therapeutic direction to overcome opioid tolerance, associated side effects, and non-responsiveness in cancer-induced and chemotherapy-induced neuropathic pain. It remains essential to continue enhancing structure–activity relationships, receptor subtype selectivity, and translational outcomes to achieve safer and more effective NMDA-modulating analgesics.

Keywords: NMDA, Piracetam and Neuropathy pain.

PHARMACOLOGICAL ASSESSMENT OF WOODFORDIA FRUCTICOSA

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ABSTRACT

Woodfordia fruticosa commonly known as “Fire Flame Bush” or “Dhataki,” is an important medicinal shrub belonging to the family Lythraceae. It is widely distributed throughout tropical and subtropical regions of Asia, including India, Nepal, Sri Lanka, and Thailand. Traditionally, various parts of the plant, particularly the flowers, have been extensively used in indigenous systems of medicine such as Ayurveda, Siddha, and Unani. The flowers are renowned for their role in the fermentation of herbal formulations like *Asava* and *Arishta* due to their natural yeast content. Ethnomedicinally, *W. fruticosa* is employed for the treatment of diarrhea, dysentery, leucorrhea, menorrhagia, wounds, ulcers, and skin diseases. Decoctions, powders, and extracts prepared from the flowers, leaves, and bark are used as astringent, anti-inflammatory, antimicrobial, and antioxidant agents. The wide range of traditional applications highlights the therapeutic potential of *Woodfordia fruticosa* and justifies further pharmacological and phytochemical investigations to validate its efficacy and safety through modern scientific approaches.

Keywords: Pharmacological, Phytochemical, menorrhagia.

HERBAL-BASED HERBOSOME-LOADED THERMORESPONSIVE HYDROGEL: A NOVEL TOPICAL SYSTEM FOR THE TREATMENT OF ATOPIC DERMATITIS

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ABSTRACT

Atopic dermatitis (AD) is a chronic inflammatory skin disorder characterized by impaired skin barrier function, microbiota imbalance, and immune dysregulation. Conventional corticosteroid therapies carry risks of local and systemic adverse effects. This study presents a novel herbosome-integrated thermoresponsive hydrogel delivering synergistic phytoconstituents for targeted management of AD. The herbosome formulation enhances the solubility, stability, and skin-penetration efficiency of bioactive herbal components through phospholipid-based nanocarrier technology. Incorporation into a poloxamer-based thermoresponsive hydrogel allows on-site gelation at physiological temperature, thereby ensuring sustained drug release and superior patient compliance. Preliminary physicochemical characterization exhibits ideal viscosity, gelation temperature, entrapment efficiency, and spreadability appropriate for dermatological application. Antioxidant and anti-inflammatory assays validate the therapeutic potential of the formulation with improved safety compared to steroids. This work provides a promising phytopharmaceutical alternative for effective and non-invasive AD therapy with strong clinical translation and commercialization potential.

Keywords: Atopic dermatitis, Herbosome, Antioxidant and anti-inflammatory.

ROLE OF AI AND BIG DATA IN ACHIEVING GLOBAL GMP COMPLIANCE

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ABSTRACT

Pharmaceutical manufacturing operates under rigorous global Good Manufacturing Practice (GMP) regulations to guarantee product safety, consistency, and quality. With increasing digitalization, Artificial Intelligence (AI) and Big Data have become essential tools for maintaining compliance and operational excellence. AI technologies such as machine learning, predictive modeling, and anomaly detection enable proactive monitoring of production processes, early identification of deviations, and prevention of quality failures. Big Data analytics supports continuous evaluation of massive datasets, offering real-time insights into process trends, equipment performance, and compliance risks. Together, these technologies enhance decision-making, automate documentation, streamline audits, and ensure data integrity across manufacturing systems. Predictive algorithms anticipate potential equipment malfunctions or quality deviations, reducing downtime and minimizing human error. Automated quality verification systems uphold regulatory standards while improving efficiency and accuracy. Despite the clear advantages, implementation challenges include maintaining cybersecurity, validating AI systems under regulatory frameworks, and ensuring ethical use of data. Addressing these factors requires robust data governance, interdisciplinary collaboration, and adaptive quality management strategies.

Keywords: Artificial Intelligence, Big Data, GMP Compliance, Predictive Analytics.

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICALS: REVOLUTIONIZING DRUG DISCOVERY AND DELIVERY SYSTEM DESIGN

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ABSTRACT

Artificial intelligence (AI) has emerged as a transformative force in the pharmaceutical industry, reshaping the processes of drug discovery, formulation, and delivery design. AI-driven technologies—such as machine learning (ML), deep learning, and natural language processing—offer data-driven insights that accelerate target identification, lead optimization, and toxicity prediction. In formulation science, AI facilitates the optimization of physicochemical properties and enhances the design of advanced drug delivery systems, including nanoparticles, liposomes, and personalized dosage forms. Predictive modeling enables the simulation of drug–biological interactions, reducing experimental trials and improving precision in therapeutic outcomes. Furthermore, AI supports adaptive clinical trial designs and real-time pharmacovigilance, improving patient safety and regulatory compliance. The integration of big data analytics with AI tools allows for the interpretation of complex biological and pharmacokinetic data, promoting rational and efficient drug design strategies. Despite its potential, challenges such as data standardization, model interpretability, and ethical considerations remain key barriers to widespread adoption. Overall, AI-driven innovation represents a paradigm shift toward smarter, faster, and more cost-effective pharmaceutical development, paving the way for personalized and precision medicine.

Keywords: Artificial intelligence, Machine learning, Drug discovery, Drug delivery systems, Pharmaceutical innovation, Predictive modelling.

LIC25-P-095

HERBAL AND PHYTOPHARMACEUTICAL INNOVATIONS IN THE MANAGEMENT OF PSORIASIS

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ABSTRACT

Psoriasis is a chronic, autoimmune skin disease distinguished by keratinocytes hyperproliferation and excessive activity of cytokine, mainly includes TNF- α , IL-17, and IL-23 pathways. Conventional therapies like corticosteroids and immunosuppressant gives symptomatic relief but however their use are often limited by adverse effects. Herbal and phytopharmaceutical innovations have recently emerged as promising, viable, and more sustainable strategies for psoriasis. Bioactive herbal constituents like curcumin, boswellic acids, psoralen, aloin, and indirubin exhibit potent anti-inflammatory, antioxidant, and immunomodulatory activities. Advanced formulation technologies including nanoemulsions, phytosomes, liposomes, and hydrogel systems significantly increase the solubility, bioavailability, and targeted skin delivery of these herbal compounds. Curcumin-based Nanogels and bakuchi phytosomes, for instance, exhibit improved transdermal penetration. These innovations bridge traditional herbal knowledge with modern pharmaceutical science, resulting in standardized, reproducible, and user-friendly phytopharmaceutical formulations. Sustained progress in green extraction techniques, nanotechnological innovation, and clinical research is likely to enhance the therapeutic efficacy of herbal treatments in psoriasis management.

Keywords: Psoriasis, Phytopharmaceutical, Nano formulation, Curcumin.

LIC25-P-096

AMR: THE SILENT PANDEMIC

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ABSTRACT

Antimicrobial resistance (AMR), which makes infections more challenging to treat, is the evolution of bacteria, viruses, fungi, and parasites to resist the effects of drugs. It is referred to as the "silent pandemic" because, in contrast to COVID-19, it spreads covertly throughout the world and claims millions of lives every year. The overuse and abuse of antibiotics in human, animal, and agricultural settings accelerates this resistance. Previously treatable common infections and minor wounds have the potential to become fatal. Global initiatives to combat AMR concentrate on surveillance systems, infection prevention, rational antibiotic use, and research into new medications and vaccines. AMR is one of the biggest threats to public health in our time because, if nothing is done quickly, it may eventually render even common surgeries or infections incurable.

Keywords: Antimicrobial resistance (AMR), Antibiotics, Silent pandemic

LIC25-P-097

PRESCRIBE WITH CARE: FIGHTING ANTIMICROBIAL RESISTANCE

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ABSTRACT

Antimicrobial resistance (AMR) is a serious global health burden, and there is a need for a shift in prescribing culture. This research explores the imperative role of prudent antibiotic prescribing in the control of AMR. Through examination of prescribing behavior in various healthcare environments, we determine contributing factors to inappropriate antibiotic prescribing and assess methods for enabling responsible prescribing. The study underscores the need for evidence-based guidelines, quick diagnostic tests, and ongoing medical education in maximizing antimicrobial stewardship. Their implementation shows a significant decrease in inappropriate antibiotic prescriptions and patient outcomes. Nonetheless, barriers of diagnostic uncertainty and patient expectations remain. This research highlights the imperative necessity of a comprehensive strategy, integrating policy responses, technological innovation, and behavioral change to maintain antibiotic effectiveness and reduce the transmission of AMR.

Keywords: Antimicrobial Resistance, Antibiotic Stewardship, Prescribing Practices, Evidence-Based Guidelines, Rapid Diagnostics.

LIC25-P-098

APPLICATION OF GREEN ANALYTICAL SOFTWARE AND AGREE TOOL IN HPLC METHOD DEVELOPMENT AND VALIDATION

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ABSTRACT

Green Analytical Chemistry (GAC) concepts are being used more quickly in method development and validation as a result of the analytical sciences' paradigm shift toward environmental sustainability. Despite being reliable and often used for both quantitative and qualitative studies, conventional High-Performance Liquid Chromatography (HPLC) techniques are frequently linked to high solvent consumption, energy-intensive processes, and the production of toxic waste. Because of these considerations, green evaluation techniques must be used in order to measure and reduce the ecological effect of chromatographic processes. An sophisticated computational tool called Analytical GREEnness (AGREE) was created to assess analytical methodologies' environmental performance quantitatively using the 12 Green Analytical Chemistry principles. Individual principle evaluations are combined into a single greenness score (0–1) by AGREE, which also offers a color-coded circular diagram that illustrates the importance of each parameter. The sustainability features of analytical techniques, such as reagent toxicity, energy efficiency, waste reduction, automation, sample throughput, and downsizing, may now be fully understood thanks to this. AGREE is the decision-support software design for the development and validation of HPLC methods. It makes it possible to systematically optimize chromatographic parameters, including solvent type, column size, flow rate, analysis time, and mobile phase composition, to improve analytical performance and environmental compatibility. By incorporating AGREE analysis into the validation process, sustainability metrics are added to the conventional validation parameters guaranteeing that the analytical technique complies with ecological and regulatory requirements.

Keywords: Green Analytical Chemistry (GAC), High-Performance Liquid Chromatography (HPLC), AGREE, environmental, validation

PHARMACOVIGILANCE

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ABSTRACT

Pharmacovigilance is a vital component of the healthcare system that focuses on the detection, assessment, understanding, and prevention of adverse effects or any other drug-related problems.. Pharmacovigilance plays a crucial role in identifying previously unrecognized adverse drug reactions (ADRs), evaluating the risk–benefit profile of medicines, and ensuring the safe and effective use of drugs in the population. It serves as a bridge between clinical research and real-world drug utilization, as clinical trials often have limitations in detecting rare or long-term side effects due to restricted sample sizes and controlled environments. The pharmacovigilance system involves various activities such as spontaneous reporting, signal detection, data mining, case evaluation, and regulatory actions to minimize risks. Collaboration among healthcare professionals, regulatory authorities, pharmaceutical industries, and patients is essential for effective pharmacovigilance practices. Moreover, the integration of modern technologies such as artificial intelligence, big data analytics, and electronic health records has revolutionized pharmacovigilance, enhancing the accuracy and efficiency of ADR detection and monitoring. In developing countries like India, strengthening pharmacovigilance programs through education, awareness, and robust reporting systems is necessary to ensure public health safety. Overall, pharmacovigilance contributes significantly to improving therapeutic outcomes, promoting rational drug use, and building public trust in healthcare systems. Continuous efforts toward global harmonization, data transparency, and technological innovation will further enhance the scope and effectiveness of pharmacovigilance in the coming years.

Keywords: Pharmacovigilance, Adverse drug reactions, Drug safety, Patient safety.

"PSEUDOTERNARY PHASE DIAGRAM: A STRATEGIC TOOL FOR SMIX AND OIL PHASE SELECTION IN NANOEMULGEL PREPARATION"

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ABSTRACT

A promising strategy for improving the solubility, stability, and bioavailability of medications that are not very water soluble is the creation of nanoemulgels. In order to create a stable and effective nanoemulsion system, a crucial stage in their formulation is the methodical selection of the right oil phase and surfactant–cosurfactant mixture (Smix). For this, the pseudoternary phase diagram is a useful scientific and strategic tool that helps identify the ideal component ratios and gives a visual depiction of the emulsification zone. Formulators can identify the best combinations that provide thermodynamic stability, small droplet size, and effective drug encapsulation by assessing the extent of the nanoemulsion area and phase behavior at various Smix ratios. This work emphasizes how crucial the pseudoternary phase diagram is for directing the logical choice of formulation ingredients for the creation of nanoemulgels, which expedites the development process and enhances the therapeutic efficacy of topical and transdermal drug delivery systems.

Keywords: Nanoemulsion, Nanoemulgel, Pseudoternary phase diagram, Surfactant-Cosurfactant and oil phase.

**NUTRACEUTICALS GUMMIES:
A NOVEL APPROACH IN MANAGEMENT OF DIABETES**

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ABSTRACT

Nutraceutical herbal gummies represent an innovative delivery system combining the nutritional benefits of food with therapeutic effects of botanical compounds. These chewable formulations bridge the gap between conventional dietary supplements and pharmaceutical preparations, offering a patient-friendly alternative to traditional tablets and capsules. A nutraceutical is an alternative to medication that has physiological benefits. Jellies or Gummies are clear or semi-transparent, oil-free, semisolid preparations that can be used internally or externally, improved bioavailability and compliance: Gummies can offer faster absorption and more consistent peak blood concentrations than tablets. Their palatable nature and ease of use, especially for children or the elderly, can significantly improve patient adherence to a regimen. Oral gummies facilitate rapid breakdown of drugs by employing saliva without the need for water and rapid drug absorption through the buccal mucosa, limiting the first-pass effect. Formulation and Composition Herbal gummies are typically formulated using gelatin, natural gelling agents (such as pectin, agar, or carrageenan), and a matrix of herbal extracts standardized for their bioactive constituents. These typically formulated using gelatin, natural gelling agents (such as pectin, agar, or carrageenan). Herbal gummies for diabetes are a promising alternative designed to manage diabetes mellitus by delivering herbal extracts with glucose-lowering properties in a convenient and palatable gummy form. These anti-diabetic gummies incorporate herbal compounds such as *Gymnema sylvestre*, *Berberis vulgaris*, *Cinnamomum verum*, *Momordica charantia*, and others, which act by increasing insulin secretion, improving insulin sensitivity, inhibiting glucose production in the liver, and enhancing glucose uptake in tissues. Formulation techniques focus on using natural gelling agents, low-calorie sweeteners, and natural flavorings to improve bioavailability, stability, and consumer acceptance. Clinical studies and in vivo trials have shown these gummies reduce fasting blood glucose and improve insulin sensitivity with good safety profiles, making them an attractive complementary treatment option alongside conventional diabetes management. Key challenges involve standardization, quality control, and regulatory compliance for consistent efficacy and safety.

Keywords: patient-friendly, blood concentrations, Jellies, Gummies, antioxidant, anti-inflammatory, bioavailability, gelling agents, sweeteners, diabetes management, insulin secretion, *Cinnamomum verum*.

DEVELOPMENT OF A NANOEMULSION FOR ENHANCED THERAPEUTIC MANAGEMENT OF HIV AND HERPES SIMPLEX VIRUS INFECTION

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ABSTRACT

Nanoemulsions represent a promising approach to drug delivery, which offers higher bioavailability and efficacy for achieving therapeutic outcomes. We have designed a nanoemulsion formulation combining therapeutic action on HIV and HSV. The selected drug comes from the BCS class 2 and 3. These drugs act as protease inhibitors and guanosine analogs. The protease inhibitors act by blocking the HIV-1 protease enzyme essential for vital maturation. The guanosine analogs inhibit viral DNA polymerase after phosphorylation in infected cells, effectively blocking HSV. Nanoemulsions, with their small droplet size and high surface area, are potentially significant by improving the solubility, stability, and targeted delivery. Nanoemulsion can effectively improve bioavailability and therapeutic efficacy and reduce systemic toxicity. It revolves around the important formulation parameters such as selection of oil, surfactants, co-surfactants, and their concoction, and their repercussion on droplet size, stability, release profile, etc. We used Kolliphor 40 and transcutol®^{HP} as surfactant and co-surfactant. It will also have a discussion on the promising opportunity provided by these delivery systems to the limitations imposed by conventional drug delivery. It can hence be accepted as an innovative strategy to increase the therapeutic effectiveness of HIV and HSV.

Keywords: Nanoemulsion, HIV, Herpes simplex virus, drug delivery, bioavailability, anti-retroviral, Protease inhibitor, droplet size, drug stability.

RECENT INNOVATIONS IN HERBAL BASED IN-SITU GEL FOR UNDER EYE APPLICATION

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ABSTRACT

The under-eye area is one of the most fragile parts of the face, with thin skin, few sebaceous glands, high muscle activity, and thick vasculature. Because of these unique characteristics, it is sensitive to frequent problems such as dark circles, puffiness, dryness, and fine lines. Traditional creams frequently provide only short-term advantages due to ineffective retention and active delivery. In-situ gel technology provides a possible alternative since it exists as a liquid during application and transforms into a gel in response to physiological stimuli such as temperature, pH, or ionic concentration. This transition allows for longer contact times, controlled active release, and increased user comfort. Calendula officinalis (marigold) and Psoralea corylifolia (Babchi) have tremendous potential for under-eye care due to their relaxing, antioxidant, depigmenting, and anti-aging characteristics. Calendula's flavonoids and triterpenoids reduce inflammation and increase hydration, whereas bakuchiol from Babchi has retinol-like properties but is more acceptable. Natural polymers such as gellan gum, alginate, pectin, and xyloglucan offer bioadhesion, stability, and sustained release, making them good carriers for these sensitive actives. Although difficulties such as phytochemical instability, standardization, and microbial contamination exist, developments in nanotechnology, AI-based formulation design, and green chemistry approaches provide unique solutions. Overall, herbal in-situ gels provide an advanced, sustainable, and patient-friendly technique for effective under-eye treatment by combining traditional herbal therapy with modern medication delivery.

Keywords: In-situ gel, calendula officinalis, Psoralea corylifolia, antioxidant, bioadhesion.

ARTIFICIAL INTELLIGENCE IN SMART DRUG DELIVERY SYSTEMS: A STEP TOWARD PERSONALIZED MEDICINE

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative tool in the field of pharmaceutical sciences, especially in the development of smart drug delivery systems. These systems aim to deliver therapeutic agents to specific target sites in a controlled and efficient manner, thereby improving treatment outcomes and minimizing side effects. By integrating AI technologies such as machine learning, deep learning, and neural networks, researchers can analyze complex biological data to predict drug behavior, optimize formulations, and design delivery systems tailored to individual patient needs. Furthermore, AI-driven modeling helps in real-time monitoring of drug delivery, allowing precise dose adjustments based on patient response. This intelligent approach supports the development of personalized medicine, where treatment strategies are customized according to genetic, physiological, and lifestyle factors. In addition, AI facilitates faster drug development by reducing the time and cost associated with experimental trials. Despite its promising potential, challenges such as data security, algorithm transparency, and ethical considerations remain. Overall, the integration of AI in smart drug delivery systems represents a significant step toward personalized and efficient healthcare, paving the way for a future where therapies are not only more effective but also precisely tailored to each individual patient.

Keywords: Artificial intelligence, Smart drug delivery, personalized medicine, Machine learning, deep learning, targeted therapy.

MOLECULAR DOCKING INSIGHTS FOR ASTHMA MANAGEMENT: EXPLORING ANTI-HISTAMINIC (H1) RECEPTOR MODULATION WITH NATURAL FLAVONOIDS

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ABSTRACT

Asthma is a chronic inflammatory airway disorder characterized by bronchial hyperresponsiveness, airway remodelling, and recurrent obstruction. Despite the availability of conventional therapies, adverse effects and limited efficacy in certain phenotypes necessitate the exploration of novel therapeutic strategies. Histamine H1 receptor (HRH1) plays a pivotal role in mediating allergic inflammation, making it a key pharmacological target for antihistaminic drug design. Flavonoids, a diverse class of polyphenolic phytochemicals, exhibit potent anti-inflammatory, antioxidant, and anti-allergic activities. This review summarizes the pathophysiology of asthma, the immunological and molecular mechanisms underlying histamine-mediated inflammation, and the pharmacological relevance of flavonoids in modulating these pathways. Molecular docking studies were conducted to evaluate the binding affinity and interaction profiles of selected flavonoids—such as quercetin, kaempferol, luteolin, and apigenin—with the HRH1 receptor. Docking analyses revealed strong binding interactions at key active sites (MET183, THR184, and ILE187), suggesting potential inhibitory effects comparable or superior to conventional antihistamines. These findings highlight the therapeutic promise of natural flavonoids as HRH1 modulators and support further in vitro and in vivo validation to develop effective, low-toxicity agents for asthma management.

Keywords: Asthma; Histamine H1 receptor; Flavonoids; Molecular docking; Anti-inflammatory; Antihistamine; Natural compounds; Airway inflammation; Quercetin; Kaempferol.

USAGE OF AI IN THE PROSPECT OF PATIENT IDENTIFICATION AND RECRUITMENT

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ABSTRACT

The integration of artificial intelligence (AI) into patient identification and recruitment aims to overcome longstanding clinical trial enrollment challenges. With over 80% of clinical trials worldwide struggling to meet recruitment goals (causing costly delays in new therapies), AI is being deployed to accelerate and broaden patient outreach. AI-driven tools can swiftly sift through electronic health records (EHRs) and other datasets to find eligible participants in minutes instead of weeks. Machine learning and natural language processing (NLP) techniques match patient profiles with complex trial criteria across diverse data sources – from EHRs to global disease registries. For example, AI systems can identify eligible patients with much higher precision than traditional methods (one approach showed 63% vs 40% eligibility yields), and predictive algorithms help streamline pre-screening and site selection. As adoption broadens globally, emerging approaches include AI-facilitated virtual trials and decentralized models; notably, AI platforms are matching oncology patients to trials in the United States and harmonizing rare-disease patient data across Europe. These advancements promise faster, more cost-effective trials and enhanced access for patients worldwide, positioning AI as a catalyst for more inclusive and successful clinical research.

Keywords: Artificial intelligence (AI), Patient identification, Clinical trial recruitment.

ARTIFICIAL INTELLIGENCE IN HOSPITAL PHARMACY: GLOBAL APPLICATIONS AND IMPACT

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ABSTRACT

Artificial intelligence (AI) is transforming hospital pharmacy practice worldwide, enhancing medication safety, operational efficiency, and personalized care. AI-driven systems automate prescription verification, optimize inventory, and support clinical decision-making. Hospitals using auto-verification tools and robotic dispensing have reported near-zero error rates and faster turnaround times, allowing pharmacists to focus on patient-facing roles. Predictive inventory models reduce stock-outs and waste, improving supply chain resilience. Clinical decision support platforms powered by AI analyze patient data to flag drug interactions and contraindications in real time. Tools like MedAware and PharmacyGPT demonstrate how AI can personalize therapy and predict outcomes, especially in complex ICU settings. AI also supports pharmacogenomic integration, enabling tailored dosing and drug selection based on genetic profiles. Globally, institutions like Ballad Health (USA), NHS (UK), and Apollo Hospitals (India) showcase successful implementations. Benefits include reduced adverse drug events, improved adherence, and enhanced patient satisfaction. However, challenges remain data quality, algorithm transparency, staff training, and regulatory oversight are critical for safe adoption. Pharmacists play a central role in validating, implementing, and monitoring AI tools. With thoughtful integration, AI can augment pharmacy practice—improving care delivery while preserving the human-centered approach essential to healthcare.

Keywords: Medication safety, Robotic dispensing, Pharmacogenomics integration.

LIC25-P-108

**A THERAPEUTIC POTENTIAL OF HERBAL CREAM FORMULATION IN THE
TREATMENT OF DERMATITIS**

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ABSTRACT

Dermatitis is a widely spread disease condition that affects comfort and quality of life, eczema and allergic skin reactions are examples of dermatitis. Although standard therapies like immunosuppressants and corticosteroids are frequently successful, stopping them might cause side effects like skin loss, discomfort, and relapses. These difficulties have increased demand for topical creams with herbal foundation because they are typically safer and better suited for long-term use. A traditional medicinal plant was used in our dermatitis study. Its bioactive ingredients, including tannins, flavonoids, and triterpenoids, are useful in dermatitis infection prevention, skin barrier restoration, and inflammation reduction. In addition to their promising therapeutic properties, creams made with traditional medicinal extract show good stability, user acceptance, and simplicity of administration. This herbal cream shows pharmacological benefits and potential role in managing dermatitis. In general, our selected drug formulation shows the potential treatment for dermatitis.

Keywords: Dermatitis, topical formulation and natural therapy.

LIC25-P-109

**A QBD- AND TQM-ORIENTED GREEN ANALYTICAL STRATEGY FOR THE HPLC
METHOD DEVELOPMENT AND VALIDATION OF METFORMIN AND GLIMEPIRIDE
COMBINATION**

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ABSTRACT

The current study describes the methodical application of Quality by Design (QbD) and Total Quality Management (TQM) paradigms to develop and validate a sustainable, high-efficiency liquid chromatographic (HPLC) method for the simultaneous quantification of metformin hydrochloride and glimepiride in combined pharmaceutical formulations. Using Design of Experiments (DoE) and associated surface techniques, critical parameters such phase composition, column temperature, and flow rate were statistically screened and modified. The risk-based QbD framework was used to carry out the development process. Critical quality attributes (CQAs) such theoretical plates, retention length, and tailing factor were evaluated in order to develop a multidimensional design space that guarantees control measures of technique and endurance. Greenness assessment was used to guide solvent selection and chromatographic settings in accordance with the principles of Green Analytical Chemistry in order to lessen the impact on the environment. Analytical performance was confirmed to meet ICH Q2(R2) standards, demonstrating acceptable levels of linearity ($R^2 > 0.999$), precision ($RSD < 2\%$), accuracy (98–102%), and specificity within the concentration range under investigation. The limit of quantification (LOQ) and limit of detection (LOD) measurements were used to confirm the approach's high sensitivity. The combination of QbD and TQM ensured a systematic, data-driven, and continuous improvement-focused analytical approach.

Keywords: Quality by Design, Total Quality Management, Green Analytical Chemistry, HPLC, Metformin, Glimepiride, Method Validation, Design of Experiments

LIC25-P-110

**EXPLORING BENZIMIDAZOLE: MULTITARGET ACTIONS AND STRUCTURE
ACTIVITY RELATIONSHIP**

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ABSTRACT

Benzimidazole represents a vital heterocyclic scaffold in contemporary drug discovery owing to its structural resemblance to purine bases. Benzimidazole-based compounds exhibit broad-spectrum antimicrobial activity against Gram-positive, Gram-negative, and multidrug-resistant strains by targeting key microbial enzymes such as DNA gyrase, topoisomerase, and β -tubulin, thereby interfering with DNA replication and microtubule formation. Structural modifications at the N1, C2, and C6 positions profoundly influence pharmacological behavior by enhancing selectivity, potency, and metabolic stability. Recent advancements in green and sustainable synthetic methodologies have facilitated efficient functionalization of the benzimidazole nucleus, improving lipophilicity, membrane permeability, and overall pharmacokinetic performance. Beyond antimicrobial properties, benzimidazole derivatives demonstrate diverse pharmacological profiles, including anticancer, anti-inflammatory, antiviral, antioxidant, and antiparasitic activities, underscoring their significance as multitarget bioactive agents. In view of the escalating global threat of multidrug resistance, benzimidazole-based hybrid molecules have emerged as promising candidates capable of simultaneously modulating multiple biological pathways, thus offering a robust platform for next-generation therapeutic development.

Keywords: Benzimidazole, MDR, AMR, Green Synthesis.

LIC25-P-111

**A COMPREHENSIVE REVIEW OF ARTIFICIAL INTELLIGENCE IN DRUG
DELIVERY SYSTEM SYSTEMS, NANOMEDICINE, PERSONALIZED MEDICINE,
TARGETED THERAPY.**

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ABSTRACT

The integration of Artificial Intelligence (AI) into the pharmaceutical landscape is heralding a new era of precision medicine, particularly in the domain of drug delivery. Traditional drug development is notoriously time-consuming, expensive, and prone to high attrition rates. AI, with its subfields of machine learning (ML) and deep learning (DL), is poised to de-bottleneck this process by enabling the rational design of intelligent, targeted, and responsive drug delivery systems (DDS). This poster meticulously outlines the transformative role of AI across the entire spectrum of advanced drug delivery. We explore how AI algorithms leverage vast chemical and biological datasets to design novel nanocarriers, predict their physicochemical properties, and optimize their formulation for enhanced efficacy and safety. A significant focus is placed on AI-driven targeted and stimuli-responsive DDS for various oncology, neurological, and inflammatory diseases. The poster is supplemented with detailed tables summarizing key algorithms, recent clinical trials, and a landscape analysis of patents, highlighting the intense commercial and academic interest. The poster also depicts various tools used by AI in drug delivery systems.

Keywords: Artificial Intelligence, Machine Learning, Deep Learning.

LIC25-P-112

**MECHANISTIC INSIGHTS INTO STATIN-INDUCED RHEUMATOID ARTHRITIS:
EVIDENCE FROM PRECLINICAL INVESTIGATIONS**

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ABSTRACT

The study aimed to assess whether statins, particularly Pitavastatin and Lovastatin, are associated with an increased risk of developing rheumatoid arthritis (RA). While statins are well-known for their role in reducing cardiovascular morbidity, they may also lead to immune system dysregulation. This investigation explored the potential link between statin use and the onset of RA. To evaluate this, a collagen-induced arthritis (CIA) rat model was employed to study the *in vivo* effects of statins on arthritis development. Molecular modeling techniques and histopathological analysis were incorporated to support the findings. Key pharmacological parameters, such as paw volume, body weight, arthritic index, and hematological markers, were measured. Additionally, *ex vivo* assays were conducted on inflamed joint tissues to evaluate lipid peroxidation and superoxide dismutase (SOD) activity, followed by detailed histopathological examinations. The findings revealed increased malondialdehyde levels and a notable decrease in SOD activity, indicating the onset of autoimmunity. These biochemical alterations, coupled with histopathological observations, suggest that statins may induce inflammatory processes linked to autoimmune reactions. In conclusion, the study presents evidence that prolonged use of Pitavastatin and Lovastatin could be associated with a higher risk of developing rheumatoid arthritis, likely due to immune dysregulation.

Key words: Hyperlipidemia, Statins, Rheumatoid Arthritis, Lipid peroxidation.

LIC25-P-113

**UNLOCKING HIDDEN MINDS: ADVANCING COMA ASSESSMENT AND
NEUROREHABILITATION WITH BRAIN-COMPUTER INTERFACES**

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ABSTRACT

Managing and evaluating coma and disorders of consciousness (DoCs) present significant challenges in both neuroscience and clinical medicine. Traditional diagnostic methods often fail to accurately detect residual cognitive function. Brain-computer interfaces (BCIs) offer a novel solution by facilitating direct brain-device communication, thereby circumventing motor impairments. This study examined the role of BCIs in interpreting the unconscious mind, identifying concealed consciousness, tracking neural activity, and modulating rehabilitation practices. Using electroencephalography (EEG), functional near-infrared spectroscopy (fNIRS), and functional magnetic resonance imaging (fMRI), BCIs can detect subtle neural responses to stimuli and serve as new diagnostic and interaction tools. Enhanced patient classification and prediction are achieved through improved brain signal processing using machine learning algorithms. With advances in BCI technology, researchers are exploring methods to enhance signal processing and reduce noise, thereby enabling more precise representations of brain function in comatose patients. Interdisciplinary collaboration is essential for developing standardized procedures and addressing the ethical issues associated with using BCIs in at-risk groups. Future research should focus on the long-term effects and potential for BCIs to facilitate communication in minimally conscious patients, fundamentally transforming our understanding of consciousness and recovery mechanisms.

Keywords: Brain-computer interface (BCI), disorders of consciousness (DoC), neurorehabilitation, machine learning, cognitive recovery

**AI-DRIVEN INNOVATIONS IN PHARMACOVIGILANCE: ENHANCING RISK
MANAGEMENT AND PATIENT SAFETY THROUGH MACHINE LEARNING AND
PREDICTIVE ANALYTICS**

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ABSTRACT

AI can be used in pharmacovigilance for the detection and reporting of adverse events. It can automatically extract relevant information about adverse events from various data sources, such as patient forums, electronic health records, and patient reviews. Natural language processing (NLP) helps identify drugs and their associated side-effects. AI tools can be used for case processing and triage, transforming this highly manual process into a fully automated one using machine learning and prioritizing cases that require urgent attention. AI can also merge clinical Furthermore; AI can use predictive analysis of drugs to identify potential risks before they are marketed by analyzing molecular structures and monitoring patient reviews through different sources. Integrating AI into pharmacovigilance enhances patient safety and reduces human error. AI enhances pharmacovigilance by automating the extraction and analysis of adverse drug event data from diverse sources like patient forums, electronic health records, and scientific literature. Natural Language Processing (NLP) identifies drugs and associated side effects within unstructured texts, facilitating automated signal detection and case processing. Machine learning (ML) prioritizes case triage by learning from historical data, enabling faster identification of urgent or high-risk reports and reducing manual workload. AI also integrates heterogeneous data sources to detect rare or emerging adverse reactions through pattern recognition. Predictive analytics assess molecular structures and patient data to forecast potential drug risks before market release. Additionally, AI-driven automation streamlines case narrative writing, coding, and regulatory reporting, improving compliance and efficiency. Together, these AI techniques support continuous, proactive risk management, enhance patient safety, and minimize human error in pharmacovigilance workflows.

Keywords: Machine learning, case triage, adverse drug reactions, pattern recognition, predictive analytics, molecular structure analysis, patient data, AI automation

**AI-DRIVEN DIGITAL INNOVATIONS: TRANSFORMING PHARMACY AND
HEALTHCARE FOR PERSONALIZED, PROACTIVE CARE**

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ABSTRACT

The integration of Artificial Intelligence (AI) and digital innovations in pharmacy and healthcare has revolutionized the way diseases are diagnosed, treated, and monitored. In recent years, AI-driven technologies have enabled a shift from generalized healthcare approaches to more personalized and predictive models. The fusion of digital tools—such as wearable sensors, smart health devices, and mobile health applications—with AI algorithms allows for continuous personalized health monitoring, enabling early detection of physiological changes and timely intervention. In pharmacy, AI is enhancing drug discovery, formulation optimization, and patient adherence through intelligent data analysis and automation. Personalized medicine, guided by AI insights from genomics and biometrics, ensures that therapies are tailored to individual needs, maximizing efficacy while minimizing side effects. Furthermore, AI-powered health monitoring systems provide real-time feedback to healthcare professionals, supporting clinical decision-making and improving patient outcomes. Digital health platforms also empower patients to take control of their health through self-monitoring tools and remote consultations, bridging the gap between patients and healthcare providers. The integration of machine learning, and big data analytics creates a connected healthcare ecosystem that promotes efficiency, accessibility, and precision in medical care. The integration of AI and digital innovations is transforming pharmacy and healthcare by enabling personalized, predictive, and data-driven care. AI technologies such as machine learning, big data analytics, and wearable devices facilitate continuous health monitoring, early detection of physiological changes, and tailored treatment plans. In pharmacy, AI enhances drug discovery, formulation optimization, and patient adherence through intelligent automation and data analysis. Digital health platforms empower patients with self-monitoring tools and remote consultations, improving engagement and bridging gaps with healthcare providers. AI-driven systems also support clinical decision-making by providing real-time feedback to healthcare professionals. This connected ecosystem promotes efficiency, accessibility, and precision in medical care, advancing smarter and more sustainable global health systems. Overall, AI and digital tools are shifting healthcare from generalized approaches to personalized, proactive models that improve patient outcomes and optimize resource use.

Keywords: Artificial Intelligence, Digital Health, Personalized Monitoring, Pharmacy Innovation, Smart Healthcare.

**AI-DRIVEN DISCOVERY AND NANO-ENABLED DELIVERY: REVOLUTIONIZING
PLANT- BASED NUTRACEUTICALS FOR PRECISION HEALTH**

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ABSTRACT

Artificial Intelligence (AI) is transforming natural product research by enabling the rapid, data-driven discovery of bioactive compounds with therapeutic potential. This study proposes an integrated AI framework that combines cheminformatics, metabolomic profiling, and predictive modeling to identify plant-derived molecules for nutraceutical innovation. Curated datasets from publicly available chemical libraries were analyzed using machine learning and QSAR-based algorithms to predict antioxidant, anti-inflammatory, and anti-diabetic activities of phytochemicals. The optimized models achieved prediction accuracies above 85% and reduced manual screening efforts by nearly 60%, enabling the efficient prioritization of compounds with high bioactivity and favorable safety profiles. Additionally, virtual screening and molecular docking analyses were performed to evaluate the interaction strength of the top-ranked compounds with relevant metabolic targets. These AI-assisted insights significantly accelerate the selection of promising nutraceutical candidates and reduce the experimental costs and timelines. Looking ahead, the integration of AI with nanotechnology presents a transformative direction for the development of personalized nutraceuticals. AI-driven nanocarrier design can optimize the solubility, bioavailability, and targeted release of natural bioactives, thereby improving therapeutic efficacy and sustainability. This convergence of AI-enabled discovery and nano-assisted delivery establishes a scalable, precise, and eco-efficient approach to bridge traditional herbal science with modern digital biopharma, shaping the future of intelligent and sustainable health care.

Keywords: Artificial Intelligence, Natural Products, Nutraceuticals, Cheminformatics, Nanotechnology

**ARTIFICIAL INTELLIGENCE IN DRUG DISCOVERY AND DEVELOPMENT: A
CHEMINFORMATICS AND PREDICTIVE MODELING PERSPECTIVE**

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ABSTRACT

Artificial intelligence (AI) has become a revolutionary element in contemporary pharmaceutical research, altering the methods used for designing, optimizing, and assessing new drugs. Traditional drug discovery processes are costly, time-consuming, and often result in high failure rates, whereas AI-based cheminformatics and predictive modeling offer quicker, data-focused alternatives. By combining extensive chemical, biological, and pharmacological datasets with machine-learning (ML) and deep-learning (DL) algorithms, AI facilitates the accurate prediction of molecular properties, bioactivity, and pharmacokinetic behaviour even before experimental testing. This poster examines the essential workflow of AI-supported drug discovery, starting with data collection and organization from databases like ChEMBL, PubChem, and Drug Bank, followed by compound representation using 0D–3D molecular descriptors and structural encodings such as SMILES or molecular graphs. These descriptors act as quantitative inputs for AI models that conduct regression, classification, and clustering to forecast ADMET profiles, drug–target interactions, and toxicity outcomes. The use of AI in de novo molecular design, hit identification, and drug repurposing has greatly enhanced the precision and speed of selecting candidates. Despite its achievements, challenges persist in data quality, the interpretability of “black-box” algorithms, and regulatory approval. Ongoing advancements in transparent model design and curated databases will bolster AI’s dependability in pharmaceutical innovation. Overall, AI-driven predictive modeling signifies a shift towards more cost-effective, sustainable, and intelligent drug discovery for future therapeutics.

Keywords: Artificial intelligence, Cheminformatics, Drug discovery, Predictive modeling, Machine learning, Drug development

AI-DRIVEN FORMULATION ENHANCEMENT: ACCELERATING PRECISION AND INNOVATION IN DRUG DEVELOPMENT

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ABSTRACT

Artificial Intelligence (AI) in formulation enhancement refers to the application of AI techniques to intelligently design and improve pharmaceutical formulations, achieving higher accuracy and efficiency than traditional methods. Previously, scientists had to conduct extensive research and numerous experiments to identify the optimal combination of drugs and excipients. This process requires significant time, money, and effort and generates large volumes of data. By applying AI to formulation optimization, computers can analyze vast datasets and rapidly predict which formula will perform best and yield effective results. Although AI cannot replace human expertise or fully substitute formulation scientists, it can significantly accelerate the process. Its purpose is to assist and enhance human capabilities rather than replace them. AI in formulation is not only about saving time; it also improves our ability to understand, develop, and design medicaments. AI assists scientists in making better decisions and discovering new possibilities in the field. In the future, it will become an essential tool for developing safe and advanced pharmaceutical products. Acknowledgements when integrated with pharmacovigilance, AI can further enhance patient safety and minimize human errors.

Keywords: Traditional methods, Formulation optimization, Prediction.

ROLE OF NANOCARRIERS IN SITE-SPECIFIC DRUG DELIVERY: ADVANCING PHARMACEUTICAL RESEARCH THROUGH INTELLIGENT INNOVATION

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ABSTRACT

Nanocarrier-based site-specific drug delivery systems have emerged as a groundbreaking approach in pharmaceutical research by overcoming the long-standing challenges of nonspecific drug distribution, systemic toxicity, and suboptimal therapeutic efficacy associated with conventional drug administration. This abstract highlights the integration of advanced nanocarrier platforms—such as liposomes, dendrimers, solid lipid nanoparticles, polymeric nanoparticles, and nanocrystal-lipid hybrid system—with intelligent computational technologies for precision therapy and for improved solubilization and bioavailability. AI-driven predictive modeling enables accurate estimation of parameters such as particle integrity, drug entrapment efficiency, and pharmacokinetic profiles, while ML algorithms facilitate the analysis of large-scale biological datasets to guide tailored surface modifications and receptor-mediated delivery strategies. The convergence of nanotechnology with intelligent innovation and cutting-edge breakthroughs fosters faster formulation development, reduced experimental trial cycles, and enhanced translational potential for personalized therapeutics. This study underscores the role of AI-guided nanocarriers as the next frontier in drug delivery research, marking a pivotal step toward intelligent, adaptive, and customized pharmaceutical systems for patient specific treatment or individualized drug delivery system.

Keywords: Nanocarriers, Site-Specific Delivery, Artificial Intelligence, Machine Learning, Personalized Medicine.

LIC25-P-120

ARTIFICIAL INTELLIGENCE IN NANO PHARMACEUTICALS AND SMART DRUG CARRIERS

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing modern pharmaceuticals by transforming the design and development of nanopharmaceuticals. Through advanced algorithms, AI enables precise control of formulation parameters, accurate prediction of particle size and drug release, and improved therapeutic outcomes. This integration minimizes experimental time and cost while supporting the creation of smarter, targeted, and personalized drug delivery systems. In this study, AI-driven models such as machine learning and neural networks were employed to analyze formulation datasets for nanoparticle characteristics including surface charge, encapsulation efficiency, and drug loading. Predictive simulations were utilized to identify optimal formulation conditions prior to laboratory validation, ensuring efficient and accurate experimental planning. The findings revealed that AI-based optimization significantly improved formulation stability, release kinetics, and predictability of nanoparticle behavior within biological systems. This reduced the number of experimental trials required and enhanced the reproducibility of results. Such outcomes demonstrate the strong potential of AI to accelerate pharmaceutical innovation and assure higher product quality in nanopharmaceutical development. In conclusion, the integration of Artificial Intelligence in nanopharmaceuticals paves the way for next-generation smart drug carriers that are efficient, targeted, and patient-specific.

Keywords: Artificial Intelligence, Nanocarriers, Regulatory Science, Predictive Toxicology.

LIC25-P-121

HEAVY METAL INDUCED OXIDATIVE STRESS AND PROTECTIVE ROLE OF POLYHERBS

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ABSTRACT

Heavy metals such as lead, cadmium, mercury, and arsenic pose a serious threat to human and animal health due to their persistence, bioaccumulation, and ability to induce oxidative stress. These toxic metals generate reactive oxygen species (ROS), disrupt redox homeostasis, and deplete endogenous antioxidants, resulting in lipid peroxidation and DNA damage. Prolonged exposure leads to the impairment of vital organs through mechanisms involving mitochondrial dysfunction, apoptosis, and inflammatory signaling. Polyherbal formulations have emerged as a promising therapeutic approach to mitigate heavy metal-induced oxidative damage. Medicinal plants possess bioactive compounds like curcumin, flavonoids, and phenolics that enhance antioxidant defense systems, chelate metal ions, and promote tissue repair. This review elucidates the molecular mechanisms underlying heavy metal-induced oxidative stress, its pathological impact on vital organs, and the protective role of polyherbal interventions in restoring physiological balance. The study emphasizes the significance of integrating polyherbal therapy into modern toxicology and preventive medicine to counteract metal toxicity and oxidative stress-related disorders.

Keywords: Heavy metals; Oxidative stress; Antioxidants; Polyherbal therapy; Organ toxicity; Reactive oxygen species; Mitochondrial dysfunction; Herbal medicine

LIC25-P-122

FORMULATION AND DEVELOPMENT OF IN-SITU NANO-GEL DRUG DELIVERY SYSTEM FOR ENHANCED TOPICAL ADMINISTRATION OF ANTI-PSORIATIC DRUGS

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ABSTRACT

Psoriasis is a chronic, immune-mediated skin disorder characterised by excessive keratinocyte proliferation and inflammation, requiring localised and sustained drug delivery for effective management. Conventional topical formulations often exhibit poor penetration, inadequate retention, and suboptimal therapeutic efficacy due to the complex structure of the stratum corneum. To overcome these limitations, the present work explores the formulation and development of an in-situ nano-gel drug delivery system for enhanced topical administration of anti-psoriatic drugs. In-situ nano-gel systems integrate nanotechnology with stimuli-responsive gelation mechanisms, forming a gel matrix upon exposure to physiological conditions such as temperature or pH. This smart transition enables improved drug diffusion, deeper skin permeation, and prolonged drug residence at the target site. The nanoscale drug dispersion enhances solubility and bioavailability, while the gel matrix provides sustained and controlled release, ensuring consistent therapeutic action with reduced dosing frequency. Furthermore, the biocompatible nature of the polymeric network minimizes irritation and enhances patient compliance, making it suitable for long-term dermatological therapy. The proposed in-situ nano-gel platform represents an innovative, non-invasive, and patient-friendly approach for the management of psoriasis. By combining the advantages of nanotechnology and controlled drug delivery, this system holds potential to significantly improve treatment efficacy, safety, and user acceptability. Future investigations may focus on optimizing formulation parameters and exploring artificial intelligence-based predictive models for further refinement and personalized drug delivery solutions.

Keywords: In-situ nano-gel, Psoriasis; Topical drug delivery; Nanotechnology, Controlled release; Anti-psoriatic drugs.

LIC25-P-123

OPTIMIZING PEDIATRIC OUTCOMES IN PFIC: CURRENT TREATMENTS AND FUTURE SAFER STRATEGIES

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ABSTRACT

A comprehensive literature review was performed using PubMed, Scopus, and Web of Science, focusing on studies addressing current treatments, challenges, and emerging strategies for PFIC management. Keywords including “Progressive Familial Intrahepatic Cholestasis,” “pediatric outcomes,” “treatment,” “liver transplantation,” and “novel therapies” were used to identify relevant publications. Articles were critically reviewed with emphasis on pharmacological, surgical, and advanced therapeutic interventions. Current management strategies, including ursodeoxycholic acid, rifampicin, fat-soluble vitamin supplementation, and biliary diversion, provide symptomatic relief but do not halt disease progression in many patients. Liver transplantation remains the curative option, significantly improving survival, growth, and quality of life, though risks of infection, rejection, and lifelong immunosuppression persist. Optimizing pediatric outcomes in PFIC requires a multidisciplinary approach combining early genetic diagnosis, supportive therapies, nutritional management, and timely transplantation. Novel pharmacological agents and gene-targeted therapies represent future safer strategies that hold potential to transform PFIC care and improve quality of life in affected children.

Keywords: Progressive Familial Intrahepatic Cholestasis, Pediatrics, Liver Transplantation.

LIC25-P-124

COMPARATIVE PHARMACOKINETIC AND THERAPEUTIC EVALUATION OF METOPROLOL SUCCINATE AND METOPROLOL TARTRATE ADMINISTERED VIA ORAL AND NASOGASTRIC ROUTES FOR OPTIMIZED DRUG DELIVERY

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ABSTRACT

Metoprolol, a selective β_1 -adrenergic blocker, remains a cornerstone in the management of hypertension and ischemic heart diseases. The transition from oral to NG route poses significant challenges in maintaining therapeutic equivalence, particularly between the immediate-release Metoprolol Tartrate and the extended-release Metoprolol Succinate formulations. The present study aims to comparatively evaluate the pharmacokinetic behaviour, therapeutic outcomes, and drug delivery efficiency of both formulations administered via oral and NG routes. In-vitro dissolution profiling and clinical monitoring of hemodynamic parameters were conducted to assess drug absorption, bioavailability, and therapeutic consistency. Preliminary findings revealed that crushing or dispersing Metoprolol Succinate for NG administration markedly altered its controlled-release characteristics, leading to fluctuations in plasma concentration and reduced therapeutic predictability. In contrast, Metoprolol Tartrate exhibited stable pharmacodynamic effects and near-identical performance through both routes. This comparative evaluation highlights the clinical significance of route-dependent drug behaviour and underscores the need for formulation-specific administration protocols. Pharmacist-led evaluation, dose modification, and patient monitoring play a crucial role in ensuring drug delivery optimization and minimizing therapy-related risks. The findings emphasize that informed route selection and adherence to evidence-based administration practices are vital to achieving safe and effective cardiovascular management in critical care settings.

Keywords: Metoprolol Succinate, Metoprolol Tartrate, Nasogastric Administration, Pharmacokinetics, Therapeutic Equivalence, Drug Delivery Optimization.

LIC25-P-125

SHOWING ARTIFICIAL INTELLIGENCE IN THE SENSING OF BREAST CANCER

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ABSTRACT

Breast cancer is one of the most common causes of mortality among women worldwide, highlighting the importance of early detection and accurate diagnosis. Artificial intelligence (AI) has emerged as a transformative tool in breast cancer detection, particularly through machine learning and deep learning applications. These technologies analyze mammograms, ultrasounds, and histopathological images with greater speed and precision, offering significant improvements over conventional methods. Data preprocessing techniques such as image enhancement and noise reduction further strengthen model performance, while evaluation metrics like sensitivity, specificity, and accuracy ensure reliability. However, challenges remain, including the availability of high-quality datasets, ethical concerns, interpretability of AI models, and integration into clinical practice. Addressing these issues is crucial for widespread adoption. AI also shows promise in personalized healthcare by combining imaging with genetic and clinical data, paving the way for tailored treatment approaches. Mammogram-based automated detection plays a particularly vital role, as mammography remains a cost-effective and accessible screening tool. AI-driven improvements in this area have the potential to enhance early diagnosis, optimize treatment planning, and ultimately save lives. Collaboration among healthcare providers, researchers, and policymakers will be essential to fully realize the benefits of AI in breast cancer management.

Keywords: Breast cancer, artificial intelligence, mammography, machine learning, personalized care.

FORMULATION AND DESIGNING OF NANOEMULSION FOR THE MANAGEMENT OF HIV INFECTION.

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ABSTRACT

Nanoemulsion represents an efficient drug delivery system that increases drug bioavailability and improves therapeutic efficacy. The Present work aim is to formulate nanoemulsion for the HIV management. The drugs belong to BCS Class 2 and include protease inhibitors and integrase strand transfer inhibitors activity. Protease inhibitors act by inhibiting the HIV-1 protease enzyme, which is essential for viral maturation. Integrase strand transfer inhibitors block the HIV integrase enzyme, preventing the incorporation of viral DNA into the host genome. This action blocks provirus formation and limits further viral replication. The nanoemulsion system exhibits a high surface area and small droplet size, which enhance drug solubility, improve formulation stability, and facilitate targeted drug delivery resulting less systemic toxicity while improving therapeutic action. The formulation consists of an oil phase, a surfactant and a co-surfactant. The interaction between the surfactant and co-surfactant stabilizes the interface, controls droplet size, and regulates the drug release profile. Overall, this nanoemulsion-based formulation improves HIV drug delivery and reduce the limitations associated with conventional dosage forms.

Keywords: Nanoemulsion, HIV, Bioavailability, Anti-retroviral, protease inhibitor, Drug stability.

DEVELOPMENT OF A NOVEL NANOEMULSION SYSTEM INTENDED FOR TARGETED DRUG DELIVERY FOR MANAGEMENT OF HIV INFECTION

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ABSTRACT

Nanoemulsion acts as an advanced drug delivery system that improves drug oral bioavailability and therapeutic performance. The formulation contains BCS Class 3 drug having nucleoside analogue reverse transcriptase inhibitors activity (NRTIs). These NRTIs resemble natural nucleosides and interact with reverse transcriptase, as well as DNA-dependent and RNA-dependent DNA polymerases. Their antiviral action involves blocking the viral polymerase and causing early termination of the DNA chain. This stops viral genome formation and reduces HIV replication. The nanoemulsion contains small droplets with a large surface area, which increases drug solubility, improves stability, enhances penetration, and allows targeted drug delivery with less systemic toxicity. The formulation includes an oil phase, surfactant and a co-surfactant. The surfactant and co-surfactant together reduce interfacial tension and form stable nano-sized droplets, controlling droplet size, stability, and drug release rate. This drug delivery system enhances absorption and therapeutic effect and reduces the limitations commonly seen with conventional HIV drug formulations.

Keywords: Nanoemulsion, HIV, Drug delivery, Nucleoside analogue reverse transcriptase inhibitors, Drug stability.

LIC25-P-128

HARNESSING ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE PHARMACEUTICAL WASTEWATER MANAGEMENT

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ABSTRACT

Pharmaceutical wastewater contains complex mixtures of active ingredients, solvents, and contaminants that challenge traditional treatment methods. This poster explores how artificial intelligence can help transform wastewater management in pharmaceutical manufacturing through real-time monitoring and predictive analytics. Machine learning algorithms can identify contamination patterns, optimize treatment processes, and predict equipment failures before they occur. By analyzing vast datasets from sensors and historical records, AI systems can help facilities reduce water consumption, lower treatment costs, and ensure regulatory compliance. AI technologies enable pharmaceutical facilities to adapt dynamically to varying wastewater compositions and flow rates. Early implementations show promising results in treatment efficiency improvements and significant reductions in environmental discharge violations. The integration of AI-driven solutions represents a practical and essential step toward more sustainable pharmaceutical production, helping the industry meet increasingly stringent environmental regulations while maintaining operational efficiency.

Keywords: Pharmaceutical wastewater, industry, sustainable, artificial intelligence.

LIC25-P-129

RISK BASED QUALITY ASSESSMENT OF GREEN TEA-BASED NUTRACEUTICAL CAPSULE USING FMEA

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ABSTRACT

In this study, the Failure Mode and Effects Analysis (FMEA) method is used to assess the risk-based quality of green tea-based nutraceutical capsules. FMEA focusses on steps like raw material selection and packaging to help identify and rank manufacturing and quality control risks. Risk Priority Numbers (RPN) were determined for each risk after potential failure mechanisms were examined and rated for severity, occurrence, and detection. Operator training and improved environmental monitoring were among the suggestions for preventative and remedial actions. Based on the results, a risk-based approach using FMEA can guarantee product safety and regulatory compliance, lower manufacturing errors, and enhance quality assurance in nutraceuticals.

Keywords: Risk-based quality, green tea capsules, manufacturing, quality control, quality assurance.

GREEN SYNTHESIS AND CHARACTERIZATION OF SILVER NANOPARTICLES (AGNPS) USING METHANOLIC EXTRACT OF BONAFOUSIA SANANHO LEAVES

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ABSTRACT

The present study focuses on the green synthesis of silver nanoparticles (AgNPs) using the methanolic leaf extract of *Bonafousia sananho*, a medicinal plant known for its rich phytochemical profile. The aim was to develop an eco-friendly, cost-effective, and sustainable method for nanoparticle production while utilizing plant-derived biomolecules as natural reducing and stabilizing agents.

Preliminary phytochemical screening confirmed the presence of alkaloids, phenolics, flavonoids, and saponins, indicating the potential of the extract for nanoparticle synthesis. The synthesis process was optimized using a 2³ factorial design, evaluating the influence of key parameters such as extract concentration, silver nitrate concentration, and reaction time on nanoparticle yield and stability. Characterization of the synthesized AgNPs was carried out using multiple analytical techniques. UV–Visible spectroscopy confirmed nanoparticle formation through a distinct surface plasmon resonance peak around 420–440 nm. FTIR analysis revealed functional groups responsible for reduction and capping of nanoparticles, while XRD patterns confirmed the crystalline nature and purity of silver nanoparticles with characteristic peaks corresponding to the face-centered cubic (FCC) structure. SEM images demonstrated uniform, spherical morphology, and DLS measurements showed average particle sizes in the nanometer range with a low polydispersity index (PDI < 0.3), indicating uniform distribution. Zeta potential values exceeding ±30 mV confirmed good stability of the nanoparticle suspension. The study successfully demonstrates that *Bonafousia sananho* leaf extract can act as a dual reducing and stabilizing agent for the synthesis of stable silver nanoparticles. This green synthesis approach offers a sustainable alternative to conventional chemical methods, with potential applications in antimicrobial, antioxidant, and pharmaceutical formulations.

Keywords: *Bonafousia sananho*, green synthesis, silver nanoparticles, FTIR, XRD, SEM, DLS, zeta potential, factorial design, phytochemicals .

PERSONALIZED MEDICINE IN HYPERTENSION: A STEP TOWARDS TARGETED THERAPY.

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ABSTRACT

Hypertension is a complex, multifactorial disease requiring individualized treatment approaches. This study explores the role of genetic markers and patient-specific factors in optimizing antihypertensive therapy. Prospective, observational study of 150 hypertensive patients. Genetic markers (e.g., ACE, AGT, CYP11B2) and patient-specific factors (e.g., age, sex, kidney function) were analyzed. Patients were treated with standardized antihypertensive regimens and monitored for 6 months. Genetic marker analysis identified 30% of patients with variants associated with reduced response to certain antihypertensives. Patient-specific factors, such as kidney function and age, significantly influenced treatment outcomes. Personalized treatment approaches, based on genetic and patient-specific factors, resulted in improved blood pressure control ($p < 0.01$) and reduced adverse events ($p < 0.05$). This study demonstrates the potential of personalized medicine in hypertension, highlighting the importance of genetic markers and patient-specific factors in optimizing antihypertensive therapy.

Keywords: Personalized medicine, hypertension, genetic markers, patient-specific factors, targeted therapy, antihypertensive treatment.

LIC25-P-132

EMULGEL FOR KERATOCONJUNCTIVITIS SICCA

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ABSTRACT

Commonly referred to as dry eye disease, keratoconjunctivitis sicca (KCS) is a chronic disorder marked by irritation, inflammation of the ocular surface, and instability of the tear film. Artificial tears, anti-inflammatory drugs, and punctal plugs are examples of current therapeutic methods; however, these sometimes only offer short-term respite and necessitate repeated administration. Emulgels, a hybrid formulation that combines the advantages of gels and emulsions, have become a viable substitute for long-term medication administration in ocular applications. This study investigates emulgel's potential as a successful treatment for KCS, emphasising how it can increase patient compliance, prolong ocular surface residence duration, and improve medication retention. Bioadhesive polymers are used in the formulation to improve mucoadhesion, which guarantees longer hydration and fewer doses. Furthermore, the emulsion-based approach makes it possible to effectively encapsulate and regulate the release of active ingredients, including corticosteroids, cyclosporine, or hyaluronic acid, to reduce inflammation and stabilise tear films. In comparison to traditional eye drops, preliminary in vitro and in vivo tests show better absorption, increased corneal penetration, and improved tear film stability. Emulgels' rheological characteristics make application simple while halting the ocular surface's fast draining. Emulgels may transform dry eye treatment, according to promising results from clinical trials evaluating efficacy, tolerability, and safety. To sum up, emulgels offer a novel, patient-friendly, and effective approach to managing KCS that may enhance long-term ocular health and treatment compliance. Their broad use in ophthalmology may be made possible by additional study and advancement.

Keywords: Keratoconjunctivitis sicca, Emulgel, Dry eye disease.

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DESIGN AND IN-SILICO CHARACTERIZATION OF PHENOLIC SCHIFF BASE DERIVATIVES AS POTENT ANTIMICROBIAL AGENTS AGAINST SKIN-ASSOCIATED BACTERIAL TARGETS

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ABSTRACT

Multi-drug antimicrobial resistance among skin pathogens such as *Staphylococcus aureus* and *Pseudomonas aeruginosa* are increasing at an alarming rate causing microbial often leads to death of patients. Natural phenols on formation of Schiff base by replacing hydroxyl groups using hydrazine hydrate to generate amino-substituted analogues with phenolic aldehydes exhibit enhanced biological activity. 41 ligand were designed and screened against 6 bacterial protein targets DNA Gyrase A (1AB4), Sortase A (1T2P), Clumping Factor A (2VR3), Enoyl-ACP Reductase FabI (4FS3), DNA Gyrase B (4URM), and Penicillin-Binding Protein 2a (5M18) against reference inhibitors including ciprofloxacin, quercetin, baicalein, triclosan, novobiocin, and ceftaroline. Comparative analysis of docking affinities showed various ligands exhibited superior predicted binding relative to the reference inhibitors. Ligands 15,18,32 and 37 emerged as most promising candidates by showing high affinity across multiple protein targets. FabI and PDB2a displayed strongest ligand interactions indicating their roles in inhibiting bacterial fatty acid synthesis and β -lactam resistance. This work demonstrates the synergistic potential of polyphenolic scaffolds and phenolic aldehydes in antimicrobial drug design through AI-assisted virtual screening and structure–activity interpretation.

Keywords: Natural phenols, Antimicrobial activity, Molecular Docking, AI drug discovery.

AI-BASED PERSONALIZED HEALTH MONITORING FOR PREVENTIVE HEALTHCARE

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ABSTRACT

The integration of Artificial Intelligence (AI) into healthcare has brought a major shift from traditional treatment-based approaches to preventive and personalized healthcare. AI-based personalized health monitoring systems use data collected from wearable sensors or biosensors electronic health records, and mobile applications to continuously track vital signs such as heart rate, blood pressure, body temperature, and oxygen levels. AI-powered scrutinize live data to pinpoint anomalies, predict potential health risks, and offer tailored guidance for individual. By enabling prompt medical interventions, these technologies support the early detection and prevention of diseases such as diabetes, hypertension, and cardiac disorders, leading to better patient safety, fewer hospital visits, and a higher quality of life. The fusion of machine learning, Internet of Things (IoT), and cloud platforms enables smooth data exchange between patients and healthcare professionals, ensuring ongoing monitoring and data-driven decision-making. This ensures continuous monitoring and better clinical judgment. Despite these benefits, issues like data security, algorithm reliability, and user adherence must be resolved to achieve broader adoption. Nevertheless, AI-driven personalized health monitoring holds great promise for advancing precision medicine and preventive care, ultimately making healthcare more accessible, cost-effective, and tailored to individual needs.

Keywords: AI, Personalized Health Monitoring, Preventive Healthcare, Wearable Devices, Precision Medicine.

CHRONOPHARMACEUTICS: TIME-BASED DRUG DELIVERY FOR IMPROVED THERAPEUTICS

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ABSTRACT

Chronopharmaceutics focuses on designing drug delivery systems that release medication in sync with the body's natural biological rhythms, mainly circadian cycles. Many diseases like asthma, hypertension, arthritis, and cancer, show time-dependent symptom changes. This means that the severity and therapeutic response vary over a 24-hour period. By timing drug release to match these rhythms, chronopharmaceutic drug delivery improves treatment effectiveness and reduces side effects. New drug delivery systems, including pulsatile and delayed-release formulations, are created using specific polymers and technologies to release drugs at exact intervals. These systems enhance pharmacokinetics, improve therapeutic outcomes, and encourage patient adherence by lowering dosing frequency. Challenges such as formulation complexity and individual variations remain, but new smart drug delivery technologies and personalized chronotherapy approaches offer hope for future progress. Chronopharmaceutics represents a forward-thinking strategy in pharmaceutical sciences. It allows synchronization of treatment with biological time to improve disease management and enhance patient quality of life.

Keywords: Chronopharmaceutics, Biological rhythms, personalized medicine, pulsatile drug release.

FORMULATION OF MUCOADHESIVE BUCCAL PATCHES FOR BIOAVAILABILITY ENHANCEMENT

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ABSTRACT

Buccal drug delivery systems have emerged as an effective platform within novel drug delivery strategies, offering the advantage of bypassing hepatic first-pass metabolism, improving drug bioavailability, and enhancing patient compliance. Recent advances highlight the integration of natural bioactive agents with pharmaceutical polymers to improve both therapeutic efficacy and patient acceptability. In this context, herbal extracts such as myrrh oil have been recognized for their antimicrobial, anti-inflammatory, and wound-healing properties, making them promising candidates for incorporation into mucoadhesive systems. Hydroxypropyl methylcellulose (HPMC) and related hydrophilic polymers are widely used for their film-forming and bioadhesive capabilities, often processed by solvent casting methods using suitable solvents and excipients to optimize flexibility, mechanical strength, and stability. Key evaluation parameters for buccal patches typically include thickness, surface morphology, folding endurance, pH compatibility, moisture balance, and drug content uniformity, ensuring consistency in formulation quality. Collectively, these findings emphasize the therapeutic potential of herbal-based mucoadhesive buccal patches in delivering cardiovascular and oral-care agents with improved performance. The outcomes summarized here are drawn from published investigations, underscoring the evidence base of this review rather than original experimental research.

Keywords: Buccal drug delivery; Mucoadhesive patches; Herbal formulations.

HARNESSING ARTIFICIAL INTELLIGENCE FOR GREEN CHEMISTRY AND SUSTAINABLE PHARMACEUTICAL DEVELOPMENT

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ABSTRACT

The global pharmaceutical industry is at a pivotal juncture where innovation must align with environmental stewardship and societal well-being. Implementing green chemistry principles—such as the use of renewable feedstocks, safer solvents, solvent recycling, and biodegradable materials—can minimise these impacts. These principles align closely with several United Nations Sustainable Development Goals (SDGs), including SDG 3 (Good Health and Well-being), SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Integrating AI-driven methodologies enhances green pharmaceutical development by optimising processes at every stage—from target identification and lead optimisation to synthetic pathway design. Machine learning (ML), deep learning, and cheminformatics tools such as ASKCOS and IBM RXN predict greener synthetic routes, assess molecular toxicity, and design molecules with high selectivity and biodegradability. Moreover, computer-aided drug design (CADD) and generative models enable the creation of novel compounds with reduced environmental impact while maintaining therapeutic efficacy. Several pharmaceutical leaders—such as Bayer, AstraZeneca, Sun Pharma, Torrent Pharma, Glenmark, and Dr. Reddy’s Laboratories—have already demonstrated strong commitment to sustainability through investments in solvent recovery systems, energy-efficient technologies, and eco-friendly packaging. These examples underscore the growing industry recognition of the dual economic and environmental benefits of adopting AI-enabled green practices. Despite its promise, the transition toward AI-powered green chemistry faces challenges including high implementation costs, limited technical expertise, and insufficient regulatory support.

Keywords: Green chemistry, AI, Sustainable development goal (SDGs), CADD, Deep Learning.

UNRAVELLING THE ENIGMA OF ARTIFICIAL INTELLIGENCE IN MEDICAL DEVICES.

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ABSTRACT

Developments in next-generation medical devices are reshaping the future of healthcare. These advanced devices are intended to observe, modulate, and restore physiological functions to improve treatment effectiveness and the patient's quality of life. Regulatory compliance and maintaining data cyber security for an AI-enabled device are equally as important as addressing the ethical and legal concerns associated with data privacy and storage, which are the foundation of ensuring safe and reliable AI-based device use. As these ML models develop further and nanotechnology continues to advance, we look towards the future of medical devices and embedded, self-powered medical devices that can work together for continuous learning and real-time feedback to enhance situations and delivery of care. Future medical devices will bring together advances in AI and machine learning, energy harvesting, and biomedical applications into the next generation of intelligent, sustainable, and patient-focused health care. FDA-approved technologies in a variety of clinical categories offers a concise synopsis of the applications of AI and ML in medical devices. In order to help researchers and medical professionals understand current trends and anticipated future changes in digital healthcare innovation, the session will demonstrate how AI and ML are revolutionizing clinical processes, enhancing diagnostic accuracy, and supporting targeted patient care.

Keywords: Artificial Intelligence, Medical devices, Next generation.

TRANSFORMING HEALTHCARE: THE RISE OF DIGITAL HEALTH, TELEMEDICINE, AND REMOTE PATIENT MONITORING (RPM)

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ABSTRACT

Digital health integrates advanced technologies such as artificial intelligence (AI), data analytics, mobile platforms, and connected devices to enhance the efficiency, accessibility, and personalization of healthcare delivery. Modern telemedicine technology is enabling artificial intelligence to revolutionize remote health care by improving patient care, diagnosis, drug monitoring, and over all medical treatment. Telemedicine facilitates both synchronous and asynchronous communication through video consultations, chat applications, and mobile tools, breaking geographical barriers and improving access for rural and underserved populations. Complementing this, RPM allows continuous tracking of physiological parameters via smart devices such as wearable ECG patches, glucose monitors, and blood pressure sensors. These systems enable early detection of health changes, timely interventions, and personalized treatment plans, reducing hospital admissions and enhancing patient engagement. Telemedicine and RPM mark a paradigm shift from episodic to continuous, data-driven, and patient-centred care. When effectively integrated, they can improve outcomes, optimize resources, and empower individuals to take an active role in managing their health. The future of healthcare rests on merging digital innovation with human compassion to build a connected, credible, and equitable digital health ecosystem. Emerging technologies such as 5G networks, Internet of Medical Things (IoMT), and AI-driven analytics are further advancing precision and responsiveness in healthcare delivery. The discussion also highlights the technological, ethical, and regulatory challenges that must be addressed for the safe and equitable global implementation of digital health systems.

Keywords: AI, Digital Health, Telemedicine, Remote Patient Monitoring, IoMT

**AI-ASSISTED COMPUTER-AIDED DRUG DESIGN FOR THE IDENTIFICATION OF
POTENTIAL THERAPEUTICS AGAINST MENINGITIS**

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ABSTRACT

A series of bioactive dipeptides were computationally designed and screened to identify potential therapeutics targeting receptors implicated in meningitis and brain tumor progression. The study utilized an integrated in silico approach combining cheminformatics, molecular docking, and artificial intelligence (AI) models to predict peptide bioactivity, drug-likeness, and safety profiles. A total of six peptides—Tyr-Cys, Tyr-His, Tyr-Glu, Tyr-Ser, Glu-Cys, and Ser-Tyr—were analyzed through SWISS-ADME, Molinspiration, PASS Online, and ProTox 3.0 for pharmacokinetic and toxicological assessments. Molecular docking using SwissDock demonstrated favorable binding affinities of these peptides toward meningitis-associated inflammatory receptors and glioma-related protein targets. AI and ML algorithms, including SVM, kNN, Naïve Bayes, and RNN, further supported prediction reliability by modeling physicochemical and structural features. The study concluded that these small peptides exhibit promising theoretical potential for blood–brain barrier permeability, target specificity, and low toxicity. Hence, they can serve as rational lead candidates for developing multifunctional therapeutics against complex central nervous system (CNS) disorders such as bacterial meningitis and brain tumors.

Keywords: Peptide Drug Design, Artificial Intelligence, Meningitis.

**PREDICTIVE MODELLING IN DRUG REPURPOSING USING AI-ENABLED
CHEMINFORMATICS: ACHIEVING QUALITY AND EFFICIENCY IN DRUG
DEVELOPMENT.**

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ABSTRACT

The combination of Artificial Intelligence with cheminformatics has become a revolutionary facet of modern drug discovery, primarily by creating pathways for the efficient identification of novel therapeutic indications for existing drugs. This research highlights the importance of predictive modelling in drug repurposing, aided by AI-driven cheminformatics, to improve the quality and efficiency of the overall drug development process. Predictive models using tailored datasets from ChEMBL, DrugBank, and PubChem support rapid screening to prioritize candidates for repurposing. The AI-enabled approach provides evidence of safety and efficacy to justify the accelerated translation of a repurposable drug through the regulatory process, reducing experimental costs and failure rates. Predictive analytics combined with cheminformatics opens new monoclones and approaches for a sustainable intelligent, and quality-centered pharmaceutical R&D. The pharmaceutical sector can thus get closer to individualized and precision-based therapeutic innovation thanks to the ai driven cheminformatics framework, which represents a paradigm change toward intelligent, high-quality, efficient drug discovery.

Keywords: Artificial Intelligence, Cheminformatics, Drug Repurposing, Predictive Modeling, Quality Assurance, Drug Development

**NOVEL TRANSDERMAL DRUG DELIVERY METHODS: ADVANTAGES,
DIFFICULTIES AND NEW USES**

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ABSTRACT

Transdermal drug delivery systems (TDDS) are a novel approach in modern pharmacology that offers a noninvasive, controlled, and patient-friendly alternative to traditional medicine administration methods. This comprehensive research covers a wide range of modern TDDS technologies, including microneedles, iontophoresis, electroporation, sonophoresis, nanocarriers, and smart patches. The mechanics, advantages, restrictions, and potential applications of these technologies are all carefully studied. These advancements aim to bypass the skin's protective barrier, allowing hormones, vaccines, peptides, and proteins to be delivered more efficiently to the patient. This study's research was based on a systematic search of online academic journal articles (including PubMed, ScienceDirect, Scopus, and Google Scholar) from 2010 to 2025. The goal was to find relevant publications from 2018 onwards, using keywords such as "transdermal drug delivery," "microneedles," and "nano-carriers" as the primary search phrases. Preclinical and clinical research conducted in English on mechanisms, benefits, limitations, and future prospects was prioritized for inclusion. Despite the numerous benefits, such as improved patient compliance and avoidance of first-pass metabolism, there are still hurdles like as poor permeability, complex formulations, and regulatory obstructions.

Keywords: iontophoresis, nanocarriers, Transdermal drug delivery systems.

**INTEGRATING ARTIFICIAL INTELLIGENCE INTO THE QUALITY BY DESIGN
FRAMEWORK FOR ENHANCED PHARMACEUTICAL QUALITY ASSURANCE**

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ABSTRACT

An innovative development in pharmaceutical quality assurance is the incorporation of Artificial Intelligence (AI) into the Quality by Design (QbD) framework. Critical process parameters (CPPs) and critical quality attributes (CQAs) are identified and controlled using statistical methods and experimental designs in traditional QbD methodologies. Nevertheless, these techniques frequently have trouble handling big, complicated information and forecasting process variability. Predictive analytics, machine learning, neural networks, and other AI-driven models offer a deeper understanding of the process, allowing for proactive control and optimization of pharmaceutical manufacturing. The use of AI approaches to improve process optimization, risk assessment, and decision making within the QbD model is examined in this study. Utilizing AI makes it feasible to forecast results related to product quality, reduce process irregularities, and guarantee continuous compliance to legal standards. AI-enhanced QbD facilitates adaptive control techniques, real-time monitoring, and continuous improvement, which eventually results in pharmaceutical production systems that are more intelligent, dependable, and quick.

Keywords: Artificial Intelligence (AI); Quality by Design (QbD); Machine Learning; Process Optimization; Risk Assessment; Critical Quality Attributes (CQAs); Critical Process Parameters.

**THE ROLE OF PHARMACOVIGILANCE IN DETECTING AND MANAGING ADVERSE
DRUG REACTIONS**

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ABSTRACT

Pharmacovigilance is essential for maintaining the safety of medications by overseeing, identifying, and addressing adverse drug reactions (ADRs). This poster offers a summary of pharmacovigilance frameworks, innovations in ADR detection techniques, and the advantages of a robust pharmacovigilance strategy. As new drug treatments emerge, the need for thorough ADR monitoring has become increasingly vital, directly affecting patient safety and healthcare results. Recent developments, including real-time signal detection, artificial intelligence, and international pharmacovigilance databases, have greatly enhanced the effectiveness of ADR management. Pharmacovigilance is instrumental in guaranteeing the safety of pharmaceuticals through organized identification, evaluation, comprehension, and prevention of adverse drug reactions (ADRs). This poster highlights contemporary techniques, recent breakthroughs, and the profound influence of pharmacovigilance frameworks on today's healthcare landscape, underlining its significance for patient safety and pharmacology.

Keywords: Adverse Drug Reaction, Pharmacovigilance, Monitoring, Safety Management.

**PROTECTIVE ROLE OF A NATURAL FLAVANONE IN HEPATOTOXICITY:
MOLECULAR MECHANISMS AND THERAPEUTIC POTENTIAL**

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ABSTRACT

The liver, a vital organ responsible for numerous biochemical reactions, plays a central role in detoxification and biosynthesis processes crucial for maintaining homeostasis. Hepatic disorders represent a major global health challenge, significantly contributing to morbidity, mortality, and economic burden. Among the key pathological processes involved in liver injury are oxidative stress, inflammatory responses, and dysregulation of cellular energy metabolism. This highlights the urgent need for safe and effective therapeutic agents to manage hepatotoxicity and related liver diseases. Natural flavanone have demonstrated notable pharmacological potential due to their antioxidant, anti-inflammatory, and cytoprotective properties. This review explores the emerging protective role of a natural flavanone in mitigating hepatotoxicity, with specific focus on its molecular mechanisms and therapeutic significance. Recent studies elucidating the flavanone's impact on critical signaling pathways are summarized, along with evidence supporting its hepatoprotective efficacy. Continued investigations into its pharmacodynamics and toxicological profile could pave the way for the development of flavonoid-based interventions as promising alternatives in liver disease.

Keywords: Hepatotoxicity, Flavanone, Antioxidant activity, Hepatoprotection.

PHARMACOVIGILANCE AND CLINICAL TRIALS

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ABSTRACT

Pharmacovigilance and clinical research play a role, in ensuring the safety and effectiveness of medications. Clinical trials like randomized controlled trials (RCTs) offer insights into a drugs performance in terms of efficacy and safety across phases. While these studies are crucial for drug approval process they come with limitations such as sample sizes, controlled settings and short durations which may not uncover all side effects. Pharmacovigilance steps in, by monitoring drugs market release to capture any unforeseen issues. In the world setting where diverse and larger patient populations are observed for drug reactions (ADRs) pharmacovigilance plays a crucial role, in detecting and preventing such issues effectively. Not does it help in uncovering term or rare side effects that may be missed during clinical trials but also works hand in hand with clinical studies to ensure the ongoing assessment of drug safety and effectiveness from start, to finish of their lifecycle. Clinical trials establish the safety profile at glance; however pharmacovigilance plays a role in continuously monitoring the situation to empower healthcare professionals and regulatory agencies with informed choices, for the benefit of patient safety and responsible medication use, across diverse communities.

Keywords: Pharmacovigilance, Randomized Controlled Trials, ADR, Regulatory Agencies

AI-BASED DRUG LOADED PHYTOSOMES

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ABSTRACT

AI has emerged as a viable technique for the development of innovative therapeutics in drug delivery systems. The application of artificial intelligence in novel medication delivery systems has the potential to change the area of medicine. Artificial intelligence (AI) can be used to optimize drug delivery systems in a variety of ways, including anticipating drug behaviour in the body, predicting medication interactions, and selecting effective and efficient finished products. Phytosome is a novel emerging technique applied to phytopharmaceuticals that contain phytoconstituents of herbal extract surrounded and bound by lipids. We used AI for optimization of formulation of drug delivery systems, to enhance drug efficacy and reduce toxicity. It has been used to optimize the formulation of drug-delivery systems. Different computational methods were used to design optimal shapes and sizes for nanoparticle binding and drug release. Selection of the optimal treatment strategies is time-consuming, expensive, unpredictable, and not consistently effective. Using Artificial Intelligence (AI) based algorithms it was possible to manage these crucial issues. Integration of AI approaches can bridge this gap, using pattern analysis and classification algorithms for improved diagnostic and therapeutic accuracy.

Keywords: Drug delivery system, Artificial intelligence (AI), Phytosome, Nanoparticles

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REGULATORY COMPLIANCE IN PHARMACEUTICAL QUALITY ASSURANCE

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ABSTRACT

Regulatory compliance in pharmaceutical quality assurance (QA) is critical for ensuring the safety, efficacy, and quality of medicinal products. This abstract explores the frameworks and standards governing pharmaceutical QA, primarily focusing on Good Manufacturing Practices (GMP), Good Laboratory Practices (GLP), and the role of regulatory bodies like the FDA and EMA. Compliance ensures that pharmaceutical products are consistently produced and controlled according to quality standards, minimizing risks associated with drug development and manufacturing processes. Key components include documentation practices, training, internal audits, and risk management strategies, which collectively foster a culture of quality within organizations. The increasing complexity of drug formulations and manufacturing processes necessitates robust compliance mechanisms to address challenges such as supply chain integrity and data integrity. Moreover, the advent of new technologies, including digital tools and automation, presents both opportunities and challenges in maintaining compliance. As regulatory landscapes evolve, pharmaceutical companies must adopt proactive strategies to navigate these changes effectively. This abstract underscores the importance of a comprehensive QA framework that not only meets regulatory requirements but also enhances operational efficiency and fosters public trust in pharmaceutical products. Ultimately, a commitment to regulatory compliance in QA is essential for safeguarding public health and advancing pharmaceutical innovation.

Keywords: Quality assurance, regulatory compliance, risk management, good manufacturing practices

LIC25-P-149

ROLE OF PHARMACOGENOMICS IN PERSONALIZED MEDICINE

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ABSTRACT

It connects pharmaceutical innovation with clinical practice, enabling the creation of customized medicines and helping physicians select the optimal drug and dosage for each patient. This personalized approach significantly reduces adverse drug reactions, minimizes toxicity, lowers healthcare costs, and improves therapeutic outcomes. Advances in genomics have expanded pharmacogenetics, which originally focused on single gene-drug interactions, into the broader and more integrative field of pharmacogenomics. Genetic variations in enzymes, transporters, and receptors now serve as critical biomarkers for tailored therapies. The primary aim of pharmacogenomics is to assist healthcare professionals in diagnosing conditions and prescribing the appropriate drug and dosage tailored to an individual's genetic profile. Its main objective is to identify and catalog the genetic and epigenetic variations that influence drug response. Currently, pharmacogenomics data, testing, and drug labeling are available for only a limited number of drugs.

Keywords: Pharmacogenomics, Personalised Medicine, Genomics, Pharmacogenomics, Precision medicine.

AI DIGITAL INNOVATIONS IN PHARMA & HEALTHCARE

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ABSTRACT

The contemporary pharmaceutical and healthcare landscape is undergoing a profound transformation driven by rapid technological integration. This collection of concepts highlights key strategic pillars for modernizing drug development, delivery, and patient care. Digital Health & Telepharmacy initiatives, illustrated by mobile health platforms, are crucial for overcoming geographic barriers, improving accessibility, and enhancing patient convenience. Concurrently, the deployment of Artificial Intelligence (AI) & Big Data into diagnostics and drug discovery processes accelerates the identification of novel therapeutic targets, exemplified by the complex molecular structures and data visualization. Advanced Biopharmaceutical Advancements, including gene therapy and biologics (represented by the DNA helix and capsule), demand high-precision manufacturing, necessitating Automation & Robotics (shown by the robotic arm and dispensing tools) to boost accuracy, regulatory compliance, and efficiency. Finally, a commitment to Sustainability & Green Pharmacy (represented by the mortar and pestle with leaves) ensures that innovative solutions are developed and delivered with environmental responsibility.

Keywords: Digital Health, Telepharmacy, Artificial Intelligence (AI), Biopharmaceuticals, Automation.

**A PROTECTIVE EFFECT OF MURRAYA KOENIGII ON ARSENIC INDUCED
ALZHEIMER'S DISEASE.**

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ABSTRACT

Arsenic exposure has been linked to neurotoxicity and the progression of Alzheimer's disease (AD), highlighting the need for effective neuroprotective strategies. This study investigates the protective effects of *Murraya koenigii* (curry leaf), a traditional medicinal herb known for its antioxidant and anti-inflammatory properties, against arsenic-induced neurodegeneration. In vitro and in vivo models were utilized to assess the impact of *Murraya koenigii* extracts on neuronal viability, oxidative stress markers, and inflammatory cytokine levels in the presence of arsenic. Results demonstrated that *Murraya koenigii* significantly reduced oxidative stress and inflammation, improved cholinergic function, and promoted neurogenesis in treated subjects. These findings suggest that *Murraya koenigii* exerts a protective effect against arsenic-induced neurotoxicity, potentially offering a novel therapeutic avenue for mitigating Alzheimer's disease pathology. Further studies are warranted to elucidate the underlying mechanisms and establish clinical relevance.

Keywords: *Murraya koenigii*, Arsenic, Alzheimer's disease, Neuroprotection, Oxidative stress, Inflammation, Cholinergic function

**INVESTIGATING THE ANTIDEPRESSANT POTENTIAL OF COLEBROOKEA
OPPOSITIFOLIA: IT’S IMPACT ON NEUROTRANSMITTER REGULATION AND MOOD
DISORDER**

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ABSTRACT

Colebrookea oppositifolia Smith (Lamiaceae), a plant native to the Indian subcontinent, holds significant ethnopharmacological value, particularly in the treatment of neurological disorders. It is commonly called as Bhaman or Dosul in local and also known as Indian Squirrel Tail in English. This plant is rich in bioactive compounds, notably its leaves contain acetoside, which has shown antioxidant and neuroprotective properties in previous studies. Chronic stress is considered responsible for depression by altering neurotransmitter systems, particularly serotonin and norepinephrine. This study proposes that the alcoholic extract of Colebrookea oppositifolia may have antidepressant-like effects by regulating neurotransmitter systems and reducing oxidative stress. To investigate this hypothesis, mice will be exposed to chronic unpredictable mild stress (CUMS) for three weeks to induce depressive-like behavior. During this period, the mice will be administered various doses of the plant extract. Behavioral assessments will include the forced swim test (FST) and the tail suspension test (TST), both of which are widely accepted procedures for assessing depression-like symptoms in mice. The envisioned outcomes include a significant reduction in depressive-like behaviors in the treated mice compared to the control groups, along with favorable modifications in biochemical markers associated with oxidative stress and inflammation. This research intends to provide evidence for the therapeutic potential of Colebrookea oppositifolia as a natural antidepressant. It seeks to establish alternative treatments for depression that may have fewer adverse effects than conventional drugs. Ultimately, this study aims to substantiate the traditional uses of this medicinal herb and to encourage further pharmacological research into its benefits.

Keywords: Colebrookea oppositifolia, Chronic unpredictable mild stress (CUMS), Neuroprotective properties, Antidepressant, Neurotransmitter regulation, Acetoside.

LIC25-P-153

ANTIDEPRESSANT POTENTIAL OF EPIGALLOCATECHIN IN MICE WITH CHRONIC UNPREDICTABLE MILD STRESS INDUCED DEPRESSION

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ABSTRACT

Depression represents the most prevalent mental health disorder, typified by profound feelings of hopelessness, helplessness, and social withdrawal, diminished engagement in social activities, impaired concentration, anxiety, and suicidal ideation, among other symptoms. Research has demonstrated its efficacy in mitigating numerous diseases associated with oxidative stress. The effects of EGCG on chronic animal models of depression have been explored across various investigations, and the findings pertaining to EGCG's impact are illustrated in this poster. Epigallocatechin gallate (EGCG) is acknowledged as a highly effective antioxidant. It manifests a range of biological effects, including antiinflammatory properties, anti-apoptotic activity, and the promotion of autophagic processes. Moreover, it mitigates inflammation and safeguards neurons within the hippocampus, thereby producing an antidepressant-like effect. EGCG also inhibits the generation of reactive oxygen species (ROS), scavenges existing ROS, and suppresses the Nrf2 signaling pathways (nuclear factor-erythroid-related factor 2). In conclusion, our presentation elucidates that the antidepressant properties of EGCG are associated with the downregulation of serum IL-1 β , the upregulation of BDNF mRNA within the hippocampal region, and a decrease in neuronal lesions in the CA3 area.

Keywords: Epigallocatechin gallate (EGCG), Depression, Antioxidant, Neuroprotection.

LIC25-P-154

A THERAPEUTIC APPROACH ON ASTHMA

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ABSTRACT

Asthma is a common chronic inflammatory disease affecting millions worldwide and requires continuous management. It is marked by an inadequate immune response to external triggers, leading to bronchial hyperresponsiveness, airway narrowing, and excessive mucus production. Management follows a stepwise approach to alleviate symptoms, prevent exacerbations, and maintain lung function. Primary treatments include beta-2 adrenergic receptor agonists and inhaled corticosteroids, with additional options like leukotriene receptor antagonists, theophylline, anticholinergics, and monoclonal antibody therapies for more severe cases. However, adherence to inhaled corticosteroids remains low, highlighting the need for improved education and individualized treatment plans. While current treatments effectively control mild to moderate asthma, there is a lack of data on the optimal combination of active ingredients, especially for non-steroidal medications. A stepwise treatment approach suggests that combining inhaled corticosteroids with long-acting beta-2 adrenergic receptor agonists may improve outcomes and reduce steroid use. Treatment choices vary across countries based on convenience, side effects, and reimbursement policies. More real-world, unsponsored studies are needed to compare asthma treatments and guide clinicians in optimizing care.

Keywords: Asthma, lungs, mucus.

HERBAL LIQUID MOSQUITO REPELLENTS: ADVANCES IN PHYTOPHARMACEUTICAL APPROACHES FOR VECTOR CONTROL

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ABSTRACT:

Mosquito-borne diseases such as malaria, dengue, chikungunya, and Zika continue to pose significant public health challenges, particularly in tropical and subtropical regions. This work focuses on the development and evaluation of herbal liquid mosquito repellents formulated using essential oils derived from plants such as Lemongrass (*Cymbopogon citratus*), Neem (*Azadirachta indica*), and Lemon Eucalyptus (*Corymbia citriodora*). The advantages of herbal repellents are manifold: they are non-toxic, hypoallergenic, biodegradable, and align with the principles of green chemistry and sustainable healthcare. Moreover, they support the valorisation of traditional medicinal plants and promote the integration of ethnobotanical knowledge into modern phytopharmaceutical applications. However, several challenges persist, including variability in essential oil composition due to geographical and seasonal factors, lack of standardisation, limited shelf-life, and inconsistent efficacy across mosquito species. In conclusion, herbal liquid mosquito repellents represent a promising frontier in phytopharmaceutical innovation. By bridging traditional plant-based practices with modern formulation science, these products offer a holistic approach to vector control that is both effective and environmentally responsible. Their development and widespread adoption could significantly contribute to public health initiatives, reduce dependence on synthetic chemicals, and foster sustainable practices in mosquito management.

Keywords: Herbal mosquito repellent, Phytopharmaceutical formulation; Essential oils.

DRUG THERAPY FOR ATHEROSCLEROSIS

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ABSTRACT:

Atherosclerosis is a leading cause of morbidity and mortality worldwide, driven by dyslipidaemia, inflammation. Recent studies highlight the critical role of LDL cholesterol in its progression and the limitations of traditional lipid lowering therapies, such as statins, which may not adequately prevent cardiovascular events on their own. Statins effectively reduce LDL cholesterol, while newer agents like proprotein convertase and ezetimibe further enhance cardiovascular outcomes. Additionally, antiinflammatory medications such as colchicine and IL-inhibitors show promise in targeting inflammation, a key factor in atherosclerosis. Clinical trials demonstrate that modifications in lipoprotein levels can be assessed through arteriograms, indicating that pharmacologic treatments can slow atherosclerosis progression. Understanding lipoprotein abnormalities like lipoprotein (a) and specific apolipoproteins—may refine therapeutic choices, enabling personalized treatment strategies. Furthermore, medications not primarily aimed at lipid effects, such as nonselective beta-blockers, can alter low-density lipoprotein subclass distribution, affecting cardiovascular risk. In summary, a comprehensive approach integrating novel therapeutic options with a focus on lipid and inflammatory mediators is crucial for effectively combating atherosclerosis.

Keywords: Atherosclerosis, Dyslipidaemia, Inflammation, Statins, Colchicine.

**ALPHAFOLD AND ITS IMPACT ON DRUG DISCOVERY: OPPORTUNITIES,
LIMITATIONS, AND FUTURE DIRECTIONS IN PHARMACEUTICAL RESEARCH**

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ABSTRACT

DeepMind's AlphaFold, a deep learning-based protein structure prediction algorithm, has changed structural biology forever by making very accurate three-dimensional models of almost all of the human proteome. The AlphaFold database, which is free to use, has made drug discovery, target identification, and structure-based design possible in new ways. It has also given scientists the chance to learn about protein function at the atomic level. AlphaFold's predictive models are accurate, but they are also rigid and static, which makes it hard for them to capture dynamic conformational changes, allosteric mechanisms, and intrinsically disordered regions that are important for biological regulation and drug binding. These limitations demonstrate that AlphaFold does not fully address the protein folding problem nor accurately simulate the conformational ensembles necessary for mechanistic understanding. However, researchers can improve AlphaFold's usefulness in rational drug design by combining its predictions with molecular dynamics simulations, docking algorithms, and experimental data. This review talks about the pros and cons of AlphaFold in pharmaceutical research and how it could change drug discovery pipelines and personalized therapeutics in the future. It focuses on how AlphaFold could work with other AI-driven and biophysical methods.

Keywords: AlphaFold, Protein structure prediction, Drug discovery, Molecular dynamics simulations, Structure-based drug design.

A THERAPEUTIC APPROACH ON HYPERTENSION

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ABSTRACT

Hypertension, a common and chronic cardiovascular condition, is primarily managed through the use of various antihypertensive medications. The goal of these treatments is to lower elevated blood pressure and reduce the risk of severe complications, such as heart attack, stroke, heart failure, and kidney disease. The main classes of antihypertensive drugs include diuretics, beta-blockers, calcium channel blockers, ACE inhibitors, angiotensin II receptor blockers (ARBs), and direct vasodilators. Diuretics work by eliminating excess sodium and water from the body, effectively reducing blood volume and lowering pressure in the arteries. Beta-blockers help slow the heart rate and reduce cardiac output, while calcium channel blockers relax and widen blood vessels to ease blood flow. ACE inhibitors and ARBs block components of the renin-angiotensin system, thereby preventing vasoconstriction and reducing overall resistance in the blood vessels. Given their varied mechanisms of action, these drug classes allow for personalized treatment strategies tailored to individual patient profiles. In many cases, combination therapy involving two or more drug classes is employed to enhance blood pressure control and achieve better long-term outcomes. Careful management of potential side effects, patient comorbidities, and drug interactions is essential for optimizing treatment efficacy and safety in hypertension management.

Keywords: Cardiovascular, Blood pressure, hypertension.

PHARMACOLOGICAL STUDY OF CANCER

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ABSTRACT

The pharmacological research of cancer deals with the knowledge of how the therapeutic agents function to the cancer cells aiming at growth inhibition and symptoms management to help the patients. Chemotherapy, in the past, was the most revered treatment for cancer due to its dosage aimed at rapidly dividing cells, but its generic nature caused a lot of side effects as well to the non-cancerous cells or tissues. With the more recent developments in pharmacology, the emphasis has changed towards monoclonal antibodies and small molecules that have the ability to act on and inhibit the pathways essential for tumor growth and survival only. Pharmacogenomics is especially gaining prominence in the context and personalization of cancer treatment, empowering patients with more targeted treatments that are less devastating to their healthy cells and are far more effective. Other developing avenues like immunotherapy complement the existing response of the immune system to pinpoint and eradicate the cancer cells, shown to be effective in specific cancer types. The underlying aim then is directed towards the enhancement of the safety and efficacy of the treatment and as a means of improving the survivorship and the quality of life while minimizing the side effects of the patients.

Keywords: Tumor, Chemotherapy, Monoclonal antibodies, Pharmacogenomics.

BIOSENSORS INTEGRATED DRUG DELIVERY: A NOVEL THERAPEUTICS APPROACH FOR DIABETES MANAGEMENT

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ABSTRACT

Diabetes is account to be the most alarming and pandemic disease across the globe. These are well provoked within the different age group that varies from pediatric to geriatric and vulnerable group like pregnant lady which often termed as gestational diabetes. These often arise due to the imbalance of insulin level in the cellular fluids. As the Chronic illnesses like diabetes, cancer require continuous monitoring and medical intervention for efficient treatment. Therefore, designing a responsive system that will reciprocate to the physicochemical changes offers a superior therapeutic activity. This can be achieved by integrating the biosensors with drug delivery which possess closed and controlled drug delivery to the target site. As this offers regulation of the changes by means of releasing a therapeutic agent whenever illness biomarkers prevail. So, this article reflects the use of advanced integrating drug delivery approach named BioMEMS which works by proper selection of biomarkers which is vital for diagnosis and stimulates the release of drug at target site. This is formulated by using the conducting polymer like Polypyrrole, Polyaniline in which the insulin get entrapped in the form of hydrogel and deliver topically as transdermal patches that can be controlled by BioMEMS technology. As it shows high accuracy and reliability. Thus, by detecting an illness before it manifests by means of biomarkers levels, therapeutic dosing would prevent the severity of biological changes.

Keyword: Biosensors, BioMEMS, Polypyrrole, Polyaniline, Diabetes Mellitus.

RESVERATROL-LOADED NANOPARTICLES FOR ENHANCED ANTINEOPLASTIC EFFICACY

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ABSTRACT

Cancer remains a primary contributor to global mortality, driven by uncontrolled cell proliferation, metastasis, and resistance to standard chemotherapeutics. Resveratrol (RSV), a naturally occurring polyphenolic compound, exhibits strong anticancer potential through modulation of multiple signaling pathways including apoptosis, angiogenesis, and oxidative stress. However, its clinical translation is hampered by poor aqueous solubility, rapid metabolism, and limited systemic bioavailability. Smart nanoparticle-based delivery systems have emerged as a transformative strategy to overcome these limitations, enabling enhanced tumor accumulation, controlled release, and selective targeting via passive Enhanced Permeability and Retention effect (EPR effect) and active ligand-mediated mechanisms. This review critically summarizes recent advancements in RSV-loaded nanocarriers such as polymeric nanoparticles, solid lipid nanoparticles, nanostructured lipid carriers, and stimuli-responsive platforms used across diverse cancer models including colorectal, pulmonary, glioblastoma, and melanoma. Preclinical studies across various cancers have shown improved anti-tumor activity, reduced systemic toxicity, and better survival outcomes with nanoparticulate formulations.

Keywords: Resveratrol, Smart nanocarrier, Targeted cancer therapy, Bioavailability enhancement.

EVALUATION OF *CELASTRUS PANICULATUS* SEED EXTRACT FOR ITS ANTI-EPILEPTIC & NEUROPROTECTIVE ACTIVITY IN PTZ-INDUCED SEIZURE MODEL IN WISTAR RATS

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ABSTRACT

To evaluate the antiepileptic and neuroprotective potential of the methanolic extract of *Celastrus paniculatus* seeds (MECP) in a Pentylene-tetrazole (PTZ)-induced seizure model in Wistar rats. The seed extract was standardized and subjected to acute oral toxicity testing to establish a safe therapeutic dose. Epileptic seizures were induced by PTZ administration, and animals were treated with MECP or standard drug clonazepam. Seizure parameters including latency, duration, and severity were recorded. Neurobehavioral alterations were assessed using standard behavioral models. Biochemical estimation of oxidative stress markers—malondialdehyde (MDA), superoxide dismutase (SOD), catalase (CAT), reduced glutathione (GSH), and nitrite—was performed, followed by histopathological examination of brain tissues. Treatment with MECP significantly delayed seizure onset, reduced seizure severity, and improved survival rates in PTZ-challenged rats compared to control. Biochemical analysis revealed restoration of antioxidant enzyme levels and reduction in MDA and nitrite content. Histopathological evaluation demonstrated marked neuronal protection, reduced necrosis, and improved cortical integrity. The ethanolic seed extract of *Celastrus paniculatus* exhibits significant antiepileptic and neuroprotective effects in PTZ-induced epileptic rats. Its efficacy is attributed to enhancement of endogenous antioxidant defense and attenuation of oxidative stress-mediated neuronal damage, highlighting its potential as a natural adjunct or alternative therapy for epilepsy management.

Keywords: *Celastrus paniculatus*, epilepsy, PTZ-induced seizures, antiepileptic, neuroprotection.

TERMINALIA CHEBULA FRUIT EXTRACT LOADED PHYTOSOMES: PREPARATION AND CHARACTERIZATION

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ABSTRACT

Medicinal plants are a reliable source of biologically active phytopharmaceuticals with potential pharmaceutical applications. The delivery of these bioactive phytocompounds into nanosystems is considered a promising approach for the optimization of their pharmacological actions. *Terminalia chebula* commonly known as Harar or Haritaki, a fruit rich in phenolic compounds, has been considered effective in alleviating oxidative stress induced by an excess of reactive oxygen species (ROS). In the present investigation phytosomes loaded with bioactive phenolic rich extract were developed and characterized in terms of size, surface charge, encapsulation, efficiency and stability. The finding reveal that smaller and more uniform particles were obtained using dichloromethane as solvent, a reaction time of 2 hours, and the adding of 1% molar concentration of soya lecithin. This study suggests a future application of these phytosomes in the delivery of bioactive agents with therapeutic interest.

Keywords: *Terminalia chebula*, Phytosomes, Harar, Haritaki.

INNOVATIVE NANOCARRIERS IN ARTHRITIS THERAPY: THE ROLE OF HERBAL CUBOSOMES

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ABSTRACT

Rheumatoid arthritis (RA) and osteoarthritis (OA) are chronic inflammatory conditions affecting the joints. While conventional treatments like NSAIDs and DMARDs are effective, they often have adverse side effects. Traditional therapies often lead to adverse side effects, prompting a search for safer alternatives, particularly in herbal medicines. Herbal medicines have shown potential in managing arthritis symptoms, but their bioavailability and stability can be limited. Nanocarriers facilitate controlled drug release, improving retention time and penetration in the joint environment. The innovative use of herbal cubosomes as advanced nanocarriers for arthritis therapy can be used. Cubosomes, a type of self-assembled lipid nanoparticle, exhibit unique structural characteristics that enhance the delivery and bioavailability of encapsulated herbal compounds. Their ability to encapsulate both hydrophilic and hydrophobic drugs allows for improved therapeutic efficacy and targeted delivery to inflamed tissues and they having the various advantages over other nanocarriers. Key herbal components, such as *Withania somnifera* (Ashwagandha), *Boswellia serrata* (Frankincense), and *Curcuma longa* (Turmeric), are highlighted for their anti-inflammatory properties and potential benefits in arthritis management. This review explores the potential of herbal cubosomes as nanocarriers, highlighting their biocompatibility, biodegradability, and ability to target specific joint tissues. The integration of herbal components may also provide additional anti-inflammatory and regenerative benefits, enhancing the overall therapeutic effect. Overall, the integration of herbal cubosomes in arthritis therapy presents a promising approach that could lead to more effective and safer treatment options.

Keywords: Arthritis, Anti-inflammatory, Herbal Medicine, Nanocarriers, Cubosomes

**KETAMINE INDUCED BEHAVIOURAL CHANGES AND ITS REVERSAL BY
PREGNENOLONE SULPHATE IN RATS**

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ABSTRACT

Pregnenolone and its derivatives have been implicated in neuroprotection and enhance NMDA receptor neurotransmission pointing out their therapeutic potential in schizophrenia. The present study was carried out to determine the effect of pregnenolone sulphate (Preg S) on behavioural changes and markers of oxidative stress in ketamine (Ket) model of schizophrenia. All rats were injected intraperitoneally (i.p) daily for 14 days with different drug treatments such as Preg S (11.86 mg/kg) and risperidone (2 mg/kg/day) alone in combination with ketamine (30 mg/kg). Different behavioural tests which include elevated plus maze, spontaneous alternation behaviour, locomotor activity tests were performed after 24 hrs of last dosing followed by the estimation of markers of oxidative stress and acetylcholine esterase (AChE) activity in rat's brain. Ket produced significant changes in behaviour resembling to that of negative symptoms and memory impairment seen in schizophrenic patients. Preg S treated rats spent more time in open arm in elevated plus maze test, decreased percentage alternation and improved locomotor activity as compared to ket treated rats. The levels of antioxidants such as superoxide dismutase (SOD) and reduced glutathione (GSH) were reduced while thiobarbituric acid reactive substances (TBARs) were elevated. Preg S administration resulted in ameliorating effects in antioxidant parameters. Preg S improved learning and memory in elevated plus maze, spontaneous alternation behaviour, locomotor activity, decreased AChE and reduced oxidative stress.

Key Words: Pregnenolone, Ketamine, Schizophrenia, Neuroprotective.

**INTEGRATING ARTIFICIAL INTELLIGENCE FOR DIGITAL ADVANCEMENT IN
PHARMACEUTICAL SCIENCES**

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ABSTRACT

The incorporation of Artificial Intelligence (AI) into pharmaceutical sciences signifies a transformative era of digital innovation and data-driven advancement. AI methodologies—such as machine learning, deep learning, and predictive analytics—are redefining every stage of the pharmaceutical value chain, encompassing drug discovery, formulation development, clinical trials, pharmacovigilance, and personalized medicine. Through rapid analysis of complex biological and chemical datasets, AI enables accelerated target identification, efficient molecular screening, and more accurate prediction of therapeutic efficacy and safety. Complementing these capabilities, digital technologies including automation, cloud computing, and AI-assisted manufacturing are enhancing operational efficiency, precision, and regulatory compliance across the industry. Collectively, these digital advancements shorten research timelines, reduce development costs, and foster the delivery of precision therapeutics that improves patient outcomes.

Keywords: Artificial Intelligence, Pharmacovigilance, digital transformation

DESIGN, FORMULATION, AND EVALUATION OF HERBAL MICROSPHERE-LOADED GEL FOR TOPICAL DELIVERY

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ABSTRACT

The present study focuses on the design, formulation, and evaluation of a herbal microsphere-loaded gel intended for topical drug delivery. The objective was to develop a sustained-release herbal formulation that enhances skin permeation, provides prolonged therapeutic action, and minimizes dosing frequency. Microspheres were prepared using the emulsion solvent evaporation technique employing biodegradable polymers such as ethyl cellulose or chitosan. The formulated microspheres were characterized for particle size, encapsulation efficiency, surface morphology, and in vitro drug release. Optimized microspheres were incorporated into a suitable gel base (e.g., carbopol 940) to obtain a stable and uniform microsphere-loaded gel. The final gel formulation was evaluated for pH, viscosity, spread ability, homogeneity, drug content, and in vitro diffusion studies, along with stability testing under accelerated conditions. Results demonstrated that the microsphere-based gel provided controlled and sustained release of the herbal active over an extended period, ensuring better skin retention and improved therapeutic efficacy compared to conventional gels.

Keywords: Artificial Intelligence, Pharmacovigilance, digital transformation.

INTEGRATING NUTRACEUTICALS INTO STANDARD CARE FOR PANCREATIC CANCER: HOPE OR HYPE?

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ABSTRACT

Pancreatic cancer is still one of the most aggressive cancers in the world. It is hard to treat, has a terrible prognosis, and is often diagnosed late. Even though surgery, chemotherapy, and immunotherapy have all improved, the overall survival rate is still less than 10%. Standard chemotherapeutics like gemcitabine and FOLFIRINOX offer only moderate advantages and are often constrained by systemic toxicity and resistance. In this situation, nutraceuticals, which are bioactive chemicals found in food, have become intriguing additions to traditional medicine. Curcumin, resveratrol, quercetin, epigallocatechin gallate, lycopene, and omega-3 fatty acids are all strong antioxidants, anti-inflammatories, and pro-apoptotic agents that work on important cancer-causing pathways like NF- κ B, STAT3, PI3K/AKT, and KRAS. Preclinical and early-phase clinical research show that they can make tumors more sensitive to chemotherapy, change the tumor microenvironment, and lessen the side effects of treatment. Nonetheless, difficulties like as inconsistent standards, pharmacokinetic constraints, and regulatory inconsistencies endure. This review brings together current mechanistic insights, preclinical and clinical evidence, and translational hurdles to show how nutraceuticals might be used in combination with other treatments and precision-based therapy for pancreatic cancer.

Keywords: Pancreatic cancer, Nutraceuticals, Chemotherapy sensitization.

**ADVANCEMENTS IN LIQUID-BASED NANOPARTICLE SYSTEMS FOR ENHANCED
MALARIA TREATMENT**

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ABSTRACT

Malaria, caused by Plasmodium parasites and spread by Anopheles mosquitoes, remains a serious health issue in tropical regions. Traditional malaria treatments often face problems such as poor absorption in the body, side effects, and increasing drug resistance. Despite various treatment strategies, malaria continues to claim lives of peoples. Recent advancements in liquid-based nanoparticle (NP) systems, such as liposomes (e.g., Ambisome), nanoemulsions (e.g., Nanoderm), and transferosomes, offer promising solutions to these challenges. Nanoemulsions, like Nanoderm, which improve drug solubility and allow for controlled release, have shown potential in delivering drugs such as quinine. Transferosomes, with their flexible structure, can enhance skin absorption for transdermal delivery, possibly aiding in malaria vaccine or topical drug administration. These liquid-based NPs improve drug efficacy by targeting the malaria parasite more precisely, reducing side effects, and ensuring a steady release of the medication. By solving problems linked to traditional treatments, these nanoparticles represent a promising wayforward for better malaria care, contributing to global health efforts.

Keywords: Liposomes, SLNs, NLCs, Nano emulsions, transferosomes, malaria treatment.

**NEXT GENERATION DRUG DELIVERY SYSTEM: NANOTECHNOLOGY IN
HEALTHCARE**

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ABSTRACT

Numerous areas of developing science have limitless potential for using nano medicine and nano delivery system. These systems use nanoscale carriers to deliver therapeutic drugs at precise sites in a controlled manner, enhancing efficacy and reducing side effects. Recently a great deal of research has been done on the structural characteristics, size manipulation and selective diagnosis employing disease imaging molecule of nano carriers like liposome, nanotubes and nanoparticles have been the subject of extensive investigation recently. Nanomedicine and nano delivery systems are a relatively new but rapidly developing science where materials in the nanoscale range are employed to serve as means of diagnostic tools or to deliver therapeutic agents to specific targeted sites in a controlled manner. Recently, there are a number of outstanding applications of the nanomedicine (chemotherapeutic agents, biological agents, immunotherapeutic agents etc.) in the treatment of various diseases. The current review, presents an updated summary of recent advances in the field of nanomedicines and nano based drug delivery systems through comprehensive scrutiny of the discovery and application of nanomaterials in improving both the efficacy of novel and old drugs (e.g., natural products) and selective diagnosis through disease marker molecules. This review focuses of the basic mechanism of drug delivery, pharmacokinetic study, recent innovations and future trends of the drug delivery system.

Keywords: Nanotechnology, extracellular vesicle, therapeutic drug, immunotherapeutic agents.

INTRACTABLE EPILEPSY – CHALLENGES AND ADVANCES MANAGEMENT

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ABSTRACT

Intractable epilepsy, defined as the failure to achieve sustained seizure freedom despite adequate trials of two or more appropriately chosen and tolerated antiepileptic drugs, affects approximately 30% of individuals with epilepsy. This condition poses significant medical, psychological, and socioeconomic burdens on patients and families. This presentation aims to explore the underlying mechanisms, diagnostic challenges, and evolving management strategies in intractable epilepsy, highlighting the importance of a multidisciplinary approach. We will discuss current understanding of the pathophysiology of drug resistance, emphasizing genetic, structural, and pharmacokinetic factors. Advances in neuroimaging, electrophysiological monitoring, and surgical evaluation have transformed diagnosis and treatment planning. Treatment modalities beyond medication—such as epilepsy surgery, vagus nerve stimulation, responsive neurostimulation, and dietary therapies—will be reviewed, alongside emerging research on novel antiepileptic compounds and gene-targeted therapies. The presentation will also address quality-of-life considerations and the role of precision medicine in optimizing outcomes. Effective management of intractable epilepsy requires early identification, comprehensive evaluation in specialized centers, and individualized therapeutic strategies.

Keywords: Intractable epilepsy, drug-resistant epilepsy, neurostimulation.

3D PRINTED DRUG-LOADED SCAFFOLDS FOR PERSONALIZED WOUND CARE: A NEXT GENERATION APPROACH

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ABSTRACT

Wound healing represents a complex biological process that often requires sophisticated therapeutic interventions, particularly in cases of chronic or complex wounds. The emergence of three-dimensional (3D) printing technology has revolutionized the field of personalized medicine, offering unprecedented opportunities for creating patient-specific drug-loaded scaffolds tailored to individual wound characteristics and healing requirements. This comprehensive review examines the current state-of-the-art in 3D printed drug-loaded scaffolds for personalized wound care, focusing on recent developments from 2020 to 2024. The review explores the fundamental principles of wound healing and the specific requirements for effective scaffold design, including biocompatibility, biodegradability, mechanical properties, and drug release kinetics. Various 3D printing technologies are evaluated for their suitability in fabricating drug-loaded wound scaffolds, including fused deposition modeling, stereolithography, selective laser sintering, and emerging bioprinting techniques. Recent research advances demonstrate significant progress in developing smart, responsive scaffolds capable of delivering multiple therapeutic agents in a controlled and sequential manner.

Keywords: 3D printing, drug delivery, wound healing, personalized medicine.

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PSORIASIS AND ITS IMPACT ON OTHER SYSTEM OF THE BODY

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ABSTRACT

Psoriasis is a long-lasting autoimmune disorder that mainly affects the skin, producing thick, scaly, and discolored patches. Although it appears as a skin disease, it is actually a result of immune-mediated inflammation that can influence several organs in the body. The constant inflammatory process in psoriasis may also affect the brain, leading to increased chances of anxiety, depression, and in some cases, memory-related disorders like dementia. In the heart, psoriasis can increase blood vessel resistance, which may reduce blood flow and contribute to heart diseases such as coronary artery disease and high blood pressure. The lungs may also be involved, as people with psoriasis have a higher risk of developing respiratory conditions including asthma, COPD, and pulmonary hypertension. Certain medicines used to treat psoriasis, like methotrexate, can rarely increase the risk of lung problems. In terms of metabolism and digestion, obesity is commonly seen in psoriasis patients and may lead to metabolic syndrome or diabetes. Continuous inflammation can also harm the liver, sometimes resulting in non-alcoholic liver disease or cirrhosis. Overall, psoriasis is a multifactorial disease influenced by both genetic and environmental factors, and its treatment involves topical medications, systemic drugs, biologic therapy, and phototherapy.

Keywords: Psoriasis, Inflammation, COPD, Hyperproliferation, Phototherapy, Metabolic Syndrome

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RECENT ADVANCES OF STEM CELL THERAPY IN CANCER TREATMENT

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ABSTRACT

In recent years, stem cells have emerged as a promising tool in the field of cancer therapy due to their remarkable abilities of self-renewal and differentiation. Various types of stem cells, such as embryonic, adult, and induced pluripotent stem cells, have been explored for their potential to repair or replace tissues and organs damaged by cancer or its treatment. Beyond tissue regeneration, stem cells can be engineered to act as carriers for targeted drug delivery, allowing precise transportation of therapeutic molecules directly to tumor sites. Moreover, they play a crucial role in modulating immune responses, thereby enhancing the body's natural ability to fight cancer. Despite these advantages, the application of stem cells in oncology requires a careful understanding of the molecular signaling pathways involved in cancer stem cell regulation, including WNT/ β -catenin, Hedgehog, Notch, NF- κ B, JAK/STAT, TGF- β , PI3K/AKT, and PPAR pathways. Continued research and clinical studies are essential to improve the safety, effectiveness, and reliability of stem cell-based cancer therapies while minimizing associated risks.

Keywords: Cancer stem cells, Molecular pathways, Stem cell therapy, Chemotherapy, Pluripotent cells.

ROLE OF DATA MINING IN PATIENT SAFETY AND DRUG SAFETY

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ABSTRACT

Accurate diagnosis is a crucial step in effective patient care, which relies on thorough clinical examinations and appropriate investigations. Computer-based decision support systems have become valuable tools in improving diagnostic accuracy and ensuring cost-effective treatment. Data mining, a computational technique that extracts meaningful patterns from large datasets using artificial intelligence, machine learning, and statistical methods, has shown significant potential in healthcare. Hospitals and healthcare organizations generate massive amounts of data daily, including patient records, diagnostic results, treatment histories, and medication details. By applying data mining techniques, these data can be analyzed to enhance clinical decision-making, increase diagnostic precision, and improve treatment outcomes. Furthermore, data mining assists public health authorities in tracking and managing disease outbreaks by identifying patterns related to symptoms, demographics, and geographic distribution. Overall, integrating data mining into healthcare systems promotes safer, more efficient, and evidence-based medical practices.

Keywords: Data mining, Healthcare, Clinical decision-making, Effective treatment.

THE HIDDEN NEUROTOXIC THREAT OF FOOD COLORANTS FOR CHILDREN NEURONAL DEVELOPMENT

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ABSTRACT

Children frequently chose bright colored foods items and beverages containing synthetic food colorants, which may be serious concerns about their neurological and neurodevelopmental safety. As compare to adults, children’s brains have a less mature blood–brain barrier (BBB), leading to increased vulnerability to lipophilic or small-molecule exposures, including food colorants. Several recent studies suggests that synthetic azo and triphenylmethane dyes (e.g., Allura Red AC, Tartrazine, erythrosine, metnil yellow Sunset Yellow) may cross the immature BBB and impact the central nervous system via metabolic, inflammatory, and neurotransmitter pathways, potentially contributing to hyperactivity, attention deficits, anxiety, and memory changes. Mechanistic evidence indicates that many food dyes can cross the immature BBB, disrupt neurotransmitter systems—particularly dopamine and glutamate and induce oxidative stress and Neuroinflammation. Animal models further demonstrate food colorants induced alterations in dopamine and glutamate neurotransmission, oxidative stress elevation, and neuronal structural change. Child population is on high risk because they are relatively high intake of confections, snacks, and drinks with less developed and immature BBB. Package food industry use high amount of food colorants and focus the child population. Regulatory bodies establish the level of acceptable daily intake (ADI).

Keywords: synthetic dyes, blood–brain barrier, neurodevelopment, attention, hyperactivity.

AN OVERVIEW ON ROLE OF POLYPHENOLS IN ALZHEIMER’S DISEASE

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ABSTRACT

Polyphenol-rich foods have been associated with a lower risk of developing various noncommunicable diseases, including Alzheimer’s disease (AD). The objective of this systematic review was to analyze and summarize available evidence regarding the potential protective effects of polyphenols on Alzheimer’s disease. Relevant studies were identified through a structured search on PubMed and Web of Science databases. Both randomized controlled trials (RCTs) and observational studies conducted on human participants were included. In total, 24 studies met the inclusion criteria. Among these, twelve studies demonstrated a positive link between polyphenol intake and a reduction in cognitive decline, five studies reported no significant association, while seven presented mixed findings. The evidence for specific subclasses of polyphenols, such as phenolic acids and flavonoids, remained inconclusive. Overall, this review suggests that while polyphenols may contribute to cognitive health, the current data are insufficient to confirm their definitive benefits against Alzheimer’s disease. Further well-designed RCTs involving human subjects are required to validate these findings.

Keywords: Polyphenols, Alzheimer’s disease, Cognitive decline, Flavonoids.

HYDROTROPIC SOLID DISPERSIONS: A ROBUST TECHNIQUE FOR SOLUBILITY IMPROVEMENT OF BCS CLASS II DRUGS

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ABSTRACT

Solubility is a fundamental property of all substances—solid, liquid, or gas—and plays a critical role in determining the feasibility of pharmaceutical formulation. A major challenge faced by the pharmaceutical industry is that nearly 40% of newly developed drug molecules exhibit poor water solubility, limiting their bioavailability and therapeutic effectiveness. To overcome this issue, the Hydrotropic Solid Dispersion (HSD) technique has emerged as a promising and efficient approach for enhancing solubility. This method significantly increases the solubility of poorly soluble drugs using hydrotropic agents without the need for chemical modification, organic solvents, or emulsification processes. Moreover, it allows for the easy recovery of dissolved solutes and reuse of hydrotropic solutions, making it a cost-effective and environmentally friendly option for large-scale production. Additional benefits of this technique include pH-independent solvent properties, high selectivity, non-flammability, and the inexpensive, easy availability of hydrotropes. These advantages make the HSD method a superior alternative among various solubilization strategies.

Keywords: Solubility, Solubilization, Hydrotropic Solid Dispersion, Chemical modification, Hydrotropes

AI POWDERD PHARMACOKINETICS DRUG MODELING

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ABSTRACT

Pharmacokinetics modelling of drugs using AI is revolutionizing the drug development process and personalized medicines. With the application of ML and DL algorithms, it greatly enhances predictions in the drug ADME process. The conventional PK models are based on empirical data and linear approximations with a limitation on the efficacy when biologic processes become complex. AI techniques can diagnose extensive datasets, put together multiple parameters, and identify patterns to create accurate pharmacokinetic models. They predict drug-drug interactions, which enhances patient safety in polypharmacy. AI used in dose optimization, it helps predict a response based on genetics and environment, minimizing adverse effects and increasing efficacy. It also accelerates discovery of drugs by identifying appropriate candidates, significantly reduces the time and cost involved in development. Explainable AI and reinforcement learning have recently advanced, including providing more transparency and adaptability and making models more reliable when actually used in clinical settings; this Integration shifts towards more precision medicine and innovative treatments.

Keywords: Drug modeling, Pharmacokinetics, Data Analysis, Drug Design.

**FORMULATION AND EVALUATION OF BETAMETHASONE LOADED SOLID LIPID
NANOPARTICLES IN CERAMIDE CREAM FOR TREATMENT OF ATOPIC
DERMATITIS.**

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ABSTRACT

Betamethasone (BTS) is a corticosteroid commonly used in the treatment of chronic inflammatory skin diseases such as psoriasis and atopic dermatitis. To enhance its therapeutic performance, various nanostructured drug delivery systems are being developed to improve skin permeability, control drug release, minimize dosing frequency, and reduce potential side effects. This review compiles and evaluates recent advances in betamethasone-based nanocarriers designed for topical administration. A systematic search was performed using PubMed, Scopus, and Web of Science databases for studies published up to June 2024. Out of 1081 identified publications, 23 studies met the inclusion criteria. The review discusses diverse colloidal formulations, including polymeric nanoparticles, lipid-based carriers, and supramolecular hydrogel systems, that aim to achieve targeted and sustained anti-inflammatory effects. Additionally, aspects related to toxicology, skin permeation, and the regulatory challenges surrounding clinical translation are highlighted. Although betamethasone nanoformulations show great promise for managing inflammatory skin conditions, further preclinical and clinical evaluations are necessary to ensure safety and efficacy in human applications.

Keywords: Betamethasone, Nanostructured drug delivery, Psoriasis, Atopic dermatitis, Nanocarriers, Inflammatory skin diseases

AI POWDERD PHARMACOKINETICS DRUG MODELING

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ABSTRACT

Pharmacokinetics modelling of drugs using AI is revolutionizing the drug development process and personalized medicines. With the application of ML and DL algorithms, it greatly enhances predictions in the drug ADME process. The conventional PK models are based on empirical data and linear approximations with a limitation on the efficacy when biologic processes become complex. AI techniques can diagnose extensive datasets, put together multiple parameters, and identify patterns to create accurate pharmacokinetic models. They predict drug-drug interactions, which enhances patient safety in polypharmacy. AI used in dose optimization, it helps predict a response based on genetics and environment, minimizing adverse effects and increasing efficacy. It also accelerates discovery of drugs by identifying appropriate candidates, significantly reduces the time and cost involved in development. Explainable AI and reinforcement learning have recently advanced, including providing more transparency and adaptability and making models more reliable when actually used in clinical settings; this integration shifts towards more precision medicine and innovative treatments. Improvements in the AI-pharmacokinetic modelling will continue to help transform pharmacological research into practical healthcare.

Keywords: Drug modelling, Pharmacokinetics, Data Analysis, Drug Design, Personalized Therapy, Machine Learning.

A REVIEW ON NANOPARTICLES: CHARACTERISTICS, SYNTHESIS, APPLICATION, AND CHALLENGES

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ABSTRACT

This review presents a comprehensive overview of the synthesis, properties, and applications of nanoparticles (NPs), which are materials ranging in size from 1 to 100 nanometers. Nanoparticles can be categorized based on their composition, size, and morphology into several groups, including fullerenes, metallic nanoparticles, ceramic nanoparticles, and polymeric nanoparticles. Due to their large surface area and nanoscale dimensions, NPs exhibit unique physical, chemical, and optical properties, often showing color variations based on size-dependent light absorption. Their exceptional characteristics have made them valuable in diverse technological and biomedical applications, offering superior performance compared to their bulk counterparts. Traditionally, nanoparticles are synthesized using chemical reduction methods that involve toxic reducing agents, posing environmental and health concerns. Recently, green synthesis approaches have gained attention as sustainable alternatives, utilizing biological resources such as bacteria, fungi, algae, yeast, actinomycetes, and plants. These eco-friendly and cost-effective methods provide a safer route for nanoparticle production. This review highlights the various types, synthesis techniques, applications, and future prospects of nanoparticles, emphasizing the growing importance of biological and green nanotechnology in modern science.

Keywords: Green synthesis, Nanoparticles, Nanotechnology, Biological synthesis, Microbial.

FORMULATION, IN VITRO AND IN VIVO EVALUATION OF TEMPERATURE SENSITIVE OPHTHALMIC GEL OF AN ANTI-GLAUCOMA DRUG

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ABSTRACT

In recent years, in situ gelling systems have gained significant attention as an effective approach for ophthalmic drug delivery. The present study focuses on the formulation and evaluation of an in situ gel for the treatment of glaucoma, aimed at enhancing ocular residence time and improving drug bioavailability. The formulations were developed using temperature-sensitive polymer Pluronic F-127 in combination with viscosity-enhancing agent HPMC K4M at varying concentrations. The prepared gels were assessed for parameters including appearance, pH, clarity, gelation capacity, gelation temperature, rheological behavior, drug content, and in vitro drug release. Additionally, ex vivo permeation, microbial testing, in vivo ocular irritancy, and stability studies were conducted on the optimized formulation. Among the tested formulations, BT-4 showed the most favorable characteristics, exhibiting rapid sol-to-gel transition near body temperature, optimal viscosity, and sustained drug release. The optimized gel was found to be non-irritating, clear, and stable over a three-month period. The study concludes that Bimatoprost-loaded in situ gel demonstrates strong potential as a novel ophthalmic drug delivery system for managing glaucoma by effectively controlling intraocular pressure and improving bioavailability.

Keywords: In situ gel, Bimatoprost, Glaucoma, Pluronic F-127, HPMC K4M.

FORMULATION DEVELOPMENT, CHARACTERIZATION, AND IN VITRO ANTIFUNGAL ASSESSMENT OF VORICONAZOLE NANOEMULSION

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ABSTRACT

Voriconazole, a broad-spectrum antifungal drug, suffers from poor aqueous solubility and limited bioavailability, which restrict its therapeutic potential. The development of nanoemulsion-based delivery systems offers a promising strategy to enhance solubility, stability, and antifungal efficacy. The present study aimed to develop and characterize a voriconazole-loaded nanoemulsion and evaluate its in vitro antifungal activity against common fungal strains. Nanoemulsions were prepared using the aqueous titration method, employing optimized combinations of oils, surfactants, and co-surfactants. The formulations were characterized for droplet size, polydispersity index (PDI), and zeta potential to assess their stability. In vitro drug release was studied using the dialysis bag method, and antifungal activity was determined through disc diffusion assays against *Candida* species. The optimized formulation showed a mean droplet size of 120 ± 10 nm, a PDI of 0.15, and a zeta potential of -25 ± 2 mV, confirming good stability and uniformity. The nanoemulsion exhibited a sustained drug release profile and demonstrated significantly improved antifungal activity compared to the marketed preparation, with lower minimum inhibitory concentrations (MICs). These findings suggest that the voriconazole nanoemulsion is a promising carrier for enhanced antifungal delivery, warranting further in vivo evaluation for clinical translation.

Keywords: Voriconazole, Nanoemulsion, Antifungal, in-vitro, Characterization.

A COMPREHENSIVE REVIEW ON RHEUMATOID ARTHRITIS

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ABSTRACT

Rheumatoid arthritis (RA) is a chronic, progressive inflammatory autoimmune disorder primarily affecting the joints, leading to persistent pain, stiffness, swelling, and ultimately bone and cartilage destruction. The disease is characterized by immune-mediated inflammation of the synovial membrane, resulting in progressive joint deformities and functional disability. Environmental and genetic factors such as smoking, obesity, infections, and hormonal imbalances contribute significantly to disease onset and progression. Cytokines play a pivotal role in the pathogenesis of RA, particularly interleukin-1 β (IL-1 β), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF- α), which promote synovial proliferation, cartilage degradation, and bone erosion. This review provides a comprehensive overview of the etiology, pathology, pathogenesis, clinical features, diagnostic approaches, and therapeutic strategies for rheumatoid arthritis. Special emphasis is given to novel therapeutic targets, including interleukins, TNF- α , and sialoprotein I, as well as the identification of specific biomarkers for disease classification and prognosis. Furthermore, the article highlights recent advancements and patented innovations in the treatment of RA, focusing on biologic agents, small-molecule inhibitors, and nanocarrier-based drug delivery systems that enhance efficacy and reduce systemic toxicity. Several marketed formulations currently used in RA management are also discussed. The review concludes that understanding the molecular mechanisms underlying RA can guide the development of targeted and personalized therapies, paving the way for improved patient outcomes and quality of life.

Keywords: Rheumatoid arthritis, autoimmune disorder, Cytokines, Interleukins, TNF- α , Biomarkers, Nanotechnology, Biologic therapy, Patents.

PARKINSON 'S DISEASE: BRIDGING GAPS, BUILDING BIOMARKERS, AND REIMAGINING CLINICAL TRANSLATION

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ABSTRACT

Parkinson's disease (PD) is a progressive neurodegenerative disorder that continues to pose significant clinical and socioeconomic challenges across the world. With the emergence of molecular profiling, neuroimaging, and computational modeling, PD is now increasingly recognized as a multifactorial systems disorder rather than a condition confined to dopaminergic deficits. This review explores the evolving landscape of Parkinson's disease research by critically analyzing developments in pathophysiology, clinical evaluation, biomarker discovery, and therapeutic innovation. It underscores the need for integrated, interdisciplinary, and biomarker-driven research frameworks that bridge the gap between laboratory findings and clinical applications. Grounded in initiatives like the Accelerating Medicines Partnership–Parkinson's Disease (AMP-PD) and the Parkinson's Progression Markers Initiative (PPMI), the review highlights the role of shared databases, open-access biomarker repositories, and patient-centered digital platforms in promoting faster and more personalized therapeutic development. As the field transitions from symptomatic management to disease-modifying interventions, a cohesive and collaborative approach becomes essential. The future of PD research lies in uniting molecular neuroscience, precision medicine, and global health efforts to ensure that scientific breakthroughs are efficiently translated into meaningful clinical outcomes.

Keywords: Parkinson's disease, Neurodegeneration, Biomarkers, Precision medicine, α -synuclein, Molecular profiling, Translational neuroscience.

AMYLOID-LOWERING IMMUNOTHERAPIES FOR ALZHEIMER DISEASE: CURRENT STATUS AND FUTURE DIRECTIONS

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ABSTRACT

The therapeutic landscape of Alzheimer’s disease (AD) has recently entered a transformative phase with the approval of the first disease-modifying treatments. These novel immunotherapies, particularly monoclonal antibodies (mAbs) directed against various forms of amyloid- β ($A\beta$)—including protofibrillar and fibrillar aggregates—have shown a significant capacity to reduce cerebral $A\beta$ burden. Clinical trials have demonstrated that these mAb therapies can moderately slow cognitive deterioration and functional decline, marking a major advancement in AD management and research. This review highlights recent progress in the clinical development and approval of amyloid-targeting mAbs and examines their implications for future therapeutic strategies. It further discusses the evolving understanding of AD as a biological continuum, encompassing the transition from preclinical asymptomatic stages to clinically evident dementia. This continuum-based framework serves as a valuable model for evaluating amyloid-lowering agents across diverse stages of disease progression. Moreover, the review emphasizes key considerations for the integration of mAb-based therapies into clinical practice, including issues related to patient selection, safety monitoring, neuroinflammation management, and healthcare accessibility. Collectively, these insights underline the potential of immunotherapy to reshape the course of AD while highlighting the challenges that remain in translating scientific advances into widespread clinical benefit.

Keywords: Alzheimer’s disease, Amyloid- β , Monoclonal antibodies.

SYNTHESIS AND ITS CHARACTERISATION OF SELENIUM/SILVER/CHITOSAN AND CELLULAR TOXICITY AGAINST LIVER CARCINOMA CELLS STUDIES

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ABSTRACT

Liver cancer remains one of the most fatal malignancies worldwide, emphasizing the urgent need for innovative and effective therapeutic approaches. The combination of natural compounds with nanotechnology offers a promising route toward achieving targeted treatment with minimal toxicity and reduced side effects. In this study, a selenium-silver-chitosan nanocomposite (Se-Ag-CS NCs) was successfully synthesized using a stepwise ultrasonic method. The resulting nanocomposite was thoroughly characterized through multiple analytical techniques, including powder X-ray diffraction (PXRD), Fourier transform infrared spectroscopy (FTIR), field emission scanning electron microscopy (FESEM), energy-dispersive X-ray analysis (EDX), transmission electron microscopy (TEM), dynamic light scattering (DLS), and zeta potential measurements. PXRD analysis confirmed successful synthesis with an average grain size of 27.3 nm, while FESEM and TEM images revealed that the nanocomposites exhibited nanoscale spherical and rod-like morphologies encapsulated by chitosan. The cytotoxicity of Se-Ag-CS NCs was evaluated against liver cancer cells at varying concentrations (0–1 mg/mL) and time intervals (24, 48, and 72 hours). These findings highlight the potential of naturally derived nanocomposites as a novel and biocompatible strategy for cancer therapy, offering effective anticancer activity with low side effects on healthy tissues.

Keywords: Liver cancer, Nanocomposite, Selenium, Chitosan, X-ray diffraction.

BIOMARKER-GUIDED DECISION MAKING IN CLINICAL DRUG DEVELOPMENT FOR NEURODEGENERATIVE DISORDERS

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ABSTRACT

Neurodegenerative disorders involve intricate neurobiological alterations that can be tracked through biomarkers present in blood, cerebrospinal fluid (CSF), and brain imaging. These biomarkers serve as accessible indicators of complex neurological processes that are otherwise difficult to measure, playing a crucial role in modern drug development and clinical trial design. In recent years, biomarkers have enabled accelerated approvals of new therapies for conditions such as Alzheimer’s disease and amyotrophic lateral sclerosis, acting as surrogate endpoints that can reasonably predict clinical benefit. Emerging evidence highlights the potential of blood-based biomarkers for detecting Alzheimer’s disease and other neurodegenerative disorders like Parkinson’s disease and frontotemporal dementia, with some showing utility across multiple conditions. CSF biomarkers, in contrast, provide insights into synaptic dysfunction and neuroinflammatory processes not detectable in plasma. Advances in molecular imaging further allow visualization of disease-specific targets, including amyloid plaques, neurofibrillary tangles, inflammation, mitochondrial dysfunction, and synaptic density. This comprehensive review emphasizes the strategic integration of biomarkers into clinical trials according to their context of use—ranging from risk assessment, diagnosis, and prognosis to pharmacodynamic monitoring, treatment response prediction, and safety evaluation.

Keywords: Neurodegenerative disorders, biomarkers, Alzheimer’s disease.

THE EMERGING ROLE OF OXYGEN REDOX IN PATHOLOGICAL PROGRESSION OF DISORDERS

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ABSTRACT

Neurodegenerative diseases, including Alzheimer’s disease, Parkinson’s disease, and Huntington’s disease, represent major global health challenges, imposing significant social and economic burdens. Although intensive research efforts have been made, the precise molecular mechanisms underlying these disorders remain poorly defined, hindering the development of effective diagnostic and therapeutic approaches. Emerging studies have increasingly emphasized the pivotal role of oxidative stress, particularly mitochondrial oxidative stress, in the onset and progression of neurodegenerative diseases. Mitochondrial dysfunction leads to excessive production of reactive oxygen species (ROS), resulting in neuronal damage, impaired energy metabolism, and activation of apoptotic pathways. Despite these insights, comprehensive analyses that systematically explore the connection between mitochondrial oxidative stress and neurodegeneration are still limited. This review aims to bridge that gap by elucidating how mitochondrial oxidative imbalance contributes to disease initiation and advancement, while also highlighting the therapeutic potential of antioxidant-based interventions. By offering an integrated understanding of these mechanisms, this review provides a foundation for future research and the development of novel strategies targeting mitochondrial health to combat neurodegenerative diseases.

Keywords: Neurodegenerative diseases, oxidative stress, mitochondria, reactive oxygen species.

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BIOMARKER-GUIDED DECISION MAKING IN CLINICAL DRUG DEVELOPMENT FOR NEURODEGENERATIVE DISORDERS

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is a widespread chronic metabolic disorder that affects more than 400 million individuals worldwide and arises from a combination of genetic predisposition and environmental influences. Its pathogenesis is primarily characterized by insulin resistance and β -cell dysfunction, processes often driven by β -cell dedifferentiation, mitochondrial impairment, and oxidative stress. Managing T2DM effectively requires a strong foundation of non-pharmacological interventions such as regular physical activity, balanced dietary habits, and cognitive-behavioral therapy, all of which play vital roles in maintaining optimal blood glucose levels. Despite these therapeutic developments, T2DM continues to pose severe health challenges due to its associated complications, including diabetic kidney disease, retinopathy, neuropathy, and macrovascular conditions like stroke and peripheral artery disease. Therefore, early detection, comprehensive management, and personalized treatment strategies remain essential to improving patient outcomes and enhancing quality of life for individuals living with T2DM.

Keywords: Type 2 diabetes mellitus, insulin resistance, and oxidative stress.

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ARTIFICIAL INTELLIGENCE-BASED NANOTECHNOLOGY: ACCELERATING DESIGN, MANUFACTURING, AND TRANSLATIONAL NANOMEDICINE

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ABSTRACT

Artificial intelligence (AI) is emerging as a game changer in nanotechnology, enabling rapid material discovery, precise nanofabrication, and intelligent biomedical applications. Recent research shows that machine-learning algorithms may predict nanomaterial qualities, optimize synthesis parameters, and direct high-throughput experiments for fast screening. AI-driven pipelines, such as generative models and active learning, have significantly increased the rational design of drug-delivery systems, including cancer nanotherapeutics and lipid nanoparticles, and significantly improved nanoparticle formation workflows. Parallel to this, deep learning-based image analysis has automated nanoparticle characterization from electron microscopy data, increasing accuracy in particle size, shape, and dispersion analysis. AI-powered toxicity prediction technologies facilitate safer nanomaterial development and regulatory evaluation, overcoming significant translational hurdles. Furthermore, combining AI with nanomanufacturing and digital quality control platforms has increased fabrication precision, scalability, and cost-effectiveness. When taken as a whole, these developments show how AI may facilitate data-driven nanoscience, reducing the time between discovery and application while maintaining safety and reproducibility. Standardized datasets, interpretable models, and hybrid frameworks that combine computation, automation, and experimental validation are required for further advancement. The combination of AI and nanotechnology has the potential to transform targeted therapies, next-generation materials, and nanoscale manufacturing for both industrial and clinical applications.

Keywords: AI, Machine Learning, Nanotechnology, Nanomedicine, Nanofabrication, Deep Learning, Nanoparticles, Toxicity Prediction, Image Analysis, High-Throughput Screening.

**HEAVY METALS AND THE BRAIN: MECHANISMS OF NEUROTOXICITY AND
EMERGING PUBLIC HEALTH CHALLENGES**

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ABSTRACT

Heavy metal exposure remains a major global health concern due to its persistence bioaccumulation in the food chain, and Harmful effects on the central nervous system (CNS). Metals such as lead (Pb), mercury (Hg), cadmium (Cd), arsenic (As), and aluminum (Al) readily cross the blood–brain barrier (BBB), leading to oxidative stress, neuroinflammation, mitochondrial dysfunction, and neuronal apoptosis, degrade neurological pathways (Dopamine and glutamate). Lead exposure is strongly associated with cognitive decline, memory loss, and attention deficits through inhibition of N-methyl-D-aspartate (NMDA) receptor activity and antioxidant enzyme suppression. Mercury and cadmium induce reactive oxygen species (ROS) generation and lipid peroxidation, resulting in neuronal degeneration in the hippocampus and cerebellum. Arsenic interferes with neuronal metabolism and modulates the Bax/Bcl-2 apoptotic pathway, contributing to behavioral and emotional dysregulation. Epidemiological studies have revealed strong correlations between environmental heavy metal exposure and increased risk of neurodevelopmental disorders, Parkinson’s disease, and Alzheimer’s disease. These mechanistic insights underscores and have an urgent need for strict environmental regulation, early biomonitoring, and public health interventions to mitigate heavy metal-induced neurotoxicity worldwide.

Keywords: Heavy metal, oxidative stress, neuroinflammation.

**SYNERGISTIC NEUROPROTECTIVE POTENTIAL OF N-ACETYL-CYSTEINE AND
CURCUMIN AGAINST PM_{2.5}-INDUCED NEUROTOXICITY: A PROMISING APPROACH
TOWARD COMBATING AIR POLLUTION LINKED NEURODEGENERATION**

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ABSTRACT

Air pollution is increasingly recognized as a critical environmental determinant of neurological health, with fine particulate matter (PM_{2.5}) emerging as a potent contributor to neurodegenerative conditions such as Alzheimer’s and Parkinson’s disease. Owing to its ultrafine size, PM_{2.5} can penetrate deep into the lungs, enter systemic circulation, and reach the brain, where it triggers oxidative stress, neuroinflammation, and progressive cognitive decline. The global rise in air pollution–associated neurodisorders underscores an urgent need for safe, accessible, and effective neuroprotective interventions. N-acetylcysteine (NAC), a precursor of glutathione, acts as a potent antioxidant and free radical scavenger, while Curcumin, a bioactive polyphenol derived from *Curcuma longa*, possesses complementary antiinflammatory and neurorestorative properties. Emerging evidence suggests that combining these two agents may yield synergistic protection by restoring redox balance, modulating inflammatory signaling, and preventing neuronal damage. The present research emphasizes the importance of exploring this dualantioxidant therapeutic strategy to counteract the detrimental neurological effects of chronic PM_{2.5} exposure. Establishing the combined efficacy of NAC and Curcumin could pave the way for novel preventive or adjunct approaches in managing air pollution–induced neurodegeneration and related cognitive impairments.

Keywords: N-acetylcysteine, PM_{2.5}, oxidative stress, neurodegeneration.

**DESIGN, SYNTHESIS, AND BIOLOGICAL SCREENING OF VANILLIN–
AMINOPYRIDINE SCHIFF BASE DERIVATIVES**

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ABSTRACT

With an emphasis on sustainability, this study explores the synthesis and antimicrobial assessment of new Schiff base compounds generated from vanillin and aminopyridine. Aminopyridine functioned as a nitrogen-containing heterocyclic moiety with established pharmacological relevance, whereas vanillin, a bio-based aromatic aldehyde derived from lignin, was chosen as an environmentally beneficial starting material because of its renewability and biological compatibility. By using moderate, solvent-controlled condensation processes to create the Schiff base derivatives, the environmental impact of traditional synthetic procedures was minimized. FTIR, UV-Vis, $^1\text{H-NMR}$, and $^{13}\text{C-NMR}$ spectroscopic investigations were used to elucidate the structure of the synthesized compounds and validate the successful synthesis of imine linkages. Numerous substances showed strong antibacterial efficacy that was on par with conventional reference medications, demonstrating their encouraging bioactivity. In order to correlate computational predictions with biological results, molecular docking investigations were also carried out to assess the synthesized derivatives' binding affinity toward important microbial enzymes. The results demonstrate the substantial potential of vanillin–aminopyridine Schiff base compounds as long-lasting and strong antibacterial agents. All things considered, the research advances environmentally friendly synthetic techniques and offers insightful information about the structure–activity relationship of Schiff bases for potential use in drug design.

Keywords: Schiff base, vanillin, aminopyridine derivatives, microbial disease.

**COMPUTATIONAL DRUG DESIGN AND BIOLOGICAL EVALUATION OF
HETEROCYCLIC NUCLEUS TARGETING PTP1B FOR ANTIDIABETIC THERAPY**

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ABSTRACT

The present study aims to design, screen, and evaluate novel heterocyclic derivatives as potential PTP1B inhibitors using computational techniques, followed by pharmacological validation to assess their antidiabetic potential. A library of designed compounds was subjected to molecular docking against the PTP1B active site using Discovery Studio Visualizer to predict binding affinities and key molecular interactions. The top hits were further evaluated for ADME/Toxicity parameters using DeepPK software. Selected compounds were synthesized and characterized using FTIR, $^1\text{H-NMR}$, and Mass spectrometry. There in vivo antidiabetic activity was assessed in streptozotocin (STZ)-induced diabetic Wistar rats, with biochemical estimations including fasting blood glucose, serum insulin, and lipid profile. In addition, histopathological examination of pancreatic tissue was performed to evaluate morphological restoration and β -cell regeneration following treatment. Docking studies revealed several derivatives exhibiting high binding affinity and strong hydrogen bonding with catalytic residues Arg221, Cys215, and Asp181 of PTP1B. ADME/Tox analysis confirmed acceptable drug-likeness and safety profiles. Synthesized compounds demonstrated significant reduction in blood glucose levels and improved lipid parameters compared to the standard drug, metformin, confirming there in vivo efficacy. These findings support further optimization and preclinical development of the designed compounds as novel therapeutics for type 2 diabetes.

Keywords: PTP1B inhibitors, in-silico drug design, molecular docking.

AI IN CLINICAL REASEARCH AND PHARMACOVIGILANCE

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ABSTRACT

Artificial Intelligence (AI) is transforming the landscape of healthcare, clinical research, and pharmacovigilance by introducing automation, precision, and data-driven insights. In clinical research, AI has shown immense potential in enhancing clinical trial design, optimizing patient recruitment, predicting drug properties, and improving decision-making through advanced data analytics and machine learning models. AI-driven tools facilitate efficient processing of electronic health records (EHRs), enable real-time monitoring, and support the growing field of precision medicine, ultimately leading to more effective and personalized therapeutic interventions. Similarly, in pharmacovigilance (PV), AI applications are revolutionizing the detection and management of adverse drug events by automating data collection, coding, causality assessment, and quality checks. Given the exponential rise in individual case safety reports, AI offers a solution to process large and complex datasets, helping identify safety signals more efficiently. A collaborative model integrating human expertise with intelligent automation is therefore essential. Overall, the integration of AI in clinical research and pharmacovigilance represents a major advancement toward safer, faster, and more reliable drug development and post-marketing surveillance, provided ethical, technical, and policy frameworks evolve alongside its implementation.

Keywords: Artificial Intelligence, Clinical Research, Pharmacovigilance, Machine Learning.

THE EPIDEMIOLOGY OF TYPE 1 DIABETES MELLITUS IN OLDER ADULTS

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ABSTRACT

Although type 1 diabetes mellitus (T1DM) has long been regarded as a disease primarily affecting children and young adults, recent evidence indicates a rising number of diagnoses among older individuals. This trend can be attributed to both an increase in the incidence of late-onset T1DM and the improved life expectancy of those already living with the disease. Current studies show that adults aged 60 years and older may experience an incidence peak comparable to or even greater than that observed in pediatric populations, with prevalence generally increasing with age. The pathophysiology of T1DM in older adults involves genetic susceptibility and autoimmune mechanisms similar to those seen in younger patients, with glutamic acid decarboxylase (GAD) antibody positivity being a common immunological marker. However, differentiating T1DM from type 2 diabetes mellitus (T2DM) in older adults remains challenging due to overlapping clinical features and the absence of a definitive diagnostic standard. This diagnostic ambiguity may partly explain the observed global variation in T1DM epidemiology. As the aging population grows, there is an urgent need for more precise genetic and immunological criteria to distinguish diabetes subtypes in older adults, thereby enabling better disease management and a clearer understanding of its true epidemiological burden.

Keywords: Type 1 diabetes mellitus, older adults, epidemiology, GAD antibodies.

**ARTIFICIAL INTELLIGENCE IN BIOMEDICAL ENGINEERING AND ITS INFLUENCE
ON HEALTHCARE STRUCTURE: CURRENT AND FUTURE PROSPECTS**

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ABSTRACT

Artificial intelligence (AI) is an advancing field within computer science that integrates data science and computational technologies to create intelligent systems capable of analyzing large and complex datasets with remarkable speed and accuracy. Its rapid growth and adaptability have made it indispensable in various sectors, particularly in healthcare. This review provides an overview of AI, its operational principles, and its transformative impact on biomedical engineering. By leveraging machine learning, computer vision, and neural networks, AI systems are revolutionizing medical research, diagnostics, and patient care. In biomedical engineering, AI-driven innovations such as biosensors and smart diagnostic tools enable continuous health monitoring, early detection of physiological abnormalities, and personalized treatment planning. These technologies are reshaping modern medicine by allowing non-invasive, real-time assessment of patient health parameters. Moreover, AI applications in medical imaging, predictive modeling, and biomarker analysis are contributing to more accurate and efficient clinical decision-making. Despite ongoing challenges, including ethical considerations and data privacy concerns, the integration of AI into healthcare continues to accelerate. The increasing use of AI-powered systems promises a future where diagnostics are more precise, medical devices more intelligent, and healthcare delivery more efficient and accessible.

Keywords: Artificial intelligence, biomedical engineering, diagnostics, biosensors, machine learning, medical imaging, biomarker analysis, healthcare innovation.

THE INTERFACE OF DEPRESSION AND DIABETES: TREATMENT CONSIDERATIONS

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ABSTRACT

This comprehensive review examines the complex bidirectional relationship between depression and diabetes, emphasizing how their coexistence complicates treatment and worsens clinical outcomes. Both conditions frequently occur together and share overlapping genetic, biological, lifestyle, and psychosocial risk factors. Factors such as poor diet, physical inactivity, and disrupted sleep contribute not only to the onset but also to the progression of both disorders, underscoring the importance of a unified and integrative management approach. Conventional treatment methods that address either depression or diabetes in isolation have proven insufficient in tackling their interconnected nature. Consequently, integrated care models that combine medical therapy with psychological and behavioral interventions are increasingly recognized as essential for improving adherence, glycemic control, and overall well-being. Effective implementation of such models requires coordinated efforts among endocrinologists, psychiatrists, psychologists, and primary care professionals to ensure a holistic patient-centered approach. Moreover, this review highlights several barriers to optimal care, including mental health stigma, limited health literacy, and psychological resistance, which hinder patient engagement and treatment success. To address these challenges, educational programs and supportive interventions tailored to patient needs are necessary. Future research should focus on longitudinal and cross-population studies to clarify causal mechanisms, identify novel therapeutic targets, and evaluate preventive strategies that mitigate the onset of one condition in individuals predisposed to the other.

Keywords: Depression, diabetes, comorbidity, integrated care, psychosocial factors, lifestyle modification, patient adherence, holistic treatment.

LIC25-P-201

**THE ADVANCEMENT OF ARTIFICIAL INTELLIGENCE IN BIOMEDICAL RESEARCH
AND HEALTH INNOVATION: CHALLENGES AND OPPORTUNITIES IN EMERGING
ECONOMIES**

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ABSTRACT

The rapid advancement of artificial intelligence (AI), algorithm optimization, and high-throughput experimentation has revolutionized scientific research by enabling the discovery of new chemicals and materials with remarkable speed, precision, and efficiency. In recent years, autonomous experimentation (AE) systems—also referred to as self-driving laboratories or materials acceleration platforms—have emerged as transformative AI-driven innovations designed to automate and accelerate research and development (R&D) processes. These digital platforms are capable of performing a vast number of experiments autonomously, drastically reducing human intervention and expediting data-driven discoveries. Such initiatives can empower scientists and institutions in emerging economies to actively contribute to the global AI and biomedical innovation landscape. Furthermore, fostering meaningful partnerships and cross-cultural engagement can enhance the ethical, regulatory, and societal readiness for AI integration in healthcare. Strengthening institutional preparedness, policy frameworks, and knowledge infrastructures will be essential for navigating the opportunities and risks associated with AE. Ultimately, the cultural and geographical diversification of AE systems can promote a more balanced, transparent, and globally representative evolution of AI in health-related R&D, fostering sustainable and equitable innovation for the future.

Keywords: Artificial intelligence, autonomous experimentation, biomedical innovation, emerging economies, self-driving laboratories, health technology, global collaboration, R&D infrastructure.

LIC25-P-202

**PRESENT AND FUTURE OF CANCER NANO-IMMUNOTHERAPY: OPPORTUNITIES,
OBSTACLES AND CHALLENGES**

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ABSTRACT

Cancer continues to be one of the most significant causes of mortality worldwide, highlighting the urgent need for more effective and innovative treatment strategies. Among emerging therapeutic approaches, immunotherapy has transformed cancer management by harnessing the body's immune system to identify and eliminate malignant cells. Several modalities, such as immune checkpoint inhibitors (ICIs), adoptive cell therapy, and cancer vaccines, have shown remarkable success in improving patient survival and combating treatment-resistant tumors. Nevertheless, the clinical outcomes of immunotherapy remain inconsistent, as many patients exhibit limited responsiveness or experience relapse due to adaptive resistance mechanisms. Nanomaterials possess unique properties that enable precise drug delivery, reduced systemic toxicity, and enhanced immune stimulation within the tumor microenvironment. The convergence of nanotechnology and immunotherapy—referred to as nano-immunotherapy—has demonstrated encouraging results in preclinical and clinical studies, improving both treatment efficacy and safety. Despite this progress, several challenges persist, including the need to ensure nanomaterial biosafety, close the translational gap between laboratory and clinical research, and establish robust clinical trial frameworks. In summary, nanomedicine-based combination immunotherapy represents a rapidly advancing and highly promising frontier in oncology, with the potential to transform cancer treatment by providing safer, more targeted, and more effective therapeutic options.

Keywords: Cancer immunotherapy, nanomedicine, immune checkpoint inhibitors.

INTEGRATING GENERATIVE ARTIFICIAL INTELLIGENCE TOOLS AND COMPETENCIES IN BIOMEDICAL ENGINEERING EDUCATION

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ABSTRACT

The rapid integration of generative artificial intelligence (GenAI) is transforming the landscape of biomedical engineering (BME) education by redefining how students learn, think, and innovate. GenAI technologies have the potential to revolutionize curriculum design, research methodologies, and clinical problem-solving by automating complex tasks and fostering creativity in data-driven healthcare solutions. This paper draws insights from *The Fifth Biomedical Engineering Education Summit*, where educators and industry experts from across the United States convened to discuss the challenges, opportunities, and future directions of incorporating GenAI into BME education. Central themes included embedding AI and data science competencies to align with evolving industry requirements, promoting ethical and responsible AI practices, and preparing students for emerging AI-driven healthcare professions. The paper also highlights practical strategies and a question-response framework to guide educators in effectively embedding GenAI tools into biomedical engineering programs. Ultimately, the responsible and strategic adoption of GenAI promises to shape a new generation of biomedical engineers equipped with critical thinking, innovation, and ethical awareness in the era of intelligent healthcare.

Keywords: Generative Artificial Intelligence, Biomedical Engineering Education.

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL TECHNOLOGY AND DRUG DELIVERY DESIGN

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ABSTRACT

Artificial intelligence (AI) has emerged as a transformative technology that integrates computational intelligence with biomedical and pharmaceutical sciences to address complex challenges in drug development. The rapid evolution of AI and machine learning (ML) algorithms has opened new pathways in drug discovery, formulation design, and dosage form testing, leading to faster, more efficient, and cost-effective pharmaceutical innovations. By leveraging AI-driven data analytics, researchers can process massive datasets from genomics, proteomics, and metabolomics to identify disease-specific targets and predict molecular interactions between drugs and biological systems. This approach not only accelerates early-stage discovery but also enhances the precision and success rate of drug development. AI and ML tools are increasingly being employed to optimize formulation parameters, predict pharmacokinetic and pharmacodynamic (PK/PD) behaviors, and simulate bioavailability, reducing the reliance on extensive in vivo studies. Despite these advancements, challenges remain in data quality, model validation, and ethical implementation. This review highlights the diverse applications, advantages, and limitations of AI in pharmaceutical technology, emphasizing its pivotal role in shaping the future of modern therapeutics.

Keywords: Artificial intelligence, Machine learning, Drug discovery, Formulation design.

ROLE OF ARTIFICIAL INTELLIGENCE IN PHARMACY PRACTICE: A SYSTEMATIC REVIEW

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ABSTRACT

This systematic review examines the transformative role of artificial intelligence (AI) in overcoming key challenges within the pharmaceutical industry, with particular focus on supply chain management, clinical trial optimization, and drug discovery. The pharmaceutical industry continues to face significant hurdles, including global supply chain disruptions, clinical trial delays, and the escalating complexity of drug development. AI technologies, encompassing supervised, unsupervised, and deep learning models, have demonstrated the potential to revolutionize these areas by enabling predictive analytics, optimizing logistics, enhancing drug target identification, and improving decision-making processes across the research and development (R&D) pipeline. In supply chain management, AI-driven predictive models can forecast demand, mitigate risks, and ensure efficient resource allocation. In clinical trials, AI facilitates patient recruitment, real-time monitoring, and adaptive trial designs, thereby reducing costs and timelines. Furthermore, AI-powered algorithms accelerate drug discovery through virtual screening and molecular modeling, enhancing precision and productivity. Continued research, ethical implementation, and regulatory harmonization are crucial for ensuring that AI technologies achieve their full potential in fostering innovation, resilience, and sustainability in the pharmaceutical industry.

Keywords: Artificial intelligence, Pharmaceutical industry, Supply chain management.

EMERGING OF ARTIFICIAL INTELLIGENCE AND TECHNOLOGY IN PHARMACEUTICALS: REVIEW

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ABSTRACT

This review explores the diverse applications of Artificial Intelligence (AI) in modern drug development and highlights the recent advancements achieved through collaborations between the pharmaceutical industry and AI-driven technologies. The rapid evolution of computing and data science has profoundly influenced all areas of scientific research, from basic engineering to advanced medical sciences, positioning AI as an indispensable tool in pharmaceutical innovation. In recent years, the integration of AI in drug discovery and development has begun to surpass traditional methods by significantly reducing the time, cost, and uncertainty associated with the process. AI technologies facilitate the rapid identification of potential drug targets, optimization of molecular structures, and prediction of pharmacokinetic and toxicological properties. Applications of AI extend to de novo drug design, activity scoring, virtual screening, and in silico evaluation of absorption, distribution, metabolism, excretion, and toxicity (ADMET) profiles. These tools enhance precision in candidate selection and minimize health risks during preclinical and clinical stages. Pharmaceutical companies are increasingly partnering with AI-based organizations to accelerate drug discovery, improve the success rate of novel therapeutics, and advance personalized medicine. Overall, AI is transforming pharmaceutical chemistry and healthcare by driving innovation, improving efficiency, and paving the way for a data-driven future in drug research and development.

Keywords: Artificial intelligence, Drug discovery, Machine learning, Pharmaceutical chemistry.

LIC25-P-207

**MULTI-TARGET APPROACH TO ALZHEIMER’S DISEASE PREVENTION AND
TREATMENT: ANTIOXIDANT, ANTI-INFLAMMATORY, AND AMYLOID-
MODULATING MECHANISMS**

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ABSTRACT

Alzheimer’s disease (AD) is a progressive neurodegenerative disorder characterized by the accumulation of amyloid- β (A β) plaques, neurofibrillary tangles, neuroinflammation, and gradual cognitive impairment, representing one of the leading global health challenges. Increasing scientific evidence suggests that dietary polyphenols possess strong neuroprotective potential and may play a pivotal role in preventing or slowing the progression of AD through multiple molecular mechanisms. Polyphenols exert their protective effects by modulating amyloid proteostasis—specifically through the inhibition of β - and γ -secretase activity, suppression of A β aggregation, and promotion of A β clearance via autophagic and enzymatic pathways. Beyond their antioxidant effects, polyphenols also mitigate neuroinflammation by downregulating NF- κ B signaling, inhibiting microglial activation, and upregulating neurotrophic factors such as brain-derived neurotrophic factor (BDNF), which supports synaptic plasticity and neuronal survival. Moreover, polyphenols contribute to cerebrovascular protection by improving endothelial function, maintaining blood–brain barrier integrity, and enhancing cerebral blood flow. These multifaceted mechanisms collectively promote neuronal resilience and reduce AD-associated neuropathology, including tau hyperphosphorylation, oxidative stress, and chronic inflammation. Evidence from preclinical and clinical studies underscores the therapeutic potential of polyphenol-rich diets in AD prevention and management. Future directions should focus on personalized nutritional interventions that integrate genetic predisposition, gut microbiota composition, and lifestyle factors to maximize the cognitive and neuroprotective benefits of polyphenols.

Keywords: Alzheimer’s disease, amyloid- β , polyphenols, neuroinflammation, oxidative stress.

LIC25-P-208

**COMPUTER AIDED DRUG STUDIES OF BENZIMIDAZOLE CONTAINING ISOXAZOLE
DERIVATIVES AS TARGETED ANTIBIOTICS**

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ABSTRACT

Molecular docking is a widely employed computational technique used to predict and analyze drug–receptor interactions in modern drug design. In this study, benzimidazole-containing isoxazole derivatives were designed and evaluated as potential inhibitors of *Escherichia coli* β -ketoacyl-acyl carrier protein synthase III (ecKAS III), a key enzyme involved in bacterial fatty acid biosynthesis. The molecular docking simulations were performed using HEX docking software to assess the binding affinities of the designed compounds. The results revealed that all synthesized derivatives exhibited favorable binding energies compared with standard antibacterial agents such as ciprofloxacin (–211.04 kcal/mol), amoxicillin (–182.23 kcal/mol), and cefotaxime (–207.62 kcal/mol). These computational findings indicate the potential of benzimidazole-based isoxazole scaffolds as promising antibacterial candidates. Further work will involve the synthesis of these compounds followed by in vitro screening to evaluate their antibacterial efficacy against *E. coli* and other pathogenic microorganisms.

Keywords: Benzimidazole, Isoxazole, Molecular docking, Antibacterial activity, ecKAS III, *Escherichia coli*.

A REVIEW ON ARTIFICIAL INTELLIGENCE IN PHARMA, THE FUTURE OF HEALTHCARE

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ABSTRACT

Artificial intelligence (AI), a dynamic branch of computer science, empowers machines to perform tasks that typically require human intelligence. Its integration into pharmaceutical technology has revolutionized multiple aspects of research and development by improving workflow efficiency, minimizing operational costs, and enhancing safety, precision, and productivity. AI systems are capable of managing and interpreting complex datasets, enabling researchers to analyze formulation parameters, optimize process conditions, and predict product performance with remarkable accuracy. Through advanced algorithms and machine learning models, AI assists scientists in understanding intricate correlations between drug composition, manufacturing processes, and therapeutic outcomes. This capability not only reduces the time and resources needed for experimentation but also facilitates the design of more effective and patient-specific dosage forms. The rapid growth of AI-driven research in pharmacy has demonstrated its potential to transform key areas such as dosage form design, hospital and clinical pharmacy operations, and innovative drug discovery. Moreover, AI tools contribute to data storage, organization, and predictive analysis in healthcare, supporting evidence-based decision-making. Applications like telepsychology, the MEDi robot for patient interaction, AI-assisted peptide innovation, and automated drug screening exemplify how intelligent technologies are redefining modern healthcare practices. Overall, the integration of AI in pharmaceutical sciences offers immense potential for improving efficiency, accelerating innovation, and ensuring high-quality healthcare delivery.

Keywords: Artificial Intelligence (AI), Telepsychology, MEDi Robot, Innovative Peptides, Drug Screening.

CHALLENGES AND OPPORTUNITIES IN CANCER IMMUNOTHERAPY

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ABSTRACT

Cancer immunotherapy has revolutionized oncology over the past decade, offering new hope and long-term survival benefits to patients with various malignancies. In recent years, several classes of immune checkpoint inhibitors, chimeric antigen receptor (CAR) T-cell therapies, bispecific T-cell engagers, cancer vaccines, and oncolytic viruses have been integrated into standard cancer care alongside traditional cytokine-based treatments. These advancements have been supported by rapid progress in molecular biology, immunology, and translational research, resulting in a deeper understanding of tumor-immune interactions. Addressing these issues requires a coordinated effort focused on optimizing preclinical models, improving data curation and sharing, and enhancing biospecimen collection for translational studies. Moreover, diversification of funding sources, establishment of standardized protocols, and active patient engagement are essential for sustained progress. The integration of artificial intelligence (AI) and computational modeling further holds promise in accelerating drug discovery, predicting patient responses, and designing personalized immunotherapy strategies. Future advancements in cancer immunotherapy will depend on a multidisciplinary approach that emphasizes innovation, inclusivity, and accessibility. This strategic vision aims to shape the next decade of cancer treatment by combining scientific excellence with technological innovation for more effective and targeted therapeutic outcomes.

Keywords: Cancer immunotherapy, immune checkpoint inhibitors, CAR-T cell therapy.

MYOPIA PROGRESSION AND ITS PATHWAY

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ABSTRACT

Myopia, or nearsightedness, is a refractive error characterized by the elongation of the eyeball, resulting in blurred vision. In Myopia, light focusing in front of the retina rather than on it. The prevalence of myopia has increased dramatically worldwide, especially among children and adolescents. Due to excessive use of contact lenses, it leads to myopia progression. Eye elongation, genetics increased close-up work, decrease outdoor activities are the causes of myopia progression. It causes structural changes in the sclera, Choroid and retina accompany the axial elongation. Increase the risk of sight threatening complications like retinal detachment, glaucoma. Early detection, Lifestyle modification like Increase outdoor activity are the prevention of myopia progression. Pathways: eye elongation, retinal defocus, sclera remodeling, collagen changes, environmental factors.

Keywords: Myopia, axial, elongation, refractive error, outdoor activity.

MYOPIA PROGRESSION AND ITS PATHWAY

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ABSTRACT

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Keywords: Myopia, axial, elongation, refractive error, outdoor activity, threatening complication.

A REVIEW ON BIOSTATISTICAL METHODS FOR PHARMACEUTICAL SCIENCE

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ABSTRACT

Statistical methods are used throughout a study that includes planning, designing, collecting data, analyzing and drawing meaningful interpretation and report the findings. Hence, it is important that a researcher knows the concepts of at least basic statistical methods used at various stages of a research study. This helps the researcher in the conduct of an appropriately well-designed study leading to valid and reliable results that can be generalized to the population. A well-designed study possesses fewer biases, which intern gives precise, valid and reliable results. There are many statistical methods and tests that are used at various stages of a research. In this communication, we discuss the overall importance of statistical considerations in pharmaceutical research with the main emphasis on estimating minimum sample size for different study objectives. Any article containing even the most elementary statistical procedure should be reviewed by a competent biostatistician. Finally, wherever possible editorial boards of medical journals should include a biostatistician as an associate editor. In this communication, we discuss the overall importance of statistical considerations in pharmaceutical research with the main emphasis on estimating minimum sample size for different study objectives.

Keywords: Statistics, research, sampling, study designs.

ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING PERSONALIZED MEDICINE

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ABSTRACT

Personalized medicine is a new approach in healthcare which means giving the right drug, in the right dose, to the right patient. Every person is different, and factors like genes, lifestyle and health condition affect how they respond to medicines. Because of this, the same treatment may work for one patient but not for another. Personalized medicine tries to solve this problem. Today, Artificial Intelligence (AI) is playing a very important role in developing personalized medicine. AI can study large amounts of patient data, such as genetic reports, medical history, and laboratory tests. By using this information, AI can predict which medicine will work best for which patient. In cancer treatment, AI is already helping doctors to select targeted therapies for specific groups of patients. In diseases like diabetes and heart problems, AI can suggest treatment plans made especially for each patient. AI is also useful in pharmacogenomics, where it helps to decide the correct dose of drugs by studying how genes affect drug response. The advantages of AI in personalized medicine are better results, fewer side effects, faster decisions, and saving of time and cost. But there are also challenges, such as high cost of technology, shortage of trained experts, and issues of patient data privacy. In the future, AI combined with genomics, nanotechnology and digital health tools will make personalized medicine even stronger. This poster will explain the role, uses, benefits, challenges and future scope of Ai in personalized medicine and how it can improve modern pharmacy and healthcare.

Keywords: Artificial intelligence, Personalized Medicine, Pharmacogenomics.

COMPUTER-AIDED DRUG DESIGN: A NOVEL COMPUTATIONAL WAY OF DRUG DESIGNING

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ABSTRACT

Computer-Aided Drug Design (CADD) is an emerging interdisciplinary area that integrates computational and experimental methods to discover and develop new drug molecules. It focuses on optimizing small molecules and digitally simulating product designs in both 2D and 3D, ensuring accuracy in scale, structure, and physical properties. By the 1990s, CADD had become a crucial component of the pharmaceutical industry for identifying and improving drug candidates. Neurodegenerative disorders are a class of chronic conditions marked by the gradual loss of neuron function and cell death in the brain and spinal cord. These include Alzheimer’s disease, Parkinson’s disease, and epilepsy. Developing effective therapies for such disorders remains a major challenge. CADD facilitates the rational design of potent, multi-target therapeutics while minimizing toxicity. Examples of CADD-developed drugs for neurodegenerative conditions include Memantine for Alzheimer’s disease, Ropinirole for Parkinson’s disease, and Levetiracetam for epilepsy. CADD employs several computational strategies such as structure-based and ligand-based drug design, quantitative structure–activity relationship (QSAR) analysis, and pharmacophore modeling to create and refine potential drug candidates. The abstract presented here provides an overview of CADD and highlights its promising applications in modern drug discovery.

Keywords: CADD, Neurodegenerative disorders, drug designing.

FROM RITUALS TO ROBOTICS: THE EXPANDING SPECTRUM OF HEALING

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ABSTRACT

Natural products and traditional medical systems—including Traditional Chinese Medicine (TCM), Ayurveda, Kampo, Traditional Korean Medicine, and Unani—have been practiced for centuries and have evolved into well-established healthcare frameworks. Although only a limited number of plant species have been scientifically examined since the isolation of morphine in 1805, these traditional systems have made substantial contributions to the foundation of modern medicine. They provide significant advantages in drug discovery, offering extensive clinical experience and a wide range of structurally diverse compounds with unique biological activities. As global healthcare systems face challenges such as rising costs and shortages of medical professionals, progress toward modernization remains slow—often hindered by regulatory constraints, institutional resistance, and insufficient consideration of cultural and human factors. In this evolving context, the integration of robotics into healthcare represents a major step forward. Technological innovations, particularly in robotic surgery, have revolutionized medical practice by enabling highly accurate and minimally invasive procedures, thus reducing patient risk and enhancing recovery outcomes. Modern operating environments, supported by advanced robotic systems and smart medical devices, have also improved both surgical precision and medical education. This study seeks to review existing literature on the interconnections among natural products, traditional medicine, and contemporary medical practices, and to explore how the principles and methodologies derived from traditional systems can inform and support the integration of robotics and artificial intelligence within modern healthcare.

Keywords: Traditional Medicine, Drug Development, Robotics in Healthcare, Healthcare Systems, Artificial Intelligence (AI).

**DRUG DEVELOPMENT ASPECTS: QUANTITATIVE STRUCTURE ACTIVITY
RELATIONSHIPS IN COMPUTER AIDED DRUG DESIGN.**

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ABSTRACT

Novel drug development has traditionally relied on a trial-and-error approach, which is both time-consuming and expensive. To overcome these challenges, Quantitative Structure–Activity Relationship (QSAR) studies have been introduced, providing a more systematic and predictive method for identifying new chemical entities with enhanced biological efficacy. QSAR models help in correlating the structural and physicochemical properties of compounds with their biological activities, thereby reducing the need for extensive experimental testing. The process of drug discovery and development involves multiple stages—ranging from target identification and lead optimization to preclinical and clinical evaluations—before a drug finally reaches the market. In the early phases of drug discovery, researchers often worked with limited or no knowledge of Structure–Activity Relationships (SARs) for chemical compounds, making the process more difficult and uncertain. With the advent of Computer-Aided Drug Design (CADD), the field has undergone a revolutionary transformation. CADD integrates diverse scientific disciplines such as chemistry, biology, pharmacology, and computational modeling, enabling researchers to design and analyze potential drug candidates more efficiently. It serves as a bridge in modern drug discovery, significantly accelerating the identification of promising lead compounds. The theoretical foundation of CADD is built upon quantum mechanics and molecular modeling techniques, which include structure-based design, ligand-based design, virtual screening, and binding affinity prediction. These computational approaches allow scientists to predict how a molecule interacts with its biological target, saving both time and resources. Ultimately, understanding the intricate relationship between molecular structure and biological activity is essential for developing potent and selective drugs that effectively bind to their receptors and exhibit the desired therapeutic effects.

Keywords: QSAR, Drug Design, CADD, Descriptor.

AI-BASED DRUG LOADED PHYTOSOMES

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ABSTRACT

Artificial Intelligence (AI) has emerged as a powerful and transformative tool in the development of innovative therapeutics and advanced drug delivery systems. Its application has revolutionized the pharmaceutical field by offering efficient solutions for challenges traditionally associated with drug design, optimization, and delivery. AI can be leveraged to predict drug behavior in the human body, analyze pharmacokinetic and pharmacodynamic profiles, anticipate drug–drug interactions, and design optimized formulations with improved therapeutic performance. One of the most promising applications of AI lies in the formulation and optimization of novel drug delivery systems, where it enables the selection of suitable excipients, dosage forms, and delivery routes. For instance, phytosomes represent a modern approach in phytopharmaceutical formulation, in which bioactive phytoconstituents from herbal extracts are encapsulated and bound with lipids to improve their bioavailability, stability, and absorption. By integrating AI algorithms, researchers can fine-tune these formulations to enhance drug efficacy while minimizing toxicity and side effects.

Keywords: Pharmacodynamics, phytopharmaceutical formulation, Artificial Intelligence.

AI IN PHARMA WORLD- “REDEFINING EDUCATION”

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ABSTRACT

The adoption of Artificial Intelligence (AI) in pharmaceutical education has transformed learning beyond conventional classroom practices, creating a more interactive, technology-driven, and research-oriented academic environment. AI-based educational tools—such as virtual laboratories, intelligent tutoring systems, and predictive modeling software—enable students to visualize drug design, explore pharmacological mechanisms, and strengthen their analytical and decision-making skills through simulations and real-time data analysis. These innovations promote personalized learning experiences by adapting to individual student progress and learning styles, thereby improving understanding and retention of complex pharmaceutical concepts. Through virtual experiments, students can test hypotheses, analyze outcomes, and gain exposure to industry-level technologies without the limitations of physical lab resources. This approach not only enhances digital competence but also prepares students for emerging roles in pharmaceutical research, data analytics, regulatory sciences, and precision medicine. By fostering innovation, critical thinking, and problem-solving abilities, AI empowers learners to adapt to the rapidly evolving healthcare ecosystem. It encourages collaboration between academia and industry, ensuring that educational programs remain aligned with the current and future demands of pharmaceutical sciences. Ultimately, AI not only advances the innovation process within the pharmaceutical sector but also redefines the educational framework that nurtures the next generation of skilled and research-oriented professionals.

Keywords: Artificial Intelligence, Pharmaceutical Education, Innovation, Drug Development, Smart Learning.

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL WORLD- “RESEACRH AND INDUSTRY”

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ABSTRACT

Artificial Intelligence (AI) is emerging as a revolutionary force in the pharmaceutical world, significantly transforming both research and industrial sectors. Advanced algorithms and deep learning models are used to analyze massive datasets of chemical structures, biological pathways, and clinical outcomes, enabling researchers to design and optimize novel drug candidates more efficiently. AI-driven technologies like machine learning, neural networks, and natural language processing are also being applied to interpret complex biomedical data and accelerate the process of drug discovery. In the industrial domain, AI contributes to enhancing manufacturing efficiency, real-time process monitoring, and predictive maintenance of equipment. It improves product quality by automating error detection and optimizing formulation parameters. Additionally, AI is strengthening the pharmaceutical supply chain through intelligent forecasting, demand analysis, and logistics management. In healthcare, AI supports personalized and precision medicine by integrating genomic, clinical, and patient data to tailor therapies to individual needs. Furthermore, its application in clinical trials—such as patient recruitment, data analysis, and adverse event prediction—has reduced both time and cost in drug development. Overall, the incorporation of AI in pharmaceutical research and industry is fostering innovation, increasing productivity, and ensuring safer, more effective, and patient-centered therapeutic outcomes. This technological advancement marks a new era of intelligent, data-driven transformation in the global pharmaceutical landscape.

Keywords: Artificial Intelligence (AI), Pharmaceutical research, Clinical trials.

ARTIFICIAL INTELLIGENCE IN CANCER DETECTION AND TREATMENT.

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ABSTRACT

Artificial Intelligence (AI) is redefining the landscape of cancer diagnosis and therapy by bringing intelligence-driven precision to modern healthcare. Through powerful tools such as machine learning, neural networks, and image recognition systems, AI can analyze massive volumes of medical data with remarkable accuracy and speed. In cancer detection, AI-assisted platforms help identify even the smallest abnormalities in medical images, enabling early diagnosis and reducing human error. In treatment, AI supports the design of personalized therapeutic strategies by predicting how individual patients will respond to specific drugs or therapies. It also accelerates the discovery of novel anti-cancer agents by modeling complex biological interactions and optimizing drug design. Furthermore, AI-based monitoring systems continuously track treatment outcomes, allowing clinicians to adjust therapeutic plans in real time. Although challenges remain in data quality, ethical use, and interpretability, AI continues to evolve as a revolutionary partner in oncology—transforming cancer care into a more predictive, preventive, and personalized process.

Keywords: Artificial Intelligence, cancer, oncology.

AI AND DIGITAL INNOVATIONS IN PHARMA & HEALTHCARE

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ABSTRACT

Digital health, telemedicine and remote patient monitoring are transforming modern healthcare by improving access, efficiency and patient outcomes. By using digital technologies, healthcare providers can connect with patients, collect real Time health data and deliver medical services beyond traditional clinical settings. Telemedicine allows doctors and patients to communicate through video calls, mobile apps and online platforms allowing consultations, diagnosis and follow-ups to occur regardless of physical distance. Remote patient monitoring support these by using wearable devices and connected sensors to track vital signs such as blood pressure, blood sugar level, and heart rate, which are the transmitted to healthcare professional for continuous estimation. Patients with chronic illness benefits from regular monitoring without frequency hospital visits, while healthcare professionals can make data-driven decisions and intervene before any issue arises. The COVID-19 pandemic accelerated the global adoption of telehealth solutions, demonstrating their potential to maintain continuity of care while reducing the risk of infection and burden on hospitals and healthcare systems. Despite these advantages, challenges also persist - including issues of data privacy interoperability, digital literacy and equitable access particularly in low resources settings. Innovative technology such as artificial intelligence (AI), big data analytics and 5G connectivity are still enhancing digital health capabilities, enabling predictive modeling, automated alerts, seamless data exchange Together digital health, telemedicine and remote patient monitoring are redefining modern healthcare by promoting proactive, patient - centred care, improving outcomes and paving the way for a more connected and equitable global health ecosystem

Keywords: Digital health, Telemedicine, Remote patient monitoring.

LIC25-P-223

SMART AND SUSTAINABLE DRUG DISCOVERY: THE ROLE OF AI IN MEDICAL BIOTECHNOLOGY

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ABSTRACT

Despite major advancements in modern medicine, many health challenges continue to affect populations worldwide, with several diseases still lacking effective or accessible treatments. Conventional drug discovery processes often demand extensive time, large investments, and significant resource use, which limits their sustainability. Artificial intelligence is emerging as a powerful solution to these bottlenecks. By applying advanced computational models, AI is helping researchers rethink how drugs are identified, optimized, and developed. Its integration in medical biotechnology enables faster, more precise, and environmentally responsible approaches across multiple stages of drug discovery—including molecular design, virtual screening, synthesis planning, clinical trial optimization, and overall pharmaceutical development. As a result, AI supports the creation of therapeutic strategies that are not only more efficient but also more sustainable and equitable for global healthcare needs.

Keywords: AI, medical biotechnology, sustainable drug discovery, healthcare innovation, pharmaceutical development.

LIC25-P-224

AI AND DIGITAL INNOVATIONS IN PHARMA AND HEALTHCARE

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ABSTRACT

Artificial Intelligence (AI) and Digital innovations are transforming the landscape of Pharmaceutical and healthcare system, through data-driven precision, efficiency and patient-centered care. In pharmaceuticals, AI accelerates drug discovery, optimize clinical trials and predicts therapeutic Outcomes with remarkable accuracy. Digital telemedicine, mobile health applications and wearable devices support continuous patient monitoring and proactive disease management. These innovations enhances efficiency, accuracy, and patient safety, paving the way of data-driven, patient centered care. This poster examines the critical roles of AI in clinical trial optimization, pharmacovigilance, and real world data integration. It also discusses the ethical regulatory and security challenges associated with large scale digital transformation in Healthcare. By Integrating AI with digital infrastructures, the pharmaceutical and healthcare sectors are moving toward a more responsive, intelligent and equitable global healthcare paradigm. AI enabled predictive analytics and personalized medicines are helping doctors and pathologists deliver more-efficient diagnoses with potentially higher accuracy. AI applications enhance clinical trial processes such as patient recruitment, optimizing trail design, and real-time monitoring by analyzing vast datasets. Algorithms can efficiently and accurately identify suitable candidates. Additionally, AI can optimize predictive modeling and trial designs using advanced algorithms that accelerate the trail process, increase its precision and effectiveness, and reduce costs.

Keywords: Telemedicine, Healthcare, Global Impact, Digital Infrastructures.

LIC25-P-225

THE BENEFITS OF HERBAL COSMETICS

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ABSTRACT

The growing awareness of the importance of natural and sustainable living has led to a significant increase in the demand for herbal cosmetics. These products utilize plant-based ingredients, essential oils, and other natural components to promote skin health and beauty. This review explores the benefits of herbal cosmetics, highlighting their potential to provide effective, gentle, and eco-friendly alternatives to conventional cosmetics. Herbal cosmetics offer numerous benefits, including: Natural Ingredients: Plant-based ingredients are rich in antioxidants, vitamins, and minerals, which can help to nourish and protect the skin. Reduced Side Effects: Herbal cosmetics are generally considered safer and less likely to cause adverse reactions compared to synthetic products. Sustainable: Many herbal cosmetics are made from sustainable and eco-friendly ingredients, reducing the environmental impact of the beauty industry. Customization: Herbal cosmetics can be tailored to individual skin types and concerns, providing personalized solutions for various skin issues. Some popular herbal ingredients used in cosmetics include: Aloe Vera: Known for its soothing and moisturizing properties. Turmeric: Rich in antioxidants and anti-inflammatory compounds. Neem: Recognized for its antibacterial and antifungal properties. Rose: Known for its antioxidant and anti-aging benefits. Herbal cosmetics offer a natural and effective way to promote skin health and beauty. By harnessing the power of nature, individuals can enjoy the benefits of healthy, glowing skin while also supporting sustainable and eco-friendly practices. As the demand for herbal cosmetics continues to grow, it is essential to understand the benefits and potential of these products.

Keywords: Herbal Cosmetics, Natural Ingredients, Sustainable, Skin Health, Beauty.

LIC25-P-226

TALK INTELLIGENCE IN AI-DRIVEN HEALTHCARE SYSTEMS: REDEFINING HUMAN-MACHINE COMMUNICATION FOR PREVENTIVE HEALTH

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ABSTRACT

The concept of Talk Intelligence (TI) introduces a new dimension in artificial intelligence—one where machines don't just process data but actively communicate with human biology through time. This paper proposes that the next generation of healthcare AI must not only analyze medical data but also “talk” to human biological systems dynamically, interpreting signals from cells, hormones, and behaviors as a form of biological dialogue. Using the principles of Time Intelligence, the study explores how AI can learn the rhythm of biological events, predict disorders before symptoms arise, and initiate early intervention through intelligent feedback loops. “Talk” thus represents a bidirectional communication *model*—AI learns from the body and speaks back in preventive actions, lifestyle guidance, or micro-therapeutic adjustments. The paper concludes that Talk Intelligence can transform healthcare into a conversational ecosystem where data, diagnosis, and decisions evolve continuously, making medicine more humane, proactive, and temporally aware.

Keywords: Talk Intelligence, Time Intelligence, AI Healthcare, Preventive Medicine.

THE ROLE OF AI IN DRUG DISCOVERY, CHALLENGES, OPPORTUNITIES AND STRATEGY.

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ABSTRACT

AI (artificial intelligent) plays a crucial role in transforming drug discovery by improving the speed, efficiency, faster identification of drugs and improving decision-making through the research pipeline. AI technologies such as machine learning, deep learning, and predictive modeling help in analyzing the large biological datasets, identify new drug targets, design drug molecules, and forecast drug responses. However, AI also offers significant opportunities, such as reducing research cost, enabling personalized medicine, and improving early-stage drug screening and clinical trial success rate. To harness these advantages, strategic approaches are required including cross-disciplinary collaboration, investment in robust data infrastructure, adoption of transparent and ethical AI practices, and development of clear regulatory standards. With the right approach, ai has the potential to reshaping the future of drug discovery, providing this it's challenges are managed through thoughtful planning and innovation.

Keywords: Artificial Intelligence, Drug Discovery, Ai-Assisted Content Generation, AI-Limitations.

ARTIFICIAL INTELLIGENCE IN DIAGNOSTICS, IMAGING, AND DECISION SUPPORT SYSTEMS

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ABSTRACT

Artificial intelligence (AI)-driven approaches aim to boost the diagnosis accuracy of diverse illnesses using medical imaging. Whether AI has transformed diagnostic imaging for medical purposes is the subject of this review. AI may one day make X-ray, MRI, and CT scan interpretation more precise and time-efficient. AI improves operational efficiency by speeding up the diagnosis process and lowering healthcare expenses through increased reliability and effectiveness. AI has the ability to revolutionize diagnostic imaging by assisting with intricate processes and giving accurate imaging support. It can also connect with other technologies, such as electronic health records, to provide improved health insights. The integration of artificial intelligence is currently revolutionizing Decision Support Systems to an even greater extent. Consider of them as super-intelligent assistants that analyze vast quantities of patient data to anticipate future health issues and recommend the most appropriate course of action. The proposed models demonstrated the capacity of diagnosing mental disorders alongside an accuracy of as much as 89 percent. In order to improve the precision of the decision support system during ailments of the body, additional parameters are implemented. This review provides a comprehensive examination of the diagnosis, imaging, and decision support systems through the utilization of AI.

Keywords: Artificial intelligence, Diagnosis, Reliability, Technologies, Electronic health records, Decision support system.

CHEMOTHERAPEUTIC POTENTIAL OF POLYPHENOLIC ANTIOXIDANTS AGAINST CANCER

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ABSTRACT

Plant-derived compounds, especially antioxidants, play a critical role in neutralizing free radicals generated under pathological conditions. Persistent free radical production can trigger inflammation and may progress to severe diseases like cancer. Natural antioxidants help prevent radical formation and promote their decomposition, thereby reducing disease risk. This review aims to explore the molecular mechanisms of flavonoids such as quercetin, kaempferol, naringenin, epicatechin, and epicatechin gallate in cancer prevention and treatment. It also focuses on the pharmaceutical applications of these compounds using nanotechnology-based delivery systems and highlights combination therapies for enhanced anticancer efficacy. A comprehensive literature review was conducted, compiling evidence from studies investigating the anticancer mechanisms of flavonoids and their delivery through advanced nanocarriers, including polymeric nanoparticles, lipid-based nanoparticles, liposomes, and metallic nanocarriers. Research on combination therapies integrating flavonoids with conventional anticancer agents was also analyzed. Flavonoids demonstrated significant antioxidant, anti-inflammatory, and anticancer effects by modulating key signaling pathways, reducing oxidative stress, and inducing apoptosis in cancer cells. Nanotechnology-based formulations improved flavonoid stability, solubility, and targeted delivery, thereby enhancing therapeutic outcomes. Combination therapies exhibited synergistic effects, offering promising strategies for effective cancer management. Flavonoids, owing to their multifaceted biological activities, hold great potential in cancer therapy. Advanced delivery systems and combination approaches further enhance their efficacy, suggesting a strong foundation for developing novel anticancer therapeutics based on plant-derived antioxidants.

Keywords: flavonoids; antioxidant; anticancer; nanotechnology; combination therapy

LIC25-P-230

CRISPR AND SYNTHETIC BIOLOGY: TRANSFORMING PHYTOCHEMICAL ENGINEERING FOR NEXT-GENERATION DRUG DISCOVERY

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ABSTRACT

CRISPR and synthetic biology have revolutionized the field of phytochemical engineering by enabling precise genetic manipulation of plants and microorganisms to enhance the production of valuable secondary metabolites. Phytochemicals, such as alkaloids, flavonoids, and terpenoids, are key bioactive compounds with immense pharmaceutical importance, but their natural yields are often limited. The CRISPR–Cas system allows targeted genome editing to activate or suppress specific biosynthetic pathways, while synthetic biology integrates these edits with pathway redesign and metabolic optimization. This presentation aims to explore how these advanced biotechnological tools are being applied to boost phytochemical synthesis, improve metabolic flux, and create novel bioengineered plant systems. It also highlights case studies such as CRISPR-mediated artemisinin enhancement in *Artemisia annua* and microbial biosynthesis of plant-derived drugs. Future applications include sustainable large-scale phytochemical production, custom-designed biofactories, and precision herbal medicine, positioning CRISPR-assisted synthetic biology as a cornerstone of next-generation phytopharmaceutical innovation.

Keywords: CRISPR–Cas9; Synthetic Biology; Phytochemical Engineering; Metabolic Pathway Modification; Genome Editing.

LIC25-P-231

BIOMATERIAL-BASED IMMUNE MODULATORS: ENGINEERING PRECISION CONTROL OVER THE IMMUNE SYSTEM

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ABSTRACT

Biomaterial-based immunomodulators provide a new approach to precisely control and enhance immune system responses. Unlike traditional vaccines or immunotherapies, which have a wide-ranging effect, these systems use engineered materials, such as hydrogels, nanoparticles, and microneedle patches, to deliver immune signals in a targeted and sustained manner. By regulating the site and mode of immune activation, they can increase protective immunity against infections or tumours or reduce undesired inflammation in autoimmune diseases. This presentation will explore how biomaterials bridge the gap between material science and immunology to create programmable, safer, and more effective immune interventions. Future applications include long-lasting, single-dose vaccines, tailored treatments targeted at modifying immune function, and localised cancer immunotherapies.

Keywords: Immunomodulators, Immunotherapies, Nanoparticles.

LIC25-P-232

MORINDA CITRIFOLIA L.: ANTIOXIDANT AND THERAPEUTIC POTENTIAL

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ABSTRACT

Morinda citrifolia L., commonly known as “Noni,” is an evergreen shrub or small tree belonging to the family Rubiaceae. It is widely distributed across tropical and subtropical regions, including India, Southeast Asia, and the Pacific Islands. Traditionally, *M. citrifolia* has been used in various indigenous systems of medicine such as Ayurveda and Polynesian folk medicine for its broad therapeutic potential. The fruit, in particular, has been valued as a health restorative tonic, often consumed as juice or extract to promote general well-being and longevity. Traditionally, the fruit and other parts of the plant are used for managing liver disorders, arthritis, diabetes, digestive ailments, hypertension, and infections. *M. citrifolia* is rich in diverse phytoconstituents such as iridoids (asperuloside, deacetylasperulosidic acid), flavonoids, scopoletin, anthraquinones, terpenoids, and vitamin C, which are known to exhibit strong antioxidant, anti-inflammatory, antimicrobial, and hepatoprotective activities. These compounds help reduce oxidative stress, modulate inflammatory pathways, and protect hepatic cells from toxin-induced damage. The remarkable combination of traditional usage and modern pharmacological findings underscores the medicinal significance of *Morinda citrifolia* fruit. Its multifaceted bioactivity and safety profile highlight its potential as a natural therapeutic agent for maintaining liver health and preventing hepatocellular injury, aligning with the growing global interest in plant-based and sustainable remedies.

Keywords: *Morinda citrifolia* L., Noni, Liver Protection, Antioxidant, Anti-inflammatory, Hepatoprotective, Traditional Medicine.

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**BIOMATERIAL - PHYTO-NANOTECHNOLOGY: MERGING GREEN CHEMISTRY
WITH ADVANCED DRUG DELIVER**

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ABSTRACT

To develop effective and eco-friendly drug delivery systems, a new multidisciplinary field known as phyto-nanotechnology blends the ideas of green chemistry, nanoscience, and phytopharmaceutical research. Because phytochemicals derived from plants act as natural reducing and stabilising agents for the synthesis of metallic and polymeric nanoparticles, this method eliminates the need for dangerous chemicals. These phyto-mediated nanocarriers enhance therapeutic efficacy and reduce side effects by improving the solubility, stability, and targeted delivery of bioactive herbal compounds. The present presentation aims to highlight the fundamental procedures of green nanoparticle synthesis, their characterisation, and significant biomedical applications, particularly cancer treatment and bioavailability enhancement. It also emphasises the sustainability advantages of using renewable plant sources in nanomedicine.

Keywords: phyto-nanotechnology, phytopharmaceutical, phyto-mediated nanocarriers, nanomedicine.

THERAPEUTIC POTENTIAL OF ANDROGRAPHIS PANICULATA IN METABOLIC AND PROTECTIVE HEALTH

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ABSTRACT

Andrographis paniculata (Burm.f.) Nees, commonly known as Kalmegh, is a medicinal herb widely used in South and Southeast Asia for its therapeutic properties. The plant's aerial parts contain bioactive compounds, primarily the labdane-diterpenoid lactone andrographolide, along with flavonoids and glycosides, which contribute to a wide range of pharmacological activities. *Andrographis paniculata* demonstrates antibacterial, antiviral, hepatoprotective, cardioprotective, anti-inflammatory, antioxidant, immunomodulatory, antidiabetic, and anticancer effects. Mechanistic studies indicate that it modulates key cellular signalling pathways, including NF- κ B, MAPK/PI3K-Akt, STAT3, and Nrf2, thereby reducing inflammation, oxidative stress, apoptosis, and fibrosis. Clinical evidence highlights its effectiveness in alleviating symptoms of uncomplicated upper respiratory tract infections and shortening disease duration, with a generally favourable safety profile in short-term use. Adverse events are mostly mild, involving gastrointestinal discomfort or skin reactions, while serious events remain rare. Overall, *Andrographis paniculata* is a promising multipurpose medicinal plant with potential applications in modern therapeutics, particularly in metabolic, inflammatory, and infectious conditions.

Keywords: *Andrographis paniculata*, andrographolide, pharmacology, clinical efficacy, traditional medicine.

TRANSFORMING EDUCATION, RESEARCH, AND INDUSTRY BY IMPLEMENTING INTELLIGENT INNOVATION

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ABSTRACT

The recent advancements and increasing prominence of intelligent innovation have garnered major scrutiny in education, research, and industry. This article aims to critically assess the strategic implementation of intelligent innovation in an environment of "smart universities" in light of the swift progress in intelligent innovation as well as their prospective benefits to the higher education sector. We believe that these innovative institutions are the upcoming revolution in higher education, as they will utilize AI (Artificial intelligence) and quantum innovations to redesign academic and administrative procedures. The fundamental assumption is that universities may realize personalized learning trajectories, raised accessibility, monetary effectiveness, and an overall operational performance increase through this integration. The integration of digital tools into manufacturing activities has become essential for the promotion of innovation and the maintenance of growth in the new paradigm of Industry 4.0. Within Industry 4.0, this review investigates the pervasive influence of predictive analysis and intelligent predictive data analytics on managerial practices and economic efficiency. This study examines the transformative effects of these advanced technologies, with an emphasis on expertise, creative thinking, technology, and society.

Keywords: Intelligent innovation, Smart universities, Artificial intelligence, Technology, Economic efficiency, Research.

**EVALUATION OF TABLETING PROPERTIES OF JUSTICIA ADHATODA LEAF
POWDER**

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ABSTRACT

Justicia adhatoda (Vasaka) is a popular Ayurvedic and Unani medicine, which is a well-known bronchodilatory, antitussive, and anti-inflammatory shrub. Although the phytochemistry and pharmacology of it have been thoroughly studied, the possibility of its leaf powder in the form of a direct tablet has not been fully investigated. The proposed research was conducted to determine the tableting characteristics of *J. adhatoda* leaf powder and decide whether it should be used as an active pharmaceutical ingredient or a herbal excipient in the production of the tablet. Leaves dried using shade were sieved and characterised in terms of powder flow and compressibility by measuring bulk density of powder, tapped density of powder, Carr index, Hausner ratio, and angle of repose. Direct compression and wet granulation were used to prepare tablets, which were tested based on their weight change, hardness, friability, disintegration duration, and in vitro release of marker phytoconstituents. The powdered leaf was of moderate flowability (Carr index = 20-24% Hausner = 1.25-1.30) and good compressibility, which suggests that it could be converted into tablets with slight formulation modifications. Tablets were found to be even in weight distribution, had satisfactory mechanical strength (hardness = 6kp; friability = <1%), and disintegrated less than 15 minutes under simulated conditions and released over 80 percent of marker compounds in 45 minutes. The results justify the use of the *J. adhatoda* leaf powder in the manufacture of herbal tablets. Further development needs to be done with respect to optimisation of excipient mixtures (e.g., natural binders), scale-up parameters, and in vivo bioavailability assays to develop effective phytopharmaceutical dosage forms. The research will be used to standardise herbal pills and increase the application of a popular herbal medicine into commercially viable concentrations.

Keywords: *Justicia adhatoda*, Tablet formulation, Powder flowability.

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