GLOBAL RESEARCH INSTITUTE OF PHARMACY

INTERNATIONAL CONFERENCE

NATIONAL TECHNOLOGY DAY, 2025

THEME | **YANTRA – Yugantar for Advancing New Technology, Research & Acceleration**

Sponsored by

HARYANA STATE COUNCIL FOR SCIENCE INNOVATION & TECHNOLOGY, DST, HARYANA

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SOCIETY OF PHARMACEUTICAL EDUCATION AND RESEARCH (SPER)

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PHARMACY WEEK

Chairman's Message

CA S. K. Jindal

It is a matter of great pride that the Global Research Group of Institutions (GRGI) is organizing an International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration". The theme of the conference, carefully chosen in line with the global shift toward innovation-driven ecosystems, aimed to provide a dynamic platform for scholars, researchers, and industry professionals to discuss cutting-edge technologies, explore research collaborations, and accelerate the adoption of new ideas for societal and industrial benefit. The conference served as a vibrant confluence of minds where futuristic ideas were deliberated, and transformative strategies were shared.

In today's rapidly evolving technological landscape, the fusion of research, innovation, and accelerated application is essential for driving sustainable development and global competitiveness. This international forum will provide an enriching opportunity to deliberate on cutting-edge advancements, foster interdisciplinary collaborations, and explore futuristic solutions in the realm of science and technology.

GRGI remains deeply committed to fostering a culture of innovation and research excellence that empowers students and scholars to shape the future.

I extend my heartfelt welcome to all participants and delegates from across the globe and wish the conference grand success.

CA S. K. Jindal

Chairman

Global Research Group of Institutions,

Radaur, Yamuna Nagar, Haryana, Inda.

From the Desk of the Principal

Prof. (Dr.) Ashwani K. Dhingra

It is indeed a matter of immense pride and satisfaction to present the proceedings of the International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration", organized by the Global Research Institute of Pharmacy (GRIP), Radaur. This prestigious event marks a significant milestone in our ongoing efforts to foster innovation, promote interdisciplinary research, and encourage intellectual dialogue on emerging technological advancements. We were truly honored by the gracious presence of several eminent national and international speakers who generously accepted our invitation and shared their invaluable insights despite their demanding schedules. Their thoughtful deliberations enriched the sessions and ignited curiosity and critical thinking among the attendees. Over 500 participants from diverse institutions actively took part in the conference, making it an intellectually stimulating and memorable experience for all.

I express my heartfelt gratitude to Haryana State Council for Science Innovation & Technology (HSCSIT), Department of Science and Technology, Government of Haryana, for sponsoring this conference and believing in our vision to promote scientific advancement. I am equally thankful to the Society of Pharmaceutical Education and Research (SPER) for their continued support and collaboration in academic excellence.

I would also like to acknowledge the valuable guidance and motivation provided by our respected Chairman, Sh. S. K. Jindal Ji, whose visionary leadership and encouragement were instrumental in the success of this event. I extend my sincere thanks to the members of the managing committee, faculty members, organizing team, and student volunteers whose collective efforts brought this event to life.

Prof. (Dr.) Ashwani K. Dhingra

Director-Principal

Global Research Group of Institutions, Radaur

From the Desk of Co-ordinator

Dr. Neha Yadav

Global Research Institute of Pharmacy (GRIP), Radaur, is committed to advancing innovation, technology, and interdisciplinary research to address the challenges of the modern world. In line with this vision, the International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration" has been organized to provide a dynamic platform for researchers, academicians, industry professionals, and innovators to share their insights and discoveries across various domains of science and technology.

This international gathering aims to foster meaningful dialogue on emerging technologies, acceleration strategies for research, and innovative practices that have the potential to shape the future of global development. The conference brings together a diverse pool of intellectuals to engage in enriching discussions and explore collaborative opportunities.

I extend a warm welcome to all our distinguished delegates, presenters, and participants who have joined us from various parts of the country and abroad. Your presence and active engagement add immense value to this academic event. I also express my heartfelt gratitude to the eminent resource persons and speakers for accepting our invitation and contributing their time, expertise, and experiences to inspire and guide our attendees. I would especially like to thank the Haryana State Council for Science Innovation & Technology (HSCSIT), Department of Science and Technology, Government of Haryana, for sponsoring this conference, and the Society of Pharmaceutical Education and Research (SPER) for their generous academic support.

I also acknowledge the commendable efforts of the organizing committee, faculty members, and student volunteers whose dedication has made this international event a grand success.

Dr. Neha Yadav

Co-ordinator

From the Desk of Organizing Secretary

Dr. Smita Narwal

It is a wonderful feeling of joy, honor, and privilege to serve as a part of the organizing committee for the International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration", held at Global Research Institute of Pharmacy (GRIP), Radaur. This international event marks a significant milestone for our institution, as it brought together distinguished minds from academia, research, and industry to explore future-driven innovations and interdisciplinary advancements. The conference's theme, being one of the most progressive and relevant to current global trends, received an overwhelming response from participants across India and abroad. It is heartening to witness such enthusiastic engagement and knowledge sharing from all corners of the academic and research community.

I extend my sincere gratitude to the esteemed speakers and resource persons who enriched the conference with their expert insights on a wide range of scientific and technological topics. I am deeply thankful to our visionary President, S. Randeep Singh Jauhar, for his continuous encouragement, guidance, and support in making this international event a resounding success. A special note of appreciation goes to the Haryana State Council for Science Innovation & Technology (HSCSIT), Department of Science and Technology, Government of Haryana, for their financial sponsorship, and to the Society of Pharmaceutical Education and Research (SPER) for their valuable academic collaboration.

I also convey my heartfelt thanks to the entire team at GRIP—faculty members, staff, and student volunteers—whose collective efforts and dedication turned this conference into a memorable and impactful experience. On behalf of the organizing committee and the institution, I sincerely thank all contributors, delegates, and well-wishers for their active participation and continued support.

Dr. Smita Narwal

Organizing Secretary

PROGRAM SCHEDULE

08 August 2025

S. No.	Event	Time
1	Registration	10:00 – 10:30 AM
2	Inaugural session • Introductory speech • Lightening of the lamp • Welcome speech by the Principal sir • Speech by the Guest of honor of the day • Speech by the Chief Guest of the day • Release of souvenir/book by dignitaries on the dais	 10:30 - 10:35 AM 10:35 - 10:45 AM 10:45 - 10:50 AM 10:50 - 11:00 AM 11:00 - 11:10 AM 11:10 - 11:20 AM
3	Tea Break for the Guest	11:20 - 11:40 AM
4	First technical session	11:40 - 12:20 PM
5	Second technical session	12:20 - 1:00 PM
6	Lunch Break	1:00 - 2:00 PM
7	Poster/Oral Evaluation	2:00 - 3:30 PM
8	Third technical session	2:00 - 2:30 PM
9	Industry-Academia Panel Discussion	2:30 - 3:00 PM
10	Valedictory session • Cultural activity • Prize distribution • Conclusive conference report • Vote of thanks	 3:00 - 3:20 PM 3:20 - 3:40 PM 3:40 - 3:50 PM 3:50 - 4:00 PM

CHIEF GUEST

Prof. (Dr.) Rohit Dutt
Principal, GMN College,
Ambala Cantt., Haryana

Complex mechanisms including mutations in various proteins and pathways can cause human illnesses. With recent genomic advances, revealing the genetic basis of disease on a personalized level has become a realistic aim. In many situations, appropriate molecular targets for which approved medications already exist will be discovered, and the possible repositioning of these drugs to a new indication will be studied. Because existing medications have proven clinical and pharmacokinetic data, repositioning provides a faster method to drug discovery. The promise for the development of new treatments provided by precision medicine creates significant challenges in the development of new approaches. As a result, a vast amount of biological data has been collected in the recent years, originating from a wide range of sources, ranging from small individual research laboratories to the large worldwide organizations. Repositioning and personalized medicine both strive to increase the efficiency of the present drug discovery pipelines, which spend a lot of time and money developing novel treatments only to have them fail in the clinical trials due to ineffectiveness or side effects.

SPECIAL GUEST

Prof. (Dr.) Harish Dureja

Dean, R&D; Dean, Faculty of Pharmaceutical Sciences; Director, Aryabhatta Central Instrument Laboratory and Centre for IPR Studies,

Maharshi Dayanand University, Rohtak, Haryana, India - 124001

As the digital era accelerates, global adoption of advanced technologies is fundamentally reshaping the healthcare landscape. Healthcare systems are undergoing transformative changes due to innovative technology solutions which enable a shift towards a more data-driven and personalised model of healthcare. In this dynamic environment, the pharmaceutical sector stands out as a highly regulated industry which consistently strives to protect public health while maintaining a steadfast commitment to patient-centric innovations. Digital Therapeutics (DTx) have emerged as a groundbreaking field at the intersection of technology with medicine for offering evidence-based therapeutic interventions delivered through software and digital platforms. DTx enable patients and providers to access high-quality treatment options that complement or have the potential to replace traditional therapies at a certain level.

As countries begin to implement DTx, regulatory authorities, including national and international levels, are closely monitoring potential risks, benefits and implementation challenges. The regulatory approaches and management strategies adopted in one region have significant potential policies and practices globally, which underlie the necessity for international cooperation. The rise of DTx is prompting a re-evaluation of existing healthcare regulations and is opening doors to novel therapeutic possibilities. There is now a need to address the fundamental principles, practical application, and regulatory framework that underpin DTx, as they act as a bridge to the traditional gaps between technology and medicine. Policymakers and industry leaders must prioritise the development of harmonised forward-thinking regulatory strategies to ensure that DTx can deliver on their promise of safer, more effective and widely accessible healthcare solutions for all.

GUEST OF HONOR

Dr. Abhishek Bhudhiraja

Principal Medical Writer

Merck KGaA, Darmstadt, Germany

Dear Delegates, Scholars, and Colleagues,

It is both an honor and a privilege to serve as Guest of Honor at this distinguished International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration." I extend my heartfelt congratulations to the organizers for curating such a timely and visionary theme—one that reflects the ever-evolving confluence of technology, innovation, and societal relevance in the field of pharmaceutical sciences and healthcare. The term "Yantra" signifies the tools and technologies that propel us forward, while "Yugantar" speaks to a transformational era marked by disruption and possibility. Today, we stand at the cusp of a new age, where AI-driven drug discovery, precision medicine, digital therapeutics, and real-world evidence are reshaping how we define care, research, and scientific communication.

In my role at Merck KGaA, I have witnessed how integrated, data-informed strategies can bridge the gap between clinical research and meaningful patient outcomes. As medical writers and scientific professionals, our responsibility extends beyond data presentation—we must ensure clarity, transparency, and impact in how innovations are communicated and translated into real-world use. This conference is a crucial platform that not only brings together diverse voices from academia, industry, and policy but also encourages interdisciplinary thinking, responsible innovation, and global collaboration. I am particularly pleased to see the focus on digital literacy, translational research, and ethical frameworks that guide the implementation of emerging technologies.

To all participants—students, educators, researchers, and innovators—I encourage you to engage fully, ask bold questions, and forge new partnerships. Let us envision a future where technology is not just an enabler but a force for equitable, accessible, and sustainable healthcare. Thank you once again for the opportunity to be part of this meaningful dialogue. I look forward to the insightful discussions and collaborative spirit that will define this conference.

GUEST OF HONOR

Dr. Rahul Taneja

Scientist, Patent Information Centre

Department of Science & Technology, Haryana

Dear Participants and Fellow Innovators,

It gives me immense pleasure to extend my warm greetings to all attendees of the International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration," sponsored by the Haryana State Council for Science, Innovation & Technology (HSCSIT) under the aegis of the Department of Science and Technology, Government of Haryana. This conference comes at a pivotal time when rapid technological transformations are reshaping every sector, including healthcare, pharmaceuticals, and scientific research. The theme "Yantra: Yugantar" captures this moment perfectly—highlighting the role of tools and technology (Yantra) in ushering in a new era of innovation (Yugantar).

As a representative of the Patent Information Centre, I am particularly encouraged to see the growing emphasis on translating research into impactful innovation, backed by robust intellectual property awareness and protection. It is critical that our researchers and academic institutions not only innovate but also safeguard their ideas through patents and technology transfer mechanisms—ensuring long-term societal and commercial value. The Department of Science & Technology, Haryana, through HSCSIT, continues to support such initiatives that foster interdisciplinary collaboration, capacity building, and innovation-led growth. Conferences like this play a crucial role in connecting young researchers, academicians, industry experts, and policymakers, creating a shared platform for knowledge exchange and strategic partnerships. I urge all participants to use this opportunity to explore the frontiers of science and technology, reflect on how innovation can serve society ethically and sustainably, and contribute to the vision of a knowledge-driven and self-reliant India.

My heartfelt appreciation to the organizers for bringing this vision to life, and my best wishes to all participants for a productive and inspiring conference.

GUEST OF HONOR

Dr. Upendra Nagaich

National Secretary,

Society of Pharmaceutical Education & Research (SPER) India

Founder & CEO,

SPER Market Research Private Limited, Noida, India.

Dear Esteemed Colleagues,

It is my honor as National Secretary of the Society of Pharmaceutical Education and Research to welcome you to the Conference on Advancing New Technology, Research & Acceleration. We will delve into pioneering advancements in artificial intelligence, biopharmaceuticals, drug delivery systems, and beyond, all aimed at bridging discoveries with tangible impact.

Our agenda features thought-provoking keynotes, interactive workshops, and panel discussions led by global experts. You will have the opportunity to engage in the Innovation Showcase, participate in poster sessions, and forge collaborations that span academia, industry, and policymaking.

SPER remains committed to fostering interdisciplinary dialogue and accelerating the translation of research into real-world solutions. I encourage each of you—researchers, educators, entrepreneurs, and students—to challenge assumptions, share insights, and cultivate partnerships that drive progress in pharmaceutical science.

Thank you to our organizers, sponsors, and volunteers for making this gathering possible. May this conference inspire breakthroughs and forge connections that enrich our collective mission to advance technology for the benefit of society.

GUEST OF HONOR

Dr. Vishal Chakkarwar

President – Society RDHS

Founder & Director – Innovational Publishers

Managing Director – K & E Prime Editors Pvt. Ltd.

Director – InventaLife Research Solutions

Dear Esteemed Colleagues,

It is with great enthusiasm and commitment to scientific progress that I welcome you all to the upcoming International Conference on Advancing New Technology, Research & Acceleration. This conference offers a forward-looking platform to engage with pioneering developments in artificial intelligence, advanced drug delivery systems, biopharmaceuticals, and beyond. From thought-provoking keynotes to immersive workshops and collaborative panel discussions, our agenda is designed to inspire dialogue, spark new ideas, and foster translational research. As a professional rooted in both scientific innovation and academic empowerment, I strongly believe in the power of interdisciplinary partnerships. The Innovation Showcase and poster presentations will highlight promising work by students, scholars, and industry leaders—bringing academia, clinical practice, and policymaking into close alignment. Through my work at Innovational Publishers, InventaLife Research Solutions, K & E Prime Editors, and Society RDHS, I have witnessed firsthand the value of ethical research, quality-driven publication, and mentorship. I urge each of you—researchers, educators, professionals, and emerging innovators—to engage deeply, collaborate meaningfully, and challenge conventional thinking throughout this event.

Let this conference not only be a stage for knowledge sharing but also a catalyst for future breakthroughs in pharmaceutical sciences. Together, let us move toward a more digitally empowered, ethically grounded, and socially relevant research ecosystem. My sincere thanks to the organizing team, sponsors, and volunteers whose dedication has made this conference possible. May this gathering serve as a milestone in our shared journey to elevate science for the greater good.

GUEST OF HONOR

Dr. Shailesh Sharma

Amar Shaheed Baba Ajit Singh Jujhar Singh Memorial College of Pharmacy,

Bela, Ropar, Punjab, India

It is a profound honor to address this distinguished gathering at "Yantra: Yugantar for Advancing New Technology, Research & Acceleration." The theme itself is both insightful and inspiring. The Sanskrit word "Yantra" signifies the instruments and tools we create, while "Yugantar" represents the dawn of a new, transformative era. This powerful combination perfectly encapsulates our collective mission: to engineer the very tools that will accelerate humanity into a future of unprecedented progress.

In today's rapidly evolving world, the confluence of technology, research, and acceleration is not merely an advantage; it is an imperative. The pace of innovation dictates the trajectory of nations. For India to achieve its ambition of global leadership, we must foster an ecosystem where new technologies are not just adopted but created, where research is not just theoretical but applied, and where promising ideas are rapidly accelerated from lab to market. To the brilliant young minds, researchers, and innovators present here: you are the architects of this new age. Your curiosity is the spark, your research is the foundation, and your collaborative spirit is the force that will build this future. I urge you to pursue not just incremental advancements, but disruptive breakthroughs. Challenge established norms, embrace interdisciplinary approaches, and never shy away from the world's most complex problems.

Platforms like 'Yantra: Yugantar' are crucial crucibles where ideas are forged and collaborations are born. Let us harness the power of our modern-day Yantras- to usher in a Yugantar- marked by sustainable growth, inclusive development, and unparalleled human achievement. I wish this conclave immense success and look forward to the groundbreaking innovations it will inspire.

GUEST OF HONOR

Prof. (Dr.) Kumar Guarve,

Principal,

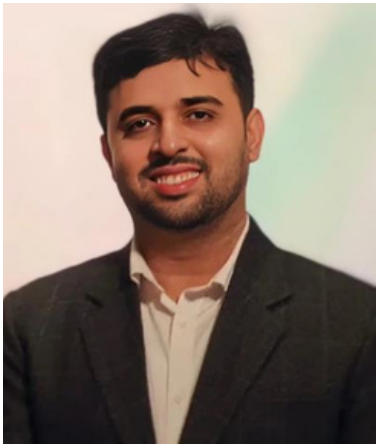
GGS College of Pharmacy,YamunaNagar,Haryana

Artificial intelligence (AI) isatechnology-basedsystemofsimulatinghumanintelligence through computers. AI utilizessystemsandsoftwareforcollectinginformation,learningfrom input, developing independentdecisionsbyusinginformation,makingpossibleoraccurate predictions, and self-correcting.Thediscoveryofnewchemicalentitiesstartswithan acquaintance of knowledgeaboutbiologicaltargetslikereceptors,enzymes,proteins,or genes. The different targetsareimplicatedintheregulationofthebiologicalprocessesin various diseases. The drugdiscoveryprocessstartswithtargetidentification,target validation, hit and lead identificationandleadoptimizationfollowedbythedevelopment phase in different clinical stages.Artificialintelligencecanproviderevolutionaryinsights into drug discovery by using theenormousdatafromgenetics,proteomicsandtargetbiology that can advance the process ofdiscoveryanddevelopment.Pharmaceuticalresearchand development make efforts to approachAItoimprovedrugdiscovery,reduceresearchand development costs, reduce the timeandcostofearlydrugdiscoveryandsupportpredicting potential risks/side effects in late trialsthatcanbeveryusefulinavoidingtraumaticeventsin clinical trials and ultimately clinicaltrials.Usually,drugdevelopmenttakesfiveyearstogo to trial, but the AI drug can reduce ittojust12months.Therapidgrowthinmachinelearning algorithms and enormous biologicalandchemicaldatahasledtoenormousgrowthinthe number of AI-based startups whicharefocusedondrugdiscoveryanddevelopmentinthe last decade.

SCIENTIFIC TALKS

S-1

Rationally Designed Dual PARP-HDAC Inhibitor Elicits Striking Anti-Leukemic Effects



Dr. Kunal Nepali

Associate Professor,
Taipei Medical University, Taiwan

Normally, PARP proteins help cancer cells repair their damaged DNA, allowing them to survive treatment. Drugs known as PARP inhibitors block this repair process, proving especially effective in cancers with BRCA mutations. However, their effectiveness is limited to a narrow range of cancers. To broaden their applicability, the research team combined PARP inhibitors with HDAC inhibitors, which can induce a state known as "BRCAness," making cancer cells behave like they have BRCA mutations. They successfully designed a dual-function molecule that inhibits both PARP and HDAC enzymes simultaneously. One of these newly developed compounds demonstrated strong anti-leukemic activity in laboratory tests on HL-60 leukemia cells.

The compound reduced the levels of PARP and HDAC proteins, increased markers indicative of HDAC inhibition, halted cell growth, and triggered autophagy—a form of programmed cell self-digestion. To ensure precise delivery, the researchers created a pH-sensitive nanoformulation—small, uniform, spherical particles capable of releasing the drug specifically in the acidic environment of cancer cells. This formulation showed targeted effects against leukemia cells. Encouraged by these promising outcomes, the team is now conducting animal studies to further evaluate the drug's performance in living systems and enhance its therapeutic potential. This dual-targeting strategy holds promise for developing more effective cancer treatments, even in types where conventional PARP inhibitors have limited efficacy.

S-2

Unlocking Chemistry's Potential: A Glimpse into Modern Tools and Techniques

Dr. DeepakSharma
AssociateProfessor,
IIT-BHU,Varanasi

Chemistry is all about understanding and changing the world around us, from the medicines we take to the materials we use every day. To do this, chemists use a fantastic array of tools and techniques, and these are constantly getting better! In this seminar, we'll take a simple tour of some of the most exciting advancements in chemistry labs today. We'll explore how new super-sensitive instruments help us see incredibly small things and identify substances quickly, even in tiny amounts. We'll also look at how robots and automation are making experiments faster, safer, and more reliable, allowing scientists to discover new chemicals and processes much quicker. Finally, we'll touch upon how computers and artificial intelligence (AI) are becoming powerful partners for chemists, helping them design new molecules and predict how reactions will behave. This seminar will show you how these amazing tools are transforming chemistry and opening up new possibilities for solving global challenges, making it an incredibly exciting field to be a part of!

RESOURCE PERSONS INSIGHTS

Reimagining Pharmaceutical Education and Research in the Era of Yantra: Driving Innovation, Integration, and Impact

Prof. (Dr.) Vinod Gautam
Principal,
SGT University, Gurugram

The theme "Yantra: Yugantar for Advancing New Technology, Research & Acceleration" reflects a profound shift in how we perceive and apply technological advancements across disciplines. In the context of pharmaceutical sciences, this theme is especially relevant, as the sector witnesses rapid digital transformation and an increasing demand for interdisciplinary integration. As Principal of SGT University, Gurugram, I have observed firsthand the evolving expectations from pharmacy professionals—not only as caregivers or researchers, but as innovators, data interpreters, and technology enablers.

The exploration of the emerging need to revamp pharmaceutical education and research methodologies by embracing modern tools such as artificial intelligence, machine learning, digital therapeutics, blockchain in supply chains, and nanotechnology in drug delivery systems. While these technologies serve as the "Yantra," the real challenge lies in using them purposefully to create a "Yugantar"—an era of inclusive, ethical, and sustainable healthcare outcomes. Collaborative ecosystems involving academia, industry, and policy stakeholders must be encouraged to bridge the gap between laboratory discoveries and real-world applications.

In conclusion, the transformation envisioned by Yantra: Yugantar is not only technological but philosophical. It calls upon educators, researchers, and institutions to rethink how we teach, innovate, and impact society—placing technology in service of humanity.

Yugantar: Powering India's Future with Innovation, Research, and Acceleration

Prof. (Dr.) Suresh Kumar

Dean,

School of Pharmacy,

Pragjyotishpur University, Chandrapur, Guwahati, Assam, India

"Yugantar", a Sanskrit word meaning epochal change-represents a transformative shift in time, vision, and innovation. In the modern context, it symbolises India's stride into a new era of scientific breakthroughs, technological advancements, and research-driven growth. Yugantar, a time of transformation where the country is reimagining its future through fresh ideas, local research, and digital progress. This change isn't just a policy on paper—it's a growing movement seen in our homes, campuses, startups, and streets. Initiatives like Make-in-India and Atmanirbhar Bharat are fuelling confidence in our ability to build what we need, right here at home—be it in technology, health, agriculture, or clean energy.

Behind the scenes, our research environment is evolving. There's stronger collaboration between universities, industries, and the government. Programs like Startup India and the PM Research Fellowship are not just supporting scholars—they're empowering young minds to solve real-life problems that affect millions. From Digital India to the launch of 5G, and from UPI to India Stack, we're seeing how digital tools can reach even the most remote corners of the country. These innovations are now being noticed around the world. Yugantar is not merely a moment in time; it is a powerful movement that symbolizes India's ascent as a knowledge-driven, tech-enabled, and self-reliant economy.

With a growing pool of researchers, innovators, and entrepreneurs, India is set to become a hub for global innovation. In this Yugantar, the future is not just awaited—it is being actively built.

From Tradition to Transformation: The Role of Technology in Shaping the Future of Pharmacy

Prof. (Dr.) Pooja Arora
Principal,
Swami Devi Dyal College of Pharmacy,
Barwala, Haryana.

Yantra: Yugantar for Advancing New Technology envisions a transformative leap toward a technologically empowered future, with a special emphasis on the convergence of science, innovation and social relevance. The term Yantra represents the mechanical and digital tools that drive human progress, while Yugantar refers to a new age of possibilities- an era marked by groundbreaking advancements and disruptive change across disciplines. This conference provides a platform for academicians, researchers, industry leaders and innovators to collaboratively address the technological challenges and opportunities that define this new era. In the domain of Pharmaceutical Sciences, this transformation is both evident and essential. The integration of technology into Pharmacy has opened new frontiers in health care, ranging from AI-assisted drug design, robotic pharmacy dispensing, machine learning in clinical trials, to blockchain in drug supply chain management and nanotechnology in drug delivery systems. The traditional Pharmacist's role is evolving – today's Pharmacy professionals are becoming innovators, data analysts and critical contributors to interdisciplinary healthcare teams. Yantra: Yugantar emphasises the need for ethical, inclusive and sustainable technological growth. It encourages academia-industry-govt collaboration to ensure that pharmaceutical innovations reach the last mile, addressing both urban advancements and rural healthcare challenges. Yantra: Yugantar also aligns itself with broader national and global goals such as the National Digital Health Mission (NDHM), Pharma Vision 2020, Ayushman Bharat and Sustainable Development Goals (SDGS). It is a clarion call to academia, Industry and policymakers to reimagine India's Pharmaceutical and Healthcare future: not in isolation, but in synergy with global tech-driven movements and indigenous knowledge systems.

Yantra: Yugantar – A Tech-Driven Transformation of Pharmacy for a Sustainable Healthcare Future

Dr. Divya Kiran
Principal,
Faculty of Pharmacy,
RPIIT Technical and Medical Campus,
Karnal, Haryana.

Pharmacy today is no longer confined to formulations and dispensing. It is evolving rapidly and radicaly with fields like drug discovery, biotechnology, AI-driven diagnostics, nanomedicine, and clinical research.

To truly contribute in this dynamic landscape, we need more than theoretical knowledge. What we need is a spirit of innovation, a culture of collaboration, and the drive for acceleration.

Just imagine—students here working on AI tools to predict drug interactions. Researchers developing personalised medicine based on a person's genome. Imagine a future where India's pharmaceutical sector doesn't just serve the world—it leads it through homegrown, world-class innovations.

This is what YANTRA stands for. Not just a name, but a movement, a mission that calls on each one of us to think bigger, research deeper, and apply smarter.

Let's embrace this vision together. Let us turn our labs into launchpads of innovation, and our curiosity into contributions for a healthier, stronger, and technologically empowered India.

Advancing Pharmaceutical Sciences in the Era of Technological Disruption: The Vision of Yantra: Yugantar

Dr. Saurabh Maan
Principal
Shri Ram College of Pharmacy
Indri Road, Ramba – Karnal, Haryana.

It is with great anticipation and enthusiasm that I look forward to participating as a Resource Person in the upcoming One-Day International Conference organized by the Global Research Institute of Pharmacy, themed "Yantra: Yugantar for Advancing New Technology, Research & Acceleration." The theme "Yantra: Yugantar" symbolizes a powerful transition — where technological innovation (Yantra) meets a new age of transformative progress (Yugantar). This convergence of ideas is both timely and essential, especially in the evolving landscape of pharmaceutical sciences and healthcare.

This conference promises to be an excellent platform to engage with distinguished scholars, researchers, and professionals from diverse backgrounds, all united by a shared commitment to exploring how emerging technologies are reshaping our field. As we delve into topics such as AI-assisted drug design, digital health platforms, blockchain in supply chains, and nanotechnology-driven drug delivery, the emphasis will remain firmly on ethical innovation, inclusivity, and societal impact.

I am particularly excited about the opportunity to contribute to discussions that highlight the growing need for interdisciplinary collaboration, data-driven research practices, and the development of digital competencies among future pharmacy professionals. The event aims not only to bridge the gap between academia and industry but also to align with broader national and global missions such as Pharma Vision 2020, NDHM, and the Sustainable Development Goals (SDGs). I look forward to meaningful dialogue, mutual learning, and collective inspiration as we work together to envision and shape a technology-empowered future for pharmaceutical research and healthcare delivery.

Synergizing Innovation and Social Relevance in Pharmacy through Yantra: Yugantar

Dr. Rajiv Sharma
Professor and Principal
University Institute of Pharmaceutical Sciences,
Chandigarh University

It is a matter of immense pride and privilege to convey my heartfelt congratulations to the organizing committee of the International Conference – YANTRA 2025: Yugantar for Advancing New Technology, Research & Acceleration, being held at the Global Research Institute of Pharmacy. The conference, organized in celebration of National Technology Day, is a commendable initiative that aligns seamlessly with the vision of empowering academia, industry, and research institutions through collaborative exchange. The theme of the conference reflects an ambitious and futuristic approach to interdisciplinary advancement, combining technological innovation with traditional knowledge systems—embodied aptly in the term YANTRA.

This prestigious event, promises to be a dynamic platform for researchers, scholars, technocrats, and policy thinkers. By providing avenues for technical sessions, poster/model presentations, panel discussions, and innovative model competitions, it inspires scientific inquiry and nurtures the spirit of innovation among students and professionals alike. I am confident that the deliberations during YANTRA 2025 will contribute meaningfully to the academic and scientific community, fostering industry-academia partnerships and opening new vistas for translational research and entrepreneurship. The souvenir will serve as a timeless repository capturing the intellectual and creative essence of this milestone event.

I extend my best wishes to the organizers, participants, and all stakeholders for the grand success of YANTRA 2025, and look forward to witnessing its continued evolution as a hallmark of academic excellence and innovation.

Technology for Pharmaceutical Innovation: Bridging Science, Society and Policy

Prof. Dr Lovkesh Bhatia

Principal

Bharat Institute of Pharmacy, Kurukshetra, Haryana

The rapid evolution of science and technology has ushered in a new era of transformative advancements across disciplines. In alignment with the theme YANTRA: Yugantar for Advancing New Technology, Research & Acceleration, this international conference, organized by the Global Research Group of Institutions on National Technology Day 2025, serves as a dynamic platform for sharing ideas, innovations, and interdisciplinary collaboration. The focus on "Yugantar" symbolizes a pivotal shift — a renaissance in how technology accelerates research, development, and its practical implementation across sectors, including artificial intelligence, pharmaceutical sciences, robotics, and beyond.

Technological acceleration has become the backbone of modern research ecosystems. The conference aims to foster dialogue among scholars, researchers, academicians, and industry professionals, encouraging collaborative problem-solving and innovative solutions to emerging global challenges. Topics such as AI integration in healthcare, smart automation, sustainable research methodologies, and digital transformation will be addressed to underline the importance of cross-disciplinary synergy.

I am honored to be invited as a Resource Person at this prestigious event and to contribute to the vibrant discourse. I extend my sincere gratitude to the Global Research Institute of Pharmacy for organizing this impactful initiative and offering a platform that bridges the gap between research and real-world application. A special note of thanks to Dr. Ashwani for his kind invitation and thoughtful coordination. I look forward to meaningful interactions, knowledge exchange, and contributing to the advancement of science and technology through this important gathering.

Bridging Tradition and Technology: Transforming Herbal Medicine Through Digital Innovation and Sustainable Practices

Dr. Sameer Sapra

Managing Director, Physic Herbals Rampura, Haryana

It is a privilege to join you as a Resource Person at this visionary International Conference on “Yantra: Yugantar for Advancing New Technology, Research & Acceleration.” I sincerely thank the organizers for curating a platform that bridges scientific exploration, technological innovation, and social impact in such a meaningful way. The term “Yantra” represents the tools—both mechanical and digital—that are revolutionizing healthcare and pharmaceutical sciences, while “Yugantar” signifies the onset of a transformative era. In this new age, traditional boundaries between disciplines are dissolving, creating opportunities for integrative, sustainable, and tech-enabled solutions.

At Physic Herbals, our mission is deeply rooted in combining indigenous knowledge systems with cutting-edge technology. The integration of automation, AI-based quality control, phytochemical fingerprinting, and blockchain-enabled traceability into our herbal medicine production not only ensures efficacy but also enhances transparency and consumer trust. This aligns perfectly with the conference's focus on ethically grounded and socially relevant innovation. As we look to the future, the convergence of Ayurveda, herbal pharmacology, and digital tools presents immense potential. From developing personalized herbal formulations using data analytics to promoting sustainable cultivation through IoT-driven agricultural practices, the herbal sector stands at the frontier of transformation.

I encourage all participants to engage with an open mind, challenge conventional approaches, and embrace the collaborative spirit that defines this Yugantar in pharmaceutical innovation.

Together, let us chart a path where technology enhances tradition, and innovation remains accessible, ethical, and inclusive.

Accelerating Medical Innovation: Integrating Technology, Research, and Ethical Practice in Modern Healthcare

Prof. (Dr.) Munish Goyal

Principal, Aakash Institute of Medical Sciences, Nalagarh.

In the evolving landscape of global healthcare, the convergence of advanced technology and evidence-based medical practice is no longer a future aspiration but a present necessity. The theme "Yantra: Yugantar for Advancing New Technology, Research & Acceleration" resonates deeply with this shift, representing a call to action for the medical and scientific community to embrace disruptive innovation while maintaining the integrity of patient-centric care. As Principal of Aakash Institute of Medical Sciences, I have witnessed firsthand how the integration of AI-driven diagnostics, electronic health records, wearable monitoring systems, and telemedicine is transforming healthcare delivery, particularly in underserved and rural areas. These “Yantras” are not just tools—they are enablers of a Yugantar, an era marked by real-time data, predictive analytics, and personalized medicine.

However, this technological leap demands more than adoption—it calls for critical reflection on ethical responsibility, accessibility, data privacy, and clinical validation. True progress lies not only in innovation but also in ensuring that these advancements are equitable, transparent, and sustainable. This abstract explores key strategies for strengthening interdisciplinary research ecosystems, fostering academia-industry-government collaboration, and equipping the next generation of healthcare professionals with digital competencies. It also highlights the importance of translational research frameworks that move innovations from lab to clinic with speed, safety, and societal relevance.

As a resource person in this important forum, I advocate for a healthcare vision that is tech-empowered yet human-centered, where innovations align with public health goals and uphold the sacred trust between caregivers and patients. Together, let us harness the power of Yantra to shape a Yugantar that is not only technologically advanced but also inclusive, ethical, and future-ready.

Catalyzing Innovation, IPR Awareness, and Technological Advancement through Interdisciplinary Collaboration

Prof. (Dr.) Akash Jain

The International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration", sponsored by the Haryana State Council for Science, Innovation & Technology (DST, Govt. of Haryana) and supported by the SPER, proved to be a dynamic and enriching platform for innovation, learning, and collaboration. Participants gained comprehensive insights into the crucial domain of Intellectual Property Rights (IPR), with a particular focus on patenting procedures, empowering them to protect and commercialize their innovative ideas. Sessions offered practical guidance on safeguarding intellectual contributions, thereby fostering a culture of innovation and legal awareness among emerging scientists and researchers.

The event also emphasized career development, offering exposure to cutting-edge research tools and technologies. Through interactions with experts, policymakers, and professionals from diverse sectors, attendees explored a wide spectrum of opportunities for collaboration, mentorship, and professional growth. A key highlight was the showcase of emerging technologies and groundbreaking projects, which served as a wellspring of inspiration. These demonstrations not only stimulated creative thinking but also highlighted the real-world applications of futuristic innovations.

The conference's recognition of outstanding contributions through awards further motivated participants to continue striving for excellence in their respective fields. Additionally, for students and young professionals, the event played a pivotal role in sparking interest in STEM, reinforcing the relevance of research and technology in shaping a better future. In essence, the conference fostered an ecosystem of knowledge sharing, innovation, and visionary thinking—equipping participants with both the tools and inspiration to drive technological advancement in India and beyond.

Yugantar for Advancing New Technology, Research and Acceleration

Prof. (Dr.) Rashmi Manchanda

Principal RKSD College of Pharmacy,

Kaithal, Haryana

"Yugantar for Advancing New Technology, Research and Acceleration" is both timely and relevant in the context of the evolving healthcare and pharmaceutical landscape. As scientific disciplines become more interconnected, it is essential to rethink how research, education and technology can be aligned to address current and future challenges. In the field of pharmacy, we are witnessing rapid transformation through developments such as computational drug discovery, personalized medicine and digital therapeutics. Such advancements are possible when innovation is encouraged not only at the laboratory level but also through active engagement between academic institutions, research bodies and industry professionals.

The idea of Yugantar, meaning the beginning of a new era, reminds us that meaningful change often requires fresh thinking, collaboration and the ability to move beyond traditional boundaries. Acceleration in research is not only about speed but also about relevance, adaptability and real-world application.

As educators and professionals, our responsibility goes beyond delivering established knowledge. We must prepare students to think critically, understand emerging technologies and contribute effectively to the healthcare ecosystem. This theme underlines the importance of forward-thinking strategies in curriculum design, research orientation and institutional collaboration.

Such academic platforms provide valuable opportunities to reflect, exchange ideas and build a shared vision where science and innovation work together to improve human health and societal well-being.

Pharmatech: Harnessing Technology for Better Health Outcomes

Prof. (Dr.) Arun Mittal
Principal
Hindu College of Pharmacy, Sonipat, Haryana

In an era of rapid technological advancement, the pharmaceutical sector is undergoing a significant transformation through the emergence of Pharmatech. The convergence of pharmaceutical sciences and cutting-edge technology—termed Pharmatech—is revolutionizing healthcare delivery, drug development, and patient outcomes. By enabling real-time monitoring, personalized therapy, and enhanced drug safety, technology is not just optimizing pharmaceutical workflows but also improving therapeutic efficacy and patient adherence. Furthermore, advances such as 3D printing of medicines, nanotechnology-based drug delivery, and blockchain for drug traceability exemplify the potential of Pharmatech to overcome longstanding challenges in healthcare. Pharmatech enables rapid screening of drug candidates, predictive modeling of disease progression, and personalized therapeutic approaches tailored to individual patient profiles. Technologies like mobile health (mHealth) platforms and Internet of Medical Things (IoMT) are bridging healthcare gaps, especially in remote and underserved areas, by offering real-time monitoring and timely interventions.

Pharmatech: Harnessing Technology for Better Health Outcomes

Prof. (Dr.) Parminder Nain
Dean & Professor
School of Pharmaceutical Sciences,
RIMT University

It is an honor and a privilege to be invited as a Resource Person for this prestigious International Conference on "Yantra: Yugantar for Advancing New Technology, Research & Acceleration." The theme powerfully captures the spirit of the 21st-century scientific and technological revolution, where 'Yantra' symbolizes not only machines or devices but also the driving force of innovation that transforms society.

Today, as we navigate a world defined by rapid technological advancements, interdisciplinary collaboration, and data-driven innovation, it becomes imperative to integrate traditional wisdom with futuristic approaches. In the realm of pharmaceutical sciences, for instance, emerging technologies such as nanomedicine, artificial intelligence, and personalized drug delivery systems are revolutionizing healthcare outcomes. At the same time, innovation in biotechnology, green chemistry, and sustainable formulations align well with the global call for responsible research and development.

This conference is a timely platform to share ideas, explore breakthroughs, and foster a spirit of collaboration among academicians, researchers, and industry professionals. It is through such intellectual forums that we can collectively shape a technologically empowered, research-driven future.

I extend my heartfelt congratulations to the organizers for curating this meaningful theme and bringing together thought leaders and innovators under one roof. I look forward to engaging in fruitful discussions and contributing towards the advancement of knowledge and innovation.

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ORAL
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O-1

Green Synthetic Approaches for the Synthesis of Quinoxaline Derivatives

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Abstract

Quinoxaline, a class of N-heterocyclic compounds and a fused heterocyclic moiety, composed of benzene and pyrazine rings and also referred to as benzopyrazine, diazanaphthalene or 1,4-benzodiazine. It contains two nitrogen atoms at the 1st and 4th positions. It possesses a wide range of biological actions, including antifungal, antibacterial, antiviral, antimicrobial, anticancer, antioxidant, antitubercular, antihistaminic, anti-inflammatory, anticonvulsant, and anti-influenza properties. Traditional methods for synthesizing quinoxaline derivatives often involve harsh reaction conditions, toxic reagents, and the generation of hazardous waste, which raise environmental and safety concerns. The adoption of green chemistry principles offers a sustainable and eco-friendly approach to synthesizing these valuable medicinal compounds. This title highlights recent advancements in green methodologies, including the use of renewable catalysts, solvent-free systems, microwave-assisted reactions, and water-based protocols, for the synthesis of quinoxaline derivatives. These methods not only reduce environmental impact but also enhance reaction efficiency, selectivity, and yield. Special attention is given to the role of recyclable catalysts and biocatalysts, as well as alternative energy sources, in minimizing the carbon footprint of synthetic processes. The integration of green chemistry principles in the design of quinoxaline synthesis represents a significant step toward sustainable development in organic synthesis, offering a promising avenue for future research and industrial application.

Keywords: *Quinoxaline, Green Chemistry, Catalyst, Solvent-free condition, Ionic liquids.*

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O-2

Artificial Intelligence in Improving Laboratory Workflows

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Abstract

Artificial Intelligence (AI) is transforming pharmaceutical technology by enhancing laboratory workflows, data analysis, and quality assurance processes, particularly when integrated with Laboratory Information Management Systems (LIMS). AI can forecast out-of-specification (OOS) results, better allocate resources, and streamline analyst and instrument assignment by examining historical data and using machine learning. Tools such as neural networks and unsupervised models (e.g., Isolation Forests) are increasingly used for anomaly detection in audit trails, thereby strengthening data integrity and compliance with regulations like 21 CFR Part 11. AI also supports predictive maintenance of lab instruments, automatic validation of LIMS entries, and trend analysis to trigger CAPA (Corrective and Preventive Action) processes proactively. Additionally, generative AI, such as ChatGPT, is being investigated to automate SOP drafting, generate batch records, and enable natural language query interfaces within LIMS. These integrations comply with GAMP5, USP <1058>, and the FDA's evolving regulations concerning digital systems and AI validation. Research and industry reviews from sources such as Clinical Chemistry, ScienceDirect, LabVantage, Clarkston Consulting, Thermo Fisher, and PinnaQL endorse these applications, confirming AI's potential to make pharmaceutical labs more efficient, compliant, and intelligent.

Keywords: *Artificial intelligence, Laboratory workflows, Laboratory information management system.*

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O-3

Breast Cancer Therapy Reinvented: Harnessing the Power of Drug Repurposing

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Abstract

Notwithstanding substantial investments in prevention and treatment, breast cancer continues to be a predominant cause of cancer-related mortality among women worldwide. The available therapeutic options have serious negative effects and are quite expensive. The current dearth of knowledge on the key routes behind resistance is reflected in the inability to treat female breast cancer patients effectively and to dramatically improve patient outcomes. In order to find medications that have not yet been considered as possible treatments for metastatic disease, it is imperative that further research be done on novel therapeutic approaches. Drug repurposing has become a cutting-edge method of drug development. It is similar to utilizing outdated weaponry for new purposes when clinically authorized, off-patent non-cancer medications with established targets are repositioned into newer indications. In addition to accelerating the drug development process, the repositioning method produces safer, more affordable, and more effective medications with fewer or less well-known side effects. Alkylating agents, anthracyclins, CDK4/6 inhibitors, aromatase inhibitors, and mitotic inhibitors are among the medications that have been repositioned for the treatment of breast cancer in the past ten years. The majority of aggressive triple-negative breast cancers have been successfully treated with the repositioning medications. According to the literature review, serendipity is crucial to the creation of new drugs. Present research provides a thorough summary of the state of drug repurposing for the treatment of breast cancer. The approaches are discussed together with several repurposed drugs.

Keywords: *Breast cancer, Drug resistance, Drug repurposing, Therapeutic integration, Cytotoxicity.*

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O-4

3D Printing of Personalized Medicines: Revolutionizing Drug Delivery

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Abstract

3D printing, also known as additive manufacturing, is emerging as a transformative technology in the pharmaceutical sector, enabling the production of personalized medicines tailored to individual patient needs. By precisely controlling dosage, shape, release profiles, and combination therapies, 3D printing allows the creation of complex drug delivery systems that were previously impossible with conventional manufacturing methods. This oral presentation explores the transformative potential of 3D printing in revolutionizing drug delivery and personalized medicine. It will delve into the introduction of 3D printing technology in pharmaceutical applications, outlining the aim and objectives of utilizing this technology to create customized medications. The oral presentation will address the challenges associated with 3D printing of pharmaceuticals; while highlighting the advantages it offers over traditional manufacturing methods. Furthermore, it will explore the diverse applications of 3D-printed medications, discuss regulatory considerations surrounding their production and distribution, and analyze the potential impact on patient care. Finally, the presentation will conclude with a discussion of prospects and the overall conclusion regarding the role of 3D printing in shaping the future of personalized medicine.

Keywords: *3D printing, Technology, Drug delivery, Challenges, Medicine*.

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O-5

Novel Drug Delivery System for the Treatment of Osteoarthritis

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Abstract

Osteoarthritis (OA) is a chronic, degenerative joint disorder characterized by cartilage breakdown, inflammation, and persistent pain, significantly impacting patient mobility and quality of life. Traditional treatment options, such as oral NSAIDs and corticosteroids, provide symptomatic relief but are often associated with systemic side effects and limited bioavailability. In recent years, various novel drug delivery systems have been explored to improve therapeutic efficacy, target specificity, and patient compliance in OA management. These include liposomes, Ethosomes, niosomes, solid lipid nanoparticles (SLNs), nanostructured lipid carriers (NLCs), micelles, hydrogels, and in situ gels. Each system offers unique advantages such as enhanced skin penetration, sustained drug release, improved solubility of poorly water-soluble drugs, and targeted delivery to inflamed tissues. For instance, Ethosomes and liposomes facilitate deep dermal delivery of anti-inflammatory agents, while SLNs and NLCs offer stable carriers for both hydrophilic and lipophilic drugs with prolonged residence time. Polymeric micelles and hydrogels enhance local drug retention and allow for controlled release. Intra-articular formulations like injectable hydrogels and thermosensitive in situ gels are also being developed for localized and sustained therapy. These NDDS not only improve the therapeutic index but also minimize gastrointestinal and cardiovascular side effects. NDDS present a promising advancement in the non-invasive and targeted treatment of osteoarthritis, aiming to improve therapeutic outcomes and reduce systemic toxicity.

Keywords: *Osteoarthritis, Bioavailability, Intra-articular, Ethosomes, Hydrogel, Liposomes.*

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O-6

Artificial Intelligence in Analytical Quality by Design (AQbD): Transforming Pharmaceutical Analysis

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Abstract

Pharmaceutical research and development are changing as a result of the combination of Analytical Quality by Design (AQbD) and Artificial Intelligence (AI), which improves accuracy, productivity, and data-driven decision-making. In order to ensure reliable and legally compatible analytical methods, AQbD focuses on methodical method development with risk assessment and design space. Predictive modeling, multivariate data analysis, and real-time optimization of analytical parameters are made possible by the advent of artificial intelligence (AI) through machine learning, neural networks, and pattern recognition. Artificial intelligence (AI) techniques may greatly reduce experimental burden and development time by analyzing complicated experimental data, identifying important procedure factors, and simulating results. Additionally, AI supports adaptive control and continuous monitoring in the lifecycle management of analytical methods, which is consistent with the core principles of regulations and quality risk management (QRM). The pharmaceutical industry might move to intelligent analytical systems that facilitate continuous production and real-time release testing (RTRT) by implementing AI in AQbD. AI in AQbD is therefore a game-changing method that will ensure constant product quality, satisfy global regulatory requirements, and encourage development in pharmaceutical analysis.

Keywords: *Artificial Intelligence (AI), Analytical quality by design (AQbD), Analytical method development.*

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O-7

Targeting Rheumatoid Arthritis with Quercetin: A Flavonoid-Based Strategy

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune disease that causes persistent inflammation in the joints, leading to joint destruction and a loss of function. While standard treatments like disease-modifying antirheumatic drugs (DMARDs) are effective, they often come with side effects, inconsistent results, and challenges with patient adherence. This has sparked interest in natural compounds with anti-inflammatory and immunomodulatory properties as potential complementary or alternative treatments. Quercetin, a flavonoid found in many fruits and vegetables, is a promising candidate due to its strong antioxidant and anti-inflammatory effects. Research suggests that quercetin can reduce inflammation by blocking the activation of nuclear factor kappa B (NF-κB) and lowering the levels of pro-inflammatory cytokines like TNF-α, IL-1β, and IL-6. The therapeutic promise of quercetin in RA management is substantial, whether as a complementary or stand-alone modality—its clinical translation necessitates further validation through large-scale, randomized controlled trials, which reflect quercetin's broader paradigm shift toward integrative approaches in autoimmune disease management, aiming to enhance efficacy while minimizing toxicity. The present study aims to comprehensively evaluate the therapeutic effectiveness and mechanistic underpinnings of quercetin in the context of rheumatoid arthritis, with an emphasis on its immunomodulatory, anti-inflammatory, and antioxidative effects.

Keywords: *Rheumatoid arthritis, Quercetin, Flavonoid, Bioavailability, Clinical trials.*

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O-8

Application of Software (AGREE) in Pharmaceuticals

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Abstract

Green Analytical Chemistry (GAC), a field of chemistry that considers the factors that may adversely affect the environment, health and safety of humans during various processes involving the use of chemicals. It mainly focuses on making analytical procedures more environmentally friendly and safe for humans. GAC is based on its principles where application of direct analytical technique with minimal sample size and minimal number of samples are utilized with view to perform *In Situ* measurements, use of reagents and energy is minimized, adapting automated and miniaturized methods with an approach to avoid derivatization agents, prevention of large volume of analytical waste, where multianalytes are detected at a time by minimizing energy consumption, utilization of reagents from renewable source and elimination of toxic reagents which leads to increased safety operators safety. Thus, to evaluate the greenness of analytical methods, these principles are considered and with time, various metric tools, namely EMI, Analytical Eco-scale, MCDA, and GAPI, are developed. These developed metrics do not fully comply with the principles of GAC. Analytical GREEnnes, a metric tool based on principles of GAC, specifically evaluates the steps in sampling, mode of analysis, minimal use of sample, toxic reagents, minimized use of energy, and other parameters based on principles of GAC. This software plots a 12-compartmental radial diagram which represents numeric values obtained in results between 0-1 on the basis of principles of GAC, and the mean of these values is considered as the final result. A case study was carried out on two methods.

Keywords: *Green analytical chemistry, Green principles, Analytical method, Analytical GREEnness, AGREE, Case study.*

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O-9

Beyond Conventional Approaches: The Role of Co-crystals in Optimizing Drug Solubility and Dissolution

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Abstract

Cocrystals, which are primarily crystals made up of two or more distinct neutral molecules at a specific stoichiometric ratio and bound together by noncovalent bond interactions (such as hydrogen bonding or van der Waals interactions), typically contain at least one API component and a pharmaceutical ingredient. Drugs taken orally have different solubilities in gastrointestinal fluids at various pH levels because the pH of the gastrointestinal tract varies by region. This often leads to nonlinear and variable absorption and makes it challenging to evaluate the safety and effectiveness of medications. As a result of the limited solubility of medications, developing oral dosage forms is a significant challenge. To improve a drug's solubility, bioavailability, permeability, and stability, the cocrystal approach is widely used. In this review, the co-crystal of Drugs is highlighted and has several drawbacks. Its limited water solubility and substantial hepatic breakdown by first-pass metabolism, however, result in poor oral bioavailability (12%). As a result, the cocrystal approach is used to increase the solubility of Drugs. In this, we analysed that the co-crystallisation method is a chemical modification that enhances solubility by reducing the interfacial tension, and the mechanism of co-solvency promotes the dissolution of a non-polar solute. Here, co-crystals are formed by the solvent evaporation method, which is found to be the best compared to others. Hence, the resulting co-crystal form of Drugs was found to have greater solubility & dissolution profile as compared to the pure form of Drugs. Cocrystals are expected to become increasingly common in pharmaceutical development as their advantages are further established and standard manufacturing processes are validated.

Keywords: *Cocrystal, Solubility, Bioavailability, Biopharmaceutical classification system, Co-crystallisation*

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O-10

Al-Based Ethnobotanical Database Mining for Novel Drug Leads from Traditional Medicinal Plants

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Abstract

The intersection of artificial intelligence and ethnobotany will provide a transformative context for drug discovery. In the past, new drugs were discovered based on the use of traditional medicinal plants, but this process took time, was expensive, and was often the result of serendipity. Now, however, we can leverage artificial intelligence to enhance the high-throughput work by extracting traditional knowledge from databases of traditional use. Through techniques such as machine learning and natural language processing, we can evaluate vast quantities of data, including scientific papers, ethnobotanical literature, and historical records, to enhance the search for bioactive compounds. In addition to increasing the chance of finding a drug, artificial intelligence provides a method for making predictions on the type of bioactivity a compound may exhibit, allowing us to focus our lab work on the compounds that are the most likely candidates. AI techniques can also assist in the quantitative screening (assessing bioactivity using cellular assays to assess the relative activity, versus potentially toxic side effects) while still in the discovery phase of research, which may save time and resources to take a molecule forward into development. At the same time, there are still challenges, including high-quality data, and the ethical imperative to safeguard the interests of indigenous peoples who have preserved, protected and used traditional knowledge to allow us to carry out this research. However, the combination of this ancient knowledge embedded within indigenous peoples and contemporary technology and innovations thinking will enable us to accelerate the speed of discovering life-saving medicines from nature.

Keyword: *Artificial intelligence, Ethnobotany, Drug discovery, Data mining, Novel drug leads, Herbal medicine.*

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O-11

Polypharmacy and Drug–Microbiome Interactions: A Hidden Layer of Complexity

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Abstract

Concurrent use of five or more drugs is known as polypharmacy, and it is on the rise as the population ages. Polypharmacy has emerged a major cause for worry because of its links to a number of detrimental health outcomes, hospitalisation, and death. Studies have found complex and bidirectional interaction between polypharmacy and gut microbes. Gut microbiome is an intricate ecology that has the ability to govern interactions between the host and their environment. Drugs may affect the makeup of the gut microbiome, vice-versa the gut microbiome can also impact an individual's reaction to a medication, affecting the pharmacokinetic and pharmacodynamic properties. The gut microbiome acts as a critical mediator of polypharmacy outcomes and if often underrecognized. It may also have an indirect effect on how well a person responds to immunotherapy. In this study we discuss the bilateral interplay between drug regimens and intestinal microbiota, emphasised on how common drugs like antibiotics, proton pump inhibitors, NSAIDs, antipsychotics, statins, and metformin can change the makeup of microbes, the way they break down food, and the way they adapt to new environments. We have also discussed microbiome mediated biotransformation of drugs and strategies to lower the hazards of polypharmacy. The study advocates for the use of microbiome science in drug development and pharmacological decision-making. Integrating clinical and transitional perspective as well as interdisciplinary collaboration is necessary to improve their safety and effectiveness.

Keywords: *Polypharmacy, Gut-microbiome, Drug-microbiome interactions, Pharmacomicrobiomics, Microbial drug metabolism*.

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O-12

Artificial Intelligence in Drug Discovery and Development in the Pharmaceutical Field

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Abstract

The pharmaceutical industry is undergoing a rapid transformation due to the use of artificial intelligence (AI) into drug discovery and development, which is providing previously impossible efficiency and capabilities. Recent developments in natural language processing, deep learning, and machine learning have made it possible for AI systems to evaluate complex biological data, forecast molecular activity, and find possible therapeutic candidates with previously unheard-of speed and precision. For target identification, virtual screening, de novo drug design, and clinical trial design optimization, pharmaceutical companies are using AI more and more. Companies like In-silico Medicine and Benevolent AI are setting the standard for AI-driven drug development pipelines, while platforms like DeepMind's AlphaFold have transformed the prediction of protein structures. Additionally, as seen during the COVID-19 pandemic, when quick computer analysis assisted in identifying potential treatments, AI has demonstrated promise in repurposing already-approved medications. In order to achieve truly personalized medicine, the profession is ready to adopt multimodal AI systems that can combine proteomic, genomic, and real-world clinical data. For implementation to be safe and successful, structures for collaboration between industry, academia, and regulators will be essential. AI is anticipated to be crucial in changing the economics and accessibility of pharmaceutical innovation as well as speeding up drug discovery as computing power and algorithmic sophistication continue to advance. This paradigm shift emphasizes the necessity of clear validation procedures and strong ethical standards in order to effectively utilize AI's promise to improve healthcare worldwide.

Keywords: *Artificial Intelligence, Drug Discovery, Deep Learning, Drug Development.*

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O-13

Plant Based Carbon Dots as Emerging Nanomaterials for Anti-Cancer Activity

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Abstract

Plant-based carbon dots (C-dots), manufactured using green and sustainable technologies, have emerged as novel nanomaterials with promising anticancer properties. These biocompatible and eco-friendly nanostructures are made from natural sources such as fruit peels, plant leaves, roots, and another biomass. They have good fluorescence qualities, customizable surface chemistry, and minimal intrinsic toxicity. Their distinct physicochemical properties enable multifunctional applications in drug administration, bioimaging, and phototherapy. Unlike traditional chemotherapeutic drugs, green-synthesized C-dots have improved aqueous solubility, stability, and cellular uptake, increasing therapeutic outcomes against a variety of malignancies, including difficult-to-treat forms such as glioblastoma and triple-negative breast cancer. Furthermore, their potential to operate as photosensitizers in photodynamic and photothermal therapy, along with real-time imaging capabilities, makes them intriguing cancer diagnostic and treatment tools. According to recent in vitro and in vivo research, they selectively kill cancer cells while leaving healthy cells unharmed. However, prior to clinical translation, issues such extensive toxicological evaluation, batch-to-batch reproducibility, scalability, and standardization of synthesis techniques need to be resolved. To fully realize their promise in oncology, this study highlights the function of plant-based carbon dots as next-generation anticancer medicines and calls for more interdisciplinary research.

Keywords: *Plant-based carbon dots, Anticancer nanomaterials, Green nanotechnology, Photodynamic therapy, Bioimaging.*

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O-14

Phytomarker Identification from Ayurvedic Formulations Using AI-Based Pattern Recognition

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Abstract

Standardization of Ayurvedic formulations is a complex task due to the presence of multiple plant-derived components, which vary across batches and sources. Current analytical methods mainly focus on detecting known phytomarkers, which limits the discovery of novel, consistent markers. In this study, we present a new AI-based approach that uses unsupervised machine learning to identify key phytomarkers from Ayurvedic polyherbal formulations. Using fingerprinting techniques like LC-MS and HPTLC, we collected multivariate data from multiple formulation batches. This data was processed using techniques like Principal Component Analysis (PCA), clustering, and t-SNE to reveal patterns and groupings that may indicate the presence of potential marker compounds. Statistically consistent peaks were then selected for further analysis and identification using MS/MS or known standards. This approach helps in discovering new, reliable phytomarkers, improving the quality and reproducibility of herbal medicines. By integrating artificial intelligence with modern analytical techniques, this work supports faster, more accurate standardization of traditional formulations. It aligns with the YANTRA mission to combine cutting-edge technology with pharmaceutical research and opens new possibilities for intelligent quality control in herbal drug development.

Keywords: *Ayurvedic formulations, Standardization, Phytomarkers, AI, Fingerprinting techniques, PCA, Clustering, Pattern recognition.*

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O-15

Bridging People, Plants, and Wildlife Through Technology

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Abstract

In today's rapidly evolving digital age, the need to reconnect with nature has never been more urgent — yet, it is technology itself that's now becoming a surprising ally in this mission. My presentation, "Connected to Conserve," explores how digital tools are not distancing us from the environment, but instead offering powerful new ways to protect and preserve it. From real-time wildlife tracking systems to AI-driven reforestation models, I highlight how innovation is transforming conservation — making efforts smarter, more precise, and far more accessible. Technology is enabling deeper engagement between communities and ecosystems, helping people not only observe nature but actively participate in its revival. However, the relationship between technology and nature is not one-sided. I also reflect on how wildlife is responding to the growing digital footprint — adapting in some cases, and facing disruption in others. These responses serve as a reminder that conservation, even when driven by technology, must remain rooted in sensitivity and respect for natural systems. This presentation is not just about tools or trends — it's a call to rethink our role in a connected world. Because being connected to conserve is not only a technological act — it's a conscious choice to care, and to act for the world we all share.

Keywords: *Conservation technology, Wildlife tracking, AI in ecology, Smart reforestation, Digital sustainability.*

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O-16

Tech-driven *In-silico* Validation of *Withania Somnifera* (Ashwagandha) as an over-the-counter (OTC) compound against the Dual Target of Anti-microbial: A Molecular Insight into Traditional Remedies

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Abstract

Antimicrobial resistance is a rising global health threat, prompting the search for novel therapeutic agents with dual-target mechanisms. *Withania somnifera* (Ashwagandha), a cornerstone of traditional Ayurvedic medicine, is widely recognized for its adaptogenic, immunomodulatory, and antimicrobial properties. This study leverages in-silico tools to explore its potential as a dual-target antibacterial agent against DNA Gyrase B (GyrB) and Topoisomerase IV (Topo IV) - both clinically validated bacterial targets. A dataset of 223 phytocompounds was screened against DNA Gyrase B (PDB ID: 5MMN) and Topoisomerase IV (PDB ID: 3K9F) via AutoDock Vina. Key bioactives were selected based on traditional relevance and chemical diversity. ADMET analysis using SwissADME and pkCSM predicted favorable drug-likeness, gastrointestinal absorption, and blood–brain barrier permeability, with minimal CYP450 inhibition. This tech-driven approach validates the traditional antimicrobial claims of *W. somnifera*, offering modern molecular insight into its efficacy. The results support its potential repositioning as an OTC antimicrobial agent and a candidate for further preclinical development.

Keywords: *Antimicrobial resistance, Withania somnifera, Dual-target, DNA Gyrase B, Topoisomerase IV, Docking, ADMET Prediction, Drug-likeness*

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O-17

Enhancing Cell Characterization with Microfluidics and AI: A Comprehensive Review of Mechanical, Electrical, and Hybrid Techniques

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Abstract

This paper provides comprehensive information on the latest progress in cell characterization using microfluidic devices, with a specific focus on mechanical, electrical, and hybrid techniques. These modern approaches have significantly boosted the precision, speed, and versatility of cellular analysis. Several key microfluidic technologies, including label-free electrical and mechanical methods specifically designed for high-throughput, real-time characterization, are discussed. The current state of microfluidic advancements is reviewed, addressing challenges such as operational complexity and the demand for more adaptable, user-friendly platforms. A major focus is placed on the integration of artificial intelligence (AI) and machine learning, highlighting their critical role in automating data analysis and improving cell classification accuracy. The presentation concludes by considering the profound implications of these technologies for personalized medicine and next-generation cellular assays.

Keywords: *Cell characterization, Microfluidics, Artificial intelligence, Electrical techniques, Mechanical techniques, Hybrid methods.*

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O-18

Revolutionizing Drug Analysis: Emerging Trends in Spectral and Chromatographic Methods

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Abstract

Pharmaceutical analysis is going through a major transformation, thanks to rapid advancements in AI technology and innovative research approaches. The pharmaceutical industry is experiencing a revolutionary transition due to the application of AI models in drug formulations and production procedures. AI's potent data mining and algorithm analysis tools are revolutionizing a number of pharmaceutical industry-related areas, allowing the development of more efficient and cost-effective medications. To satisfy the changing needs of pharmaceutical analysis, there is an increasing focus on modernizing essential analytical techniques, especially spectral and chromatographic methods including UV-Vis, FTIR, NMR, HPLC, and UPLC. These tools are essential for accurately identifying, measuring, and checking the purity of drugs throughout their development. The adoption of next-generation instruments, smart data analysis tools, and robust validation methods that align with regulatory standards. This not only improves the quality and safety of medicines but also boosts their readiness for global markets. This abstract highlights how the use of AI, small systems, environmentally friendly practices, and real-time testing tools is changing pharmaceutical analysis. With these innovations, the field is shifting toward faster and more efficient ways of ensuring drug quality. "In essence, new standards are being set for how we analyze and ensure the safety and effectiveness of medications.

Keywords: *Artificial intelligence (AI), Spectral techniques, Data mining, Smart data analysis, Real-time testing.*

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O-19

Catalyzing Innovation in Pharmaceutical Analysis: The Yugantar Framework for R&D Acceleration

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Abstract

Pharmaceutical research and development (R&D) often take a long time and involves complex processes. To speed up innovation while maintaining high standards, the Yugantar Framework offers a new and practical approach to improve pharmaceutical analysis. This framework brings together modern tools like artificial intelligence (AI), automation, and cloud computing with flexible ways of working. It is built on four main ideas: smart automation, decisions based on data, flexible lab systems, and smooth alignment with regulatory rules. By using AI and machine learning in lab testing, Yugantar helps scientists get faster and more accurate results, such as identifying drug impurities or studying stability. It also encourages teamwork between different departments and outside partners, helping share knowledge and speed up discoveries. Importantly, it makes sure that even as things move faster, all safety and regulatory standards are still followed. Real-world examples show that Yugantar can reduce testing time by up to 40% and make results more reliable. It also improves how well data can be tracked and reused. In short, the Yugantar Framework is a new way to improve pharmaceutical R&D—making it faster, smarter, and better prepared for future challenges. It is a useful model for companies looking to innovate while staying efficient, safe, and compliant.

Keywords: *R&D, Yugantar, Regulatory standards, Artificial intelligence, Challenges.*

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O-20

Yugantar: Digital Fingerprinting of API Impurities Using Deep Learning

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Abstract

Deep learning-based digital fingerprinting of API (Active Pharmaceutical Ingredient) impurities leverages sophisticated neural network models to generate distinct digital signatures, or "fingerprints," for trace amounts of chemical contaminants in pharmaceutical products. Supporting regulatory compliance and ensuring drug safety, this method enables rapid identification, classification, and tracking of impurity profiles using high-resolution analytical data, such as mass spectrometry or chromatography results, gathered under standardized protocols. Convolutional neural networks (CNNs) and other deep learning architectures are trained on labeled datasets to extract critical features that reveal the structural or spectral fingerprints of both pure APIs and their contaminants. This approach automates the recognition and discrimination of impurities—even at low concentrations or among chemically similar species—by generating compact digital fingerprints for each contaminant. The system can adapt to new impurity profiles via incremental model updates or transfer learning, demonstrates scalability across diverse compound libraries, and maintains robustness in the presence of noise. By reducing manual interpretation, expediting root-cause analysis, and enhancing the accuracy and reliability of pharmaceutical quality control, digital fingerprinting transforms traditional impurity analysis

Keywords: *Convolutional neural networks, APIs, Quality control, Fingerprints, Impurity analysis.*

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O-21

Leveraging AI and Digital Health Technologies to Enhance Medication Adherence: A Transformative Approach in Modern Healthcare

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Abstract

This paper explores the emerging role of artificial intelligence (AI) and digital health technologies in addressing medication non-adherence, a persistent challenge in both chronic and acute care management. AI-driven tools such as predictive models, intelligent reminders, and personalized feedback systems enable real-time interventions and accurate adherence monitoring. Digital platforms including mobile health (mHealth) applications, wearable sensors, and telehealth services support continuous patient-provider communication and individualized care strategies. When integrated into clinical practice, these innovations improve therapeutic outcomes, reduce hospital readmissions, and promote data-informed medical decisions. A key emphasis is placed on AI's ability to analyze behavioral trends and forecast adherence risks, fostering a shift from reactive to proactive healthcare delivery. The paper also considers ongoing challenges such as data privacy, digital literacy disparities, and system interoperability. Furthermore, it outlines the potential for scalable implementation of these technologies, particularly in resource-limited settings. Overall, the review underscores the transformative capacity of AI and digital health technologies to enhance patient engagement, strengthen medication adherence, and build a more responsive, technology-enabled healthcare ecosystem.

Keywords: *Medication adherence, Artificial intelligence, Digital health technologies, mHealth, Predictive analytics, Healthcare innovation.*

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O-22

Automation in Pharmaceutical Analysis: Integrating Robotics and Artificial Intelligence for Enhanced Precision and Efficiency

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Abstract

Pharmaceutical analysis plays a key role in making sure that medicines are safe, effective, and of high quality. Today, this process is becoming faster and more accurate thanks to automation technologies like robotics and artificial intelligence (AI). Robots are being used in laboratories to handle routine tasks such as preparing samples, testing tablets, and managing large numbers of tests. This helps save time, reduces human errors, and increases productivity. At the same time, AI is being used to analyze complex data, improve testing methods, and predict results more accurately. AI can quickly detect problems, suggest better testing conditions, and help make smart decisions during drug development and quality control. Together, robotics and AI make the entire testing process more efficient and reliable. This presentation will explain how robotics and AI are used in pharmaceutical analysis, with examples from real industry practices. It will also cover the benefits, such as improved accuracy and speed, as well as challenges like cost, training needs, and meeting regulatory requirements. As these technologies continue to grow, they are expected to transform laboratories into smarter, more advanced spaces that support innovation and ensure better quality medicines for patients.

Keywords: *Automation, Robotics, Artificial intelligence (AI), Drug quality control, Method optimization, Data interpretation, High-throughput screening, Regulatory compliance.*

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O-23

AI based prediction of drug –induced liver injury: Current trends and future directions

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Abstract

Drug-induced liver injury (DILI) is a leading cause of drug withdrawal from the market. Evaluating the risk of DILI early in the drug development process is crucial, yet difficult, due to the complex and multifactorial nature of liver toxicity, especially before clinical trials begin. Artificial intelligence (AI), especially machine learning methods ranging from traditional models like random forests to advanced deep learning techniques, offers promising tools for analyzing chemical structures and predicting potential toxic effects based solely on molecular features. Currently AI-based strategies for DILI prediction and discusses key challenges, including the limited availability of high-quality, annotated datasets. Furthermore, it highlights emerging opportunities such as the use of advanced data modalities, including 3D cell culture models (spheroids), which offer more physiologically relevant insights. The steady growth in the number of drugs labeled with known DILI risk also holds promise for improving model performance and reliability. These advancements pave the way for safer drug development through more accurate, early-stage hepatotoxicity screening.

Keywords: *Drug-induced liver injury (DILI), Artificial intelligence, Machine learning, 3D cell culture, Hepatotoxicity screening.*

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O-24

Targeting DNA gyrase B: In silico discovery of potent quinoline derivatives against multidrug-resistant bacteria

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Abstract

Antimicrobial resistance (AMR) poses a growing threat to global health, reducing the effectiveness of current antibiotics and resulting in millions of deaths annually. To address this challenge, we investigated DNA Gyrase B an essential bacterial enzyme involved in DNA replication as a novel antibacterial drug target. An in-silico drug discovery strategy was employed, integrating pharmacophore modeling, QSAR analysis, molecular docking (using AutoDock Vina), evaluate new quinoline-based derivatives. Among the designed compounds, D7 demonstrated the highest binding affinity (-8.6 kcal/mol), outperforming both the standard drug Novobiocin (-6.8 kcal/mol) and the co-crystallized ligand. Detailed interaction analysis revealed strong hydrogen bonding and π-π stacking with key amino acid residues at the GyrB active site. ADMET predictions via Swiss ADME and ProTox-II showed favorable oral bioavailability, acceptable absorption, and low toxicity, suggesting good drug-likeness. This study identifies promising quinoline-based inhibitors of DNA Gyrase B, with compound D7 emerging as a strong lead candidate. The findings support further experimental validation and demonstrate the effectiveness of an integrated computational pipeline in accelerating early-stage drug discovery against multidrug-resistant bacterial infections.

Keywords: *Antimicrobial resistance, DNA gyrase B, Quinoline derivatives, Molecular docking, AutoDock vina, Pharmacophore modeling, ADMET, Molecular dynamics, Novobiocin, Drug discovery***.**

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O-25

AI Convergence in Drug Development and Recent Applications: A Review

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Abstract

Artificial intelligence (AI) is transforming the pharmaceutical industry by enhancing the efficiency and precision of the drug discovery and development process. This review explores recent applications of AI technologies—such as machine learning (ML), deep learning (DL), and natural language processing (NLP)—across various stages of drug development. These tools are widely applied in target identification, virtual screening, drug repurposing, and personalized response modeling. Furthermore, AI contributes to clinical trial design by optimizing dosing strategies and predicting outcomes. AI-based screening and data analytics are significantly improving success rates while reducing the time and financial investment required for new drug development. However, challenges persist, including data limitations, model transparency, and regulatory compliance. This review underscores the growing importance of AI in personalized medicine and calls for further research to ensure faster, safer, and more effective drug development processes. The findings demonstrate AI's potential to address complex healthcare challenges and revolutionize modern therapeutics.

Keywords: *Artificial intelligence, Drug discovery, Machine learning, Virtual screening, Pharmaceutical innovation.*

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Conference Proceedings

O-26

Yugantar: Predicting Analytical Instrument Failure using AI (Smart Labs)

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Abstract

In today's pharmaceutical and research labs, analytical instruments like HPLC, GC, UV-Vis, and FTIR are very important for getting accurate and reliable results. But when these instruments fail without warning, it can cause serious delays, waste time and money, and affect the quality of work. This project focuses on using Artificial Intelligence (AI) to predict when these instruments might fail before it actually happens. This idea leads to the creation of "Smart Labs" — laboratories that can monitor themselves and alert users about possible issues early on. By using machine learning (ML) — a type of AI — we can study past data such as how often instruments were used, when they were maintained, and their working conditions. AI can find hidden patterns or warning signs that suggest an instrument is likely to fail soon. With this knowledge, labs can do maintenance before problems happen, which saves time and increases the lifespan of the equipment. A test system was built using smart sensors and cloud technology to keep track of instrument health in real-time. Different AI models like Random Forest and SVM were tested, and some were able to predict failures with over 85% accuracy. Overall, this AI-powered system helps make laboratories more efficient, reduces unexpected downtime, and supports better planning and decision-making. Smart Labs offer a new way to manage lab equipment, making operations more reliable, safe, and cost-effective for industries like pharmaceuticals, chemicals, and life sciences.

Keywords: *Artificial intelligence (AI), Machine learning (ML), Smart labs, Analytical instrumentation, Instrument failure prediction, IoT sensors, Data analysis.*

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O-27

Virtual Laboratories in Scientific Research: Bridging Innovation, Accessibility, and Precision

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Abstract

Virtual Laboratories are now an integral part of today's research environments because of the rapid digital transformation of science and learning. These cloud-based, simulated environments allow researchers and learners to perform high-fidelity experiments remotely under simulated conditions that closely simulate true experimental conditions. Virtual labs enable cross-disciplinary research in the areas of life sciences, engineering, data science, and artificial intelligence. They are driven by cloud computing, virtual reality (VR), augmented reality (AR), and interactive simulation platforms such as Labster and MATLAB Simulink. By offering scalable, cost-effective, and risk-free alternatives for traditional wet labs, they have revolutionized areas such as computational fluid dynamics (CFD), digital twin modeling, and in silico drug development. By enhancing accessibility, reproducibility, and sustainability, virtual labs play a significant role in global academic and industrial research. Platforms like Labster and Virtual Labs developed by India's Ministry of Education were critical replacements for ongoing training and research during the COVID-19 pandemic. Besides advancing global agendas like the Sustainable Development Goals (SDGs), Open Science, and democratization of STEM education, virtual labs also facilitate the global agendas of industry sectors. Besides summarizing significant case studies and future possibilities, including blockchain authentication of data, IoT connectivity, and metaverse-based research platforms, this study explores the architecture, applications, benefits, and limitations of virtual labs.

Keywords: *Virtual laboratories, Cloud-based simulation, Remote experimentation, In silico research.*

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O-28

In Silico Evaluation of *Withania somnifera* Constituents as Dual Inhibitors of HDACs and PARP: A Comparative Docking and ADMET Study

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Abstract

Changes in a variety of cellular processes, such as those in charge of DNA repair and epigenetic regulation, are what cause cancer, a complicated illness. Poly (ADP-ribose) polymerases (PARPs), which are crucial for repairing DNA damage, and histone deacetylases (HDACs), which alter chromatin structure and gene expression. A promising tactic to improve therapeutic efficacy and combat medication resistance is dual inhibition of HDAC and PARP. Using molecular docking techniques, we investigated the dual inhibitory potential of three phytoconstituents derived from Withania somnifera (ashwagandha): Withanolide D, Withaferin A, and Withanone. Autodock Vina was used to retrieve, prepare, and dock the crystal structures of PARP1 (PDB ID: 7KK6) and HDAC1 (PDB ID: 4BKX) with specific ligands. Veliparib (PARP) and Vorinostat (HDAC), two common inhibitors, were used to compare the docking results. Withaferin A and Withanolide D demonstrated superior or equivalent binding to the reference medications, indicating substantial interaction at both targets, according to binding affinity scores and interaction profiles. Additionally, SwissADME's ADMET profiling revealed that the natural compounds had favorable pharmacokinetics, good oral bioavailability, and acceptable drug-likeness. These results demonstrate the potential of molecules derived from Withania somnifera as multi-target anticancer agents.

Keywords: *Anti-cancer, Withanolide D, Withaferin A, Withanone, PARP, HDACs, Autodock Vina, SwissADME.*

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O-29

AI-integrated Clinical Trial Platforms: A 2025 Milestone in Data-driven Research with Jeeva

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Abstract

In 2025, Jeeva Clinical Trials introduced a new generation of AI-powered tools that redefined the digital infrastructure supporting clinical research. Central to these advancements is an AI-integrated clinical trial management system (CTMS), capable of automating protocol design, monitoring, and compliance checks using real-time data inputs. Additionally, the integration of multilingual localization—through Jeeva's partnership with Vistatec—enabled seamless global deployment, allowing data collection and communication across over 100 languages. These tools enhance participant retention, reduce protocol deviations, and improve operational transparency. Jeeva's 2025 system also leverages predictive analytics trained on historical trial datasets to optimize recruitment and minimize logistical delays. The platform's user interface is designed for accessibility, requiring no technical background to operate, thus enabling efficient collaboration between sponsors, CROs, and investigators. This presentation provides a comprehensive walkthrough of the 2025 AI enhancements, offering a practical framework for understanding how they improve data reliability, regulatory compliance, and trial scalability in decentralized research environments.

Keywords: *Artificial intelligence (AI), Clinical trial management system (CTMS), Jeeva clinical trials, Real-time data monitoring, Decentralized clinical trials.*

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O-30

Empowering Regulatory Science: FDA's Elsa AI Tool for Review and Operational Efficiency

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Abstract

The U.S. Food and Drug Administration (FDA) has introduced Elsa, a generative AI tool designed to enhance regulatory data workflows by accelerating document analysis, information synthesis, and risk-based decision-making. The agency is already using Elsa to accelerate clinical protocol reviews, shorten the time needed for scientific evaluations, and identify high-priority inspection targets. Elsa is a large language model–powered AI tool designed to assist with reading, writing, and summarizing. It can summarize adverse events to support safety profile assessments, perform faster label comparisons. Early deployment has shown dramatic reductions in processing times. For example, reducing protocol reviews from multiple days to minutes. However, the use of large language models in regulatory contexts raises important challenges around auditability. The FDA launched Elsa ahead of schedule using an all-center approach. Leaders and technologists across the agency collaborated, demonstrating the FDA's ability to transform its operations through AI. This presentation presents Elsa's capabilities, safeguards, and early impact in the FDA's overall AI journey.

Keywords: *Elsa, Artificial intelligence, Large language model, Scientific evaluation.*

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O-31

Smart Wearables for Personalized Medicine: A New Era of Patient-centred Healthcare

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Abstract

Smart wearable technologies are rapidly revolutionising healthcare by enabling continuous and real-time monitoring of vital physiological parameters, such as heart rate, blood glucose, sleep patterns, body temperature, and activity levels. These wearable devices—from smartwatches and biosensor patches to smart rings and fabrics—enable the delivery of personalized medicine by offering individual-specific health information that can inform prevention, diagnosis, and treatment. Personalized medicine, in contrast to traditional one-size-fits-all treatment, individualizes interventions based on genetic, physiological, and behavioural determinants. The combination of artificial intelligence and Internet of Things (IoT) technologies in wearables enables predictive analytics, early disease identification, remote monitoring, and improved patient compliance. This topic discusses the potential of smart wearables to promote personalized health and examines major regulatory views of agencies, including the US FDA, European Medicines Agency, and India's CDSCO. Products such as the Apple Watch and Dexcom G7 are already enhancing chronic disease care and health outcomes worldwide. Nevertheless, issues still exist in data privacy, security, reliability of devices, cost, and regulatory designation. For safe and effective use, regulatory systems are transforming to place digital health products under Software as a Medical Device and wearable device regulations. In summary, intelligent wearables are a giant leap toward preventive, participatory, and precision medicine. Their integration into mainstream health systems backed by strong regulatory control has the potential to transform patient empowerment, enhance outcomes, and curb long-term healthcare expenditure.

Keywords: *Smart wearables, Personalized medicine, Wearable electronic devices, Biosensing techniques.*

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O-32

Pharmacological Management of Depression: An Overview

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Abstract

Depression is a prevalent psychiatric disorder marked by persistent sadness, loss of interest, fatigue, and disturbed sleep or appetite. It significantly impacts personal, social, and occupational life. According to the WHO, depression is one of the leading causes of disability worldwide. The underlying mechanisms are complex, involving genetic, biochemical, and environmental factors. The monoamine hypothesis, which suggests decreased levels of serotonin, norepinephrine, and dopamine, is widely accepted in explaining its pathophysiology. Pharmacological treatment plays a vital role in managing moderate to severe depression. Commonly prescribed drugs include selective serotonin reuptake inhibitors (SSRIs) like fluoxetine and escitalopram, serotonin-norepinephrine reuptake inhibitors (SNRIs) such as venlafaxine, and tricyclic antidepressants (TCAs) like amitriptyline. These agents work by enhancing the availability of neurotransmitters in the brain. Atypical antidepressants (e.g., mirtazapine, bupropion) and novel treatments like ketamine, an NMDA receptor antagonist, are also being explored for treatment-resistant depression. Although effective, current antidepressants may take weeks to show full benefits and often cause side effects. Therefore, recent research is focused on developing rapid-acting antidepressants and individualized therapy. Combining medication with psychotherapy, lifestyle modification, and social support improves overall outcomes and patient quality of life.

Keywords: *Depression, SSRIs, SNRIs, Antidepressants, Neurotransmitters, Ketamine, Mental health, Pharmacotherapy.*

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O-33

From Paper to Pixel: Evaluating the Shift to Electronic Instructions for Use (eIFU) in Medical Device Labelling

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Abstract

The transition from traditional paper-based instructions for use (IFU) to electronic instructions for use (eIFU) is a significant advancement in medical device labelling. This modification aligns with global efforts to enhance accessibility, ensure real-time updates, reduce environmental impact, and improve usability. Lower prices, multilingual support, quicker dissemination of updated information, and reduced packaging waste are some of the key benefits of eIFUs. However, there are still challenges, such as ensuring internet access for all, handling data security, and meeting stringent validation and usability testing requirements. Manufacturers must conduct risk assessments, provide clear user guides, and ensure that patients and healthcare professionals can easily access eIFUs. This lecture evaluates the technological, practical, and regulatory aspects of eIFU implementation using real-world examples. Future advancements like blockchain for traceability, AI-powered personalized counselling, and engagement with electronic health data are also examined. The transition to eIFU is a step toward the transformation of digital healthcare and the sustainability of medical device communication, in addition to being a change in regulations.

Keywords: *Electronic instructions for use, Medical device labelling, Digital health, Healthcare accessibility, e-labelling.*

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O-34

Regulatory Challenges and Opportunities in 4D Bioprinting and Smart Biomaterials

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Abstract

Smart biomaterials are materials that can potentially alter their structure or function with time due to an external trigger, such as temperature, pH, humidity, or light and are integrated into 4D bioprinting, an advanced version of 3D bioprinting. With infinite possibilities in the field of tissue engineering, drug targeting, regenerative therapy, and personalized medicine, this cutting-edge technology has vast potential. But its fast climb has left behind the development of suitable regulatory structures, making it a source of many challenges. These include the absence of clear-cut assessment guidelines from major regulatory authorities such as the US FDA, EMA, CDSCO, and others, and the uncertainty of the classification of the product—whether the printed constructs are pharmaceuticals, devices, biologics, or combination products. In addition, no standard methods for preclinical and clinical evaluation of dynamic, stimulus-responsive products have yet been established, and the customized character of 4D printing renders it even harder to implement the conventional Good Manufacturing Practices (GMP). Because no information is available regarding the long-term performance and safety of such new products, post-market monitoring is therefore still a vague area. 4D bioprinting represents a massive opportunity to revolutionize the care of patients despite these shortcomings of regulation. To bridge these gaps and ensure that patient safety and innovation are assured in this next wave of biological progress, regulatory affairs practitioners have a responsibility to champion flexible, risk-based, and visionary regulation.

Keywords: *4D bioprinting, Smart biomaterials, Regulatory challenges, Regulatory affairs, Good manufacturing practices, Product classification.*

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O-35

Blockchain Applications in Health Care: A New Era of Digital Trust

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Abstract

One of the significant concerns in multi-party supply chains is the integrity of products and their traceability. There is a recent emergence of blockchain technology (BT), which is a cost-effective way to achieve secure tracking, performance benchmarking, and to create trust between stakeholders. Data analytics is central to being able to manage secure data in blockchain platforms, especially when integrated with machine learning (ML) which requires consistent and reliable data to provide accurate results. In this paper, a new blockchain-based framework called Lebesgue Integrable Consensus and Interpolated Gaussian Learning (LIC-IGL) is proposed to enhance the secure exchange of pharmaceutical data. The LIC-IGL model consists of two major steps. The initial step is the confirmation of the block using the Lebesgue Integrable Consensus algorithm. The second phase involves authentication via smart contracts, which incorporate the Adaptive Support Vector Machine Authentication model. Post-authentication, product exchange remains secure, trusted, and tamper-resistant. The LIC-IGL method is compared with other existing blockchain-based authentication methods in terms of latency, authentication precision, and false positive rate across various product environments. The experimental results show that the suggested model outperforms current solutions in accuracy while significantly reducing latency and false positives. Thus, LIC-IGL presents a secure and effective approach to preserving the integrity of the pharmaceutical supply chain through the integration of blockchain and machine learning.

Keywords: *Blockchain technology, Machine learning, LIC-IGL, Pharmaceutical supply chain, Data security.*

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O-36

Implications of Nanoparticles in CNS Disorders

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Abstract

Brain disorders, including neurological and psychiatric conditions, are among the leading factors of disability, affecting approximately 1.5 billion people worldwide. The treatment of brain disorders is difficult because of the blood–brain barrier (BBB), which protects the brain by blocking most medicines from entering. Recently, nanotechnology has introduced tiny carriers called nanoparticles that can transport drugs across the BBB. These particles can be designed for precision targeting, improved drug stability, therapeutic payload, imaging properties, and reduced side effects. Nanoparticles can be made of lipids, polymers, or metals, and can be combined with specific tags such as ligands or antibodies to help them locate and attach to brain cells. This method shows promise in treating various CNS disorders. To achieve targeted delivery, it is essential to design effective strategies for drug transport across the BBB and into specific brain regions. In addition to drug delivery, nanoparticles are being explored for gene therapy, RNA delivery, and anti-inflammatory treatments for neurodegenerative diseases like Alzheimer's, Parkinson's, glioblastoma, and multiple sclerosis. Combinatory therapies using nanoparticles can enhance treatment efficacy and reduce resistance. Overall, nanoparticles offer significant advantages by reducing systemic toxicity and enabling precise targeting within the brain.

Keywords: *Nanoparticles, Brain disease, Blood–brain barrier, Neurodegenerative disorders, Targeted drug delivery.*

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O-37

Next-generation GMP: AI and Robotics in Automated Cleanroom Compliance

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Abstract

The pharmaceutical industry is rapidly transitioning toward Pharma 4.0, where artificial intelligence (AI) and robotic automation are redefining good manufacturing practices (GMP). Traditional cleanroom operations rely heavily on manual interventions, which are prone to human error, contamination risks, and data integrity challenges. Integrating AI-driven analytics, machine vision systems, and collaborative robotics (cobots) into cleanroom environments enables real-time environmental monitoring, predictive contamination control, and automated compliance reporting. Advanced robotic systems ensure consistent material handling, aseptic operations, and precise cleaning validation, minimizing deviations and non-conformities. Furthermore, AI-powered predictive maintenance and digital twins of cleanroom processes allow proactive risk management, aligning with evolving ICH Q9 and Annex 1 guidelines. Regulatory agencies are increasingly acknowledging the role of digital technologies in enhancing GMP adherence, yet standardized frameworks for AI and robotics validation remain limited. This abstract explores the potential of next-generation GMP technologies, their regulatory implications, and the future of automated, intelligent cleanrooms that can deliver higher product quality, reduced operational costs, and improved patient safety, paving the way for fully digital, human-error-free pharmaceutical manufacturing.

Keywords: *Pharma 4.0, Robotic automation, Automated cleanroom compliance, Real-time environmental monitoring, Artificial intelligence.*

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O-38

Use of AI in Analyzing Prescription Patterns to Prevent Abuse

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Abstract

Prescription drug misuse, which encompasses the abuse of controlled substances such as opioids, stimulants, and benzodiazepines, constitutes a significant public health concern. Conventional monitoring systems do not always timely identify sophisticated and emerging patterns of misuse. AI gives us sophisticated analysis we can use to track and analyse, and ultimately predict prescription behaviours that might be signs of abuse or diversion. Large datasets - such as EHRs, pharmacy claims, and prescribing histories can be analysed by AI using machine-learning algorithms, natural language processing, and predictive analytics to identify aberrant trends, high-risk prescribers or patients, and even possible instances of doctor shopping. Pharmacists, regulatory bodies, and healthcare professionals are helped by these insights to optimize prescribing practices, improve adherence to prescription guidelines, and implement timely interventions. The potential of AI to revolutionize drug safety surveillance and encourage responsible medicine use is highlighted in this abstract, which also examines the advantages, disadvantages, and uses of AI in prescription pattern analysis.

Keywords: *Artificial intelligence, Prescription drug abuse, Prescription monitoring, Drug safety surveillance, Natural language processing, Healthcare compliance.*

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O-39

3D Printing in Healthcare and Biomedical Engineering

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Abstract

The integration of 3D printing into healthcare and biomedical engineering marks a transformative leap in modern medicine and technological innovation. As an advanced form of additive manufacturing, 3D printing enables the precise fabrication of complex, patient-specific medical components that were once difficult or impossible to create through traditional manufacturing methods. Its applications span across multiple domains—ranging from customized prosthetics and implants to anatomical models for pre-surgical planning, biocompatible scaffolds for tissue engineering, and even the development of drug delivery systems with controlled release mechanisms. This presentation explores the core principles of 3D printing technologies, such as stereolithography (SLA), fused deposition modeling (FDM), and selective laser sintering (SLS), and their relevance in the clinical and research domains. Special focus is given to bioprinting, where living cells and biomaterials are printed layer-by-layer to create tissue-like structures, with promising implications for regenerative medicine and organ transplantation in the future. Moreover, the talk highlights successful case studies, ongoing research, and the regulatory and ethical considerations in adopting 3D printing in healthcare. By addressing the challenges and future outlook of this rapidly evolving field, the presentation underscores the significance of 3D printing as a key technological enabler for personalized medicine, cost-effective manufacturing, and faster innovation cycles in biomedical engineering.

Keywords: *3D printing, biomedical engineering, additive manufacturing, healthcare, biomaterials, stereolithography.*

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O-40

Eco-pharmacy: Managing Pharmaceutical Waste for a Sustainable Future

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Abstract

Improper disposal of unused, expired, or surplus pharmaceutical products poses a significant threat to the environment and public health. From contaminating water bodies with active pharmaceutical ingredients (APIs) to contributing to the growing issue of antimicrobial resistance, unmanaged pharmaceutical waste is a silent environmental crisis. Despite the expansion of the pharmaceutical industry, a lack of awareness, inadequate infrastructure, and insufficient enforcement persist regarding eco-friendly waste management in many parts of India. These abstract highlights the urgent need to adopt eco-pharmacy practices—a sustainable approach that emphasizes the responsible handling, segregation, and disposal of pharmaceutical waste across the supply chain. It explores key issues, including household drug disposal habits, hospital waste management protocols, and the lack of take-back programs for expired medicines. Regulatory authorities like the Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs), and the Central Drugs Standard Control Organization (CDSCO) play a vital role. This paper proposes strategies for establishing reverse logistics systems, pharmacy-based return schemes, and community awareness programs to encourage responsible drug disposal.

Keywords: *Eco-pharmacy, Pharmaceutical waste, Antimicrobial resistance, Environmental pollution, Reverse logistics, Drug take-back, CPCB, Sustainable healthcare.*

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O-41

PharmaTech 4.0: Integrating artificial intelligence and digital twins for smart drug development

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Abstract

The pharmaceutical industry is undergoing a significant transformation with the integration of advanced technologies like artificial intelligence (AI), machine learning (ML), and digital twins, collectively known as PharmaTech 4.0. These innovations are essential to meet the growing demand for precision, personalized medicine, and efficient production. AI-driven systems are reshaping drug development by analyzing complex data patterns, predicting molecular behavior, and enhancing the design of clinical trials through virtual simulations. Meanwhile, digital twins provide real-time virtual representations of manufacturing processes, allowing for proactive monitoring, predictive maintenance, and improved production efficiency. This technological convergence is not only reducing development timelines and operational costs but also strengthening quality control and regulatory compliance. The presentation will explore successful collaborations between academic researchers and industry leaders that have accelerated the adoption of these technologies. Additionally, it will address the ethical considerations and regulatory challenges that arise with AI-driven pharmaceutical practices, highlighting the need for globally aligned frameworks. By bridging traditional pharmaceutical sciences with innovative digital ecosystems, PharmaTech 4.0 is poised to revolutionize the drug development landscape, fostering smarter, safer, and faster therapeutic solutions. This discussion aims to inspire stakeholders to embrace these advancements for a sustainable and future-ready pharmaceutical industry.

Keywords: *PharmaTech 4.0, Artificial intelligence, Digital twins, Drug development Innovation.*

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O-42

The Falsified Medicines Directive – Impact for Patients and the Pharmaceutical Industry

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Abstract

The falsified medicines directive (FMD), first proposed by the European Union in 2011 and enacted in February 2019, is a major legislative attempt to protect public health by preventing counterfeit pharmaceuticals from entering the legitimate supply chain. The comprehensive safety and verification requirements of this directive, which include tamper-evident packaging and a unique identification (2D barcode), must be met by prescription drugs. These standards have fundamentally altered the operational and regulatory landscape for all stakeholders in the pharmaceutical sector, significantly enhancing accountability and traceability. The FMD offers essential safeguards by ensuring the authenticity and integrity of the drugs that patients take. This reduces the health risks associated with counterfeit or subpar drugs, which were previously a big worry, particularly in the illegal market and online marketplaces. By promoting increased public confidence in the calibre of drugs prescribed, the system improves the relationship between patients and healthcare professionals. Nonetheless, the pharmaceutical industry faces significant obstacles as a result of the directive. To meet the FMD's requirements, businesses have had to make significant investments in new packaging technology, serialization systems, and IT infrastructure. While wholesalers and pharmacies must put strong verification procedures in place to prevent interruptions in the distribution and dispensing of medications, small and medium-sized businesses (SMEs) in particular must overcome financial and technical obstacles in order to comply with the directive. All things considered, the falsified medicines directive has significantly improved patient safety and the integrity of the pharmaceutical supply chain, despite posing difficult logistical and financial challenges for industry participants. In addition to laying the groundwork for future advancements in digital traceability, regulatory harmonization, and international cooperation in pharmaceutical regulation, the directive has emerged as a standard for international regulatory tactics intended to combat counterfeit medications.

Keywords: *Falsified medicines directive (FMD), Counterfeit medicine, Tamper-evident packaging, Supply chain integrity.*

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O-43

Human Organs-on-Chips: Accelerating Drug Testing & Disease Modelling

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Abstract

The use of animals in preclinical drug testing has long raised ethical, scientific, and translational concerns. Human Organ-on-a-Chip (OOC) technology emerges as an innovative and humane alternative, offering precise, efficient, and biologically relevant models that closely replicate the structural and functional complexity of human organs. These micro-engineered systems integrate living human cells with microfluidic platforms to simulate real-time physiological responses. By better mimicking human biology, OOC devices yield superior predictive data regarding drug efficacy, toxicity, and disease progression—often outperforming traditional animal models in both relevance and reliability. This presentation highlights the growing application of OOC in enhancing preclinical safety assessments, accelerating ethical drug development, and reducing dependence on animal studies. As regulatory agencies begin to recognize and validate these advanced models, OOC technology is leading a compassionate and cutting-edge transformation in biomedical research. Aligned with the 3Rs (Replacement, Reduction, and Refinement), its most promising feature is the potential to minimize or eliminate the need for animal testing. Additionally, OOC platforms can utilize patient-derived cells to simulate individual drug responses, paving the way for personalized medicine by overcoming interspecies variability.

Keywords: *Organ-on-a-chip, Microengineering, Animal-free testing, Human organ models, Personalized medicine.*

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O-44

AI-powered Drug Discovery: Accelerating Lead Identification and Optimization

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Abstract

Artificial Intelligence (AI) is playing a pivotal role in redefining drug discovery, particularly in the critical phases of lead identification and optimization. Traditional drug development workflows are often constrained by lengthy experimental cycles, high costs, and limited success rates. AI offers an alternative by applying advanced computational models to analyse large-scale chemical, biological, and clinical datasets. These technologies enhance the early discovery process by predicting biological activity, identifying potential drug candidates, and optimizing molecular structures more efficiently than conventional methods. Machine learning algorithms—including deep learning, generative models, and reinforcement learning—enable rapid screening of compound libraries, structure-based activity prediction, and the design of novel molecules with desired pharmacological traits. These approaches significantly reduce the dependency on trial-and-error synthesis and allow for multi-parameter optimization, considering efficacy, safety, and pharmacokinetics simultaneously. Moreover, the integration of AI with molecular docking, cheminformatics, and high-throughput screening accelerates the prioritization of promising leads and supports decision-making in preclinical stages. While challenges such as data bias, model interpretability, and regulatory hurdles remain, the potential of AI to streamline discovery pipelines and improve candidate quality is substantial. This work provides an overview of current AI methodologies applied to lead discovery and optimization, highlighting their practical applications, limitations, and the future trajectory of AI-driven drug development. As these technologies evolve, they are expected to contribute significantly to a more agile, precise, and cost-effective pharmaceutical research landscape.

Keywords: *Artificial intelligence (AI), Drug discovery, Lead optimization, Molecular docking, High-throughput screening.*

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O-45

The Green Shift in Pharma: Yugantar in Regulation for Carbon-Neutral Drug Development

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Abstract

Medications that save and improve lives sometimes bring unexpected harm to nature. Pharmaceutical manufacturing has a large carbon footprint due to its energy-intensive processes and various chemical procedures. Now is the right time for the pharmaceutical industry to bring sustainability into the global movement—not only by developing new drugs but also by improving how they are manufactured. To ensure that environmental responsibility is considered along with safety and efficacy in drug regulation, this topic introduces the concept of a "Yugantar," or revolutionary shift, in how we approach drug production regulation. With technologies like solvent recovery, biocatalysis, and sustainable energy integration already available, the question is no longer whether we can achieve sustainability, but why we haven't fully implemented it yet. The key may lie in how we incentivise and structure greener practices. From granting Green GMP certificates to offering fast-track licenses and tax breaks for manufacturers adopting carbon-neutral approaches, this lecture suggests integrating eco-sustainability into regulatory frameworks. It also emphasizes how India can adapt international models from the US and EU, while engaging regulatory authorities like CDSCO, MoEF&CC, and industry leaders. As one of the world's leading pharmaceutical hubs, India has the potential to ensure that tomorrow's life-saving medicines are developed without compromising the environment they are meant to protect. This transformation requires a change not just in regulation, but in mindset.

Keywords: *Sustainable manufacturing, Green GMP, Pharmaceutical regulation, Eco-friendly innovation, Carbon neutrality in pharma.*

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O-46

Regulatory Challenges and Cybersecurity Strategies for the Internet of Medical Things (IoMT) in Smart Healthcare

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Abstract

The integration of the Internet of Medical Things (IoMT) in healthcare has greatly enhanced patient care through real-time data sharing, remote surveillance, and automated diagnosis enabled by interconnected medical devices. Nevertheless, this heightened connectivity raises the risk of cybersecurity threats such as ransomware attacks, unauthorized access to data, and manipulation of remote devices. These risks jeopardize patient safety, disrupt clinical workflows, and erode trust in digital health solutions. This presentation aims to examine the changing landscape of regulations and guidelines on IoMT cybersecurity. Significant global regulations and standards, including the FDA's guidance on premarket and post-market cybersecurity, data protection requirements under HIPAA, ISO/IEC 27001 for information security management, and the EU MDR, are critically analyzed. Specific regulatory requirements for risk assessments, secure-by-design development practices, cybersecurity labelling, software bills of materials (SBOM), and continuous market surveillance are emphasized. Additionally, the role of regulatory affairs in ensuring compliance throughout the entire life cycle of a device, from premarket approvals to ongoing security upkeep, is underscored. Technical approaches such as encryption, secure firmware updates, network segmentation, and AI-driven threat detection are discussed in connection with regulatory compliance. As the healthcare sector transitions to more digital and data-rich environments, aligning innovation with cybersecurity regulations is essential for creating robust, secure, and patient-focused smart healthcare systems.

Keywords: *Internet of medical things (IoMT), Cybersecurity, Regulatory compliance, Smart healthcare systems.*

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O-47

Evaluation of Pharmacological Potential of Methadone in Traumatic Brain Injury

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Abstract

Traumatic brain injury (TBI), several pathogenic processes, including excitotoxicity, mitochondrial dysfunction, neuroinflammation, and oxidative stress, begin. Methadone, a synthetic opioid primarily used for pain management and opioid dependence, has recently garnered attention for its potential neuroprotective properties beyond analgesia. The main objective of this study was to understand the pathological mechanisms further and determine whether therapy with methadone has neuroprotective effects following TBI. Wistar Rats were randomly divided into different groups: Control group, TBI+Vehicle treated group, Sham group (false injury group) and TBI+ Methadone groups (2 doses, i.e. 5 mg/kg, 10 mg/kg, i.p.). For the induction of TBI, the weight drop model was used, and 30 minutes after TBI, the methadone was administered intraperitoneally. Then, the behavioural tests were performed at different time points, i.e. at day 1, 7, 14 and 21. At day 21, various biochemical tests were performed to evaluate the neuroprotective effect of Methadone after TBI. In addition to enhancing the blood-brain barrier's integrity and reducing the pathogenic effects of TBI, methadone also suppressed oxidative stress, oedema development and cognitive dysfunctions. These results elucidate that methadone protects against neurodegenerative processes and oxidative stress in animal models of traumatic brain injury.

Keywords: *Methadone, Oxidative stress, Cognitive dysfunction, Neuroprotective, Traumatic brain injury.*

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O-48

Smarter Validation: The Role of Artificial Intelligence in Analytical Method Validation

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Abstract

Analytical method validation, which ensures the precision, consistency, and reliability of drug testing procedures, is a crucial part of pharmaceutical quality assurance. This process is typically time-consuming and mostly manual and entails assessing multiple criteria, including accuracy, precision, linearity, and resilience. The growing complexity of formulations and regulatory requirements necessitates the use of more clever and efficient techniques. This talk examines the ways in which artificial intelligence (AI) is progressively changing the reliability of analytical techniques in the field of pharmaceutical sciences. By using machine learning algorithms and predictive models, artificial intelligence (AI) can assist with validation experiment optimisation, pattern detection in large datasets, method outcome prediction, and even suggestions for method modification under a variety of scenarios. For example, regression models can enhance linearity and detection limit prediction, and neural networks can enhance method precision analysis. AI integration promotes data-driven decision-making, decreases human error, and expedites data processing. It aligns well with Quality by Design (QbD) principles and ICH recommendations (Q2(R2) and Q14), paving the way for more dependable, science-based validation processes. Nonetheless, issues like model transparency, data quality, and regulatory approval continue to be significant factors.AI has the potential to make analytical technique validation not just quicker but also more intelligent and dependable as the pharmaceutical sector transitions to digitalisation. This talk will address key applications, case studies, benefits, and potential future developments for incorporating AI into routine validation processes.

Keywords: *Artificial intelligence, Analytical method validation, Machine learning, Pharmaceutical quality control, ICH guidelines.*

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ABSTRACTS

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P-1

Floating Gastroretentive Drug Delivery Systems for the Eradication of *Helicobacter pylori*: Formulation Strategies and Clinical Relevance

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Abstract

Helicobacter pylori (*H. pylori*) infection is a major global health concern associated with chronic gastritis, peptic ulcers, and gastric malignancies. Despite the availability of various antibiotic regimens, treatment failures remain common due to poor patient compliance, rapid gastric emptying, and suboptimal local drug concentrations. Floating Gastroretentive Drug Delivery Systems (GRDDS) offer a promising strategy to overcome these limitations by prolonging gastric residence time and enabling site-specific drug release in the stomach. This chapter explores the pathophysiology of *H. pylori* infection and highlights the advantages of floating systems in enhancing therapeutic efficacy. It provides an in-depth overview of formulation approaches—including effervescent, non-effervescent, and polymer-based floating systems—tailored for anti-*H. pylori* agents. The chapter also discusses the role of mucoadhesive polymers, gas-generating agents, and innovative combination strategies to optimize gastric retention and drug bioavailability. Recent advancements, preclinical findings, and clinical studies supporting the use of GRDDS in *H. pylori* eradication are critically reviewed. Ultimately, this chapter underscores the clinical relevance of floating drug delivery systems as a viable platform to improve outcomes in the management of *H. pylori*-related gastric disorders.

Keywords: *Helicobacter Pylori, Floating Drug Delivery Systems, Gastroretentive Systems, Gastric Rretention, Site-Specific Delivery, Formulation Strategies, Clinical Relevance*

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P-2

Black Tea

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Abstract

Tea is the most widely used ancient beverage in the world and black tea possesses many biological effects on the organisms. Black Tea has significant cultural and historical importance. Black Tea is grown in well drained, fertile loamy or sandy loam soils, preferably slightly acidic to neutral (PH 5.5 to 6.5). Black Tea is known for its strong or unique flavor, intense color, and high caffeine level compared to green and oolong teas. Black tea undergoes full oxidation process which gives distinctive flavor and color. Black tea polyphenols possess various health benefits such as anticancer, antioxidant, anti- cardiovascular, anti-diabetic, blood pressure, cardiovascular disease, coronary heart disease, covid-19 and some benefits for skin, hair, brain and nervous system, etc. The conventional method of tea manufacturing involves several stages, these are withering, rolling, fermenting, firing, drying and finally sorting. The quality parameters of tea (color, taste, and aroma) are developed during the fermentation stage where polyphenolic compounds are oxidized when exposed to air. Thus, controlling the fermentation stage will result in more consistent production of quality tea. The caffeine content of tea was modest compared with other sources and was unlikely to have an adverse effect on health within an intake range of 1 to 8 cups of tea per day. Genetic Modification can improve black tea by enhancing disease resistance, drought tolerance, yield, and flavor through these techniques like gene editing.

Key words: *Black Tea, Caffeine, Fermentation, Polyphenols, Quality.*

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P-3

YANTRA in Green Pharmacy: Biocatalysis, Biosynthesis & Eco-Friendly Therapeutics

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Abstract

Specialized positions are increasingly needed to support and optimize clinical workflows, system utilization, and data gathering as technology and innovation continue to quickly transform health care and medication management. The well-established discipline of health informatics connects information technology and healthcare to enhance clinical treatment, guarantee patient safety, and boost organizational operations' efficacy and efficiency. In order to meet the global demand for pharmaceuticals and implement sustainable practices, the pharmaceutical sector currently faces numerous challenges. Significant developments in biochemical engineering, such as the utilization of renewable feedstocks, the creation of innovative bioreactors, and the optimization of microbial systems, have been prompted by the growing need for sustainable and ecologically friendly production techniques. Green chemistry is crucial to the pharmaceutical industry's development of novel drug delivery techniques that are less harmful, more practical, efficient, and have fewer adverse effects—methods that potentially benefit millions of patients. These "greener" industrial alternatives are well received by the pharmaceutical sector. Many large pharmaceutical companies in industrialized nations have research departments that are developing novel "green" techniques, biocatalysis reactions, less solvents, and waste reductions while also enforcing safety and health laws to safeguard their employees. In accordance with sustainability principles, it suggests a YANTRA-based lifecycle framework that maps R&D through the steps of synthesis, formulation, packing, and waste recovery. One of the most significant results is the correlation between documented activity in the sector and the policies and activities of local governments that seek to foster increased productivity, efficiency, and innovation.

Keywords: *Medications, Health informatics, Green Chemistry, Biochemical Engineering, Innovation.*

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P-4

A Review of Green Production Methods for Bio-Plastics and Comparison with the Conventional Plastic Manufacturing Methods

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Abstract

Every country is racing to curb the production of single use plastic utensils by introducing new legislative policies due to the increased awareness of the microplastics pollution and its adverse effects on the human body, land and air pollution, and sea contamination. Bioplastics derived from seaweed are scalable and a better alternative compared to conventional plastics. The green production methods for polysaccharides extraction as compared to the conventional method has shown very promising results such as higher yield, lower labor cost and water utilization. This review paper discusses some of the most commonly used techniques obtaining polysaccharides using green production methods. The paper also gives comparison of green production methods with the conventional methods used for obtaining polysaccharide.

Keywords: *Bioplastics, Green Production, Polysaccharides, Manufacturing.*

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P-5

Smart Diagnosis and Treatment of Parkinson's Disease Using Artificial Intelligence: Enhancing Motor Symptom Tracking and Deep Brain Stimulation Control

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Abstract

Parkinson's Disease (PD) is a multifaceted neurodegenerative condition with persistent and long-standing motor and non-motor symptoms that significantly affect patients quality of life. The conventional diagnosis and therapy are typically plagued by subjectivity, delayed diagnosis, and sporadic monitoring of signs. Recent developments in Artificial Intelligence (AI) provide effective solutions to address the above shortcomings by providing smart, real-time, and personalized management of PD. This chapter explores the two-sidled role of AI in PD, focusing particularly on its application in monitoring motor symptoms and maximizing DBS therapy. AI technologies such as machine learning (ML), deep learning (DL), natural language processing (NLP), and computer vision are applied to early diagnosis, mimicking syndrome differentiation, and objective symptom monitoring of tremor, bradykinesia, and gait disturbances. The chapter also addresses wearable sensor systems and mHealth applications integration for ongoing data collection and AI-powered analysis. The technologies enable real-time evaluation, treatment personalization, and augmented clinical decision support. AI models also have the capacity to enhance DBS benefits by dynamically adjusting stimulation parameters based on symptom variability. Through the fusion of multimodal data from wearable sensors, neuroimaging, electronic health records, and genomics, AI opens the door to precision neurology. This chapter summarizes the existing advancements, technical frameworks, and directions of AI-supported PD treatment, outlining its revolutionary potential in neurology and digital therapeutics.

Keywords: *Parkinson's Disease, Artificial Intelligence, Motor Symptom Tracking, Deep Brain Stimulation, Wearable Sensors, Machine Learning*

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Conference Proceedings

P-6

Herbal gel formulation of Aloe Vera and Turmeric for Anti-Inflammatory Use

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Abstract

The demand for herbal based topical formulations is vary due to increased awareness of natural and safer alternatives to synthetic drugs. Aloe Vera and turmeric (Curcuma longa) are widely used medicinal plants known for their anti-inflammatory, anti-bacterial and wound healing properties. This study aimed to formulate and evaluate a topical herbal gel with the benefits of aloe Vera gel and turmeric extract for local anti-inflammatory applications. The gel was made with triethanolamine to balance the pH, glycerin as a humectant, and Carbopol 940 as the gelling agent. Extract of aloe Vera and turmeric were added to the base while being constantly stirred to guaranteed consistency. The produced gel as evaluate for drug concentration, spread ability, viscosity, pH, organoleptic characteristics, and in vitro diffusion studies. The final formulation looks like smooth texture, yellowish color, pH (6.2), and excellent spread ability. In vitro diffusion studies showed sustain release of active ingredients over 6 hours also the formulation does not cause any irritation during short term evaluation. For managing the inflammatory diseases like minor cuts, and muscle soreness this herbal gel provides safe and natural option. So basically, for further process in vivo studies are needed to establish its clinical effectiveness and the formulation also highlights the integration of traditional herbal remedies with modern pharmaceutical advancements.

Keywords: *Herbal Gel, Aloe Vera, Turmeric, Anti-Inflammatory, Carbopol, Topical Formulation.*

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BioFusion: Integrating Synthetic Biology and AI for the Next Evolutionary Shift

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Abstract

Synthetic biology and artificial intelligence are merging in biofoundries to create technological platforms that can produce synthetic organisms on a large scale. Biofoundries have the potential to change society as a whole in addition to producing fresh ideas and answers for unsolvable policy issues. Future scenarios that can be roughly categorized as bio-informational futures are the result of the convergence of the information sciences and the biological sciences. For the upcoming ten years, when the public will be more aware of synthetic biology applications in government, commercial, and research institutions, it is crucial to acknowledge and assess their transformative potential. To shape and direct this bio-informational future, scientists, technologists, practitioners, and policy makers must collaborate closely with biofoundry operators and the general public. Its wide-ranging applications in industry, agriculture, health, and the environment, synthetic biology is a quickly developing area that offers long-term answers to unmet demands in contemporary society. This discipline is currently expanding at a rate that can contribute to achieving the desired outcomes of a bio-based society over the next few decades, thanks to the relatively recent addition of artificial intelligence (AI) technologies. There have already been reports of potentially disruptive applications of combining artificial intelligence (AI) with plant-based technologies, such as protein engineering, phytochemical production, plant system engineering, or microbiome engineering. The convergence of synthetic biology and AI is also speeding up biological engineering and discovery. Large language models and biological design tools are examples of AI approaches that are making it possible for engineered biological systems to have automated design, build, test, and learning cycles. This convergence holds promise for democratizing synthetic biology and opening up new applications in fields ranging from environmental sustainability to medical.

Keywords: *Artificial intelligence, Biology, Engineering, science, Technology*

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Artificial Intelligence in Drug Discovery and Personalized Medicine

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Abstract

By facilitating data-driven, accurate and effective decision-making in the clinical and pharmaceutical sectors, Artificial Intelligence (AI) has completely transformed the healthcare industry. AI-based predictive analytics improves both preventative and therapeutic approaches in smart healthcare systems by facilitating risk forecasting, patient classification, and early disease diagnosis. Large-scale datasets including genomic profiles, biomedical imaging, and electronic health records (EHRs) are analyzed using machine learning (ML) algorithms, which help with quicker and more precise diagnosis. AI helps with in silico modeling of pharmacokinetics and pharmacodynamics, predicts drug-target interactions, and speeds up the identification of drug candidates in drug development. In target deconvolution, compound screening, and chemical property prediction, deep learning architectures such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs) have demonstrated exceptional performance. Additionally, by analyzing patient-specific data, AI helps personalize medicine by optimizing treatment plans like drug selection and dosage adjustment, predicting treatment response, reducing ADR, etc. Despite the progress, issues such as data privacy, model interpretability, and regulatory compliance still persist. To clinically evaluate AI tools and ethically incorporate them into healthcare systems, ongoing interdisciplinary initiatives are crucial.

Keyword

Artificial Intelligence (AI), Predictive Analytics, Machine Learning (ML), Electronic Health Records (EHRs), Drug Discovery, Personalized Medicine.

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Personalized Medicine through 3D-Printed Drug Delivery Platforms

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Abstract

3D printing (3DP) has emerged as a transformative approach in pharmaceutical sciences, enabling the development of highly personalized and efficient drug delivery systems (DDS). Unlike conventional DDS, which often lack precise control over drug release and patient-specific customization, 3DP offers enhanced flexibility and precision. This chapter highlights various 3DP techniques Inkjet Printing, Stereolithography (SLA), Laser-Induced Forward Transfer (LIFT), and Fused Deposition Modeling (FDM) along with their respective pharmaceutical applications, advantages, and limitations. Key design parameters such as drug release kinetics, spatial distribution, mechanical integrity, and biocompatibility are vital in developing effective 3D-printed DDS. A wide range of materials, including hydrogels, polymers, and biodegradable compounds, are utilized in both direct and indirect printing methods. Applications span oral, parenteral, and transdermal routes, with innovations like 3D-printed tablets, microneedle patches, and injectable hydrogels gaining attention. Despite rapid advancements, several challenges remain, including material compatibility, scalability, and regulatory approval. However, ongoing research indicates a promising future for 3DP in personalized medicine, smart DDS, and combination therapies. By leveraging the precision and adaptability of 3DP, the pharmaceutical industry is moving toward more tailored therapeutic solutions that improve efficacy and patient compliance. This chapter explores the current status, technological developments, and future potential of 3DP as an integral component of advanced drug delivery systems.

Keywords: *3D Printing; Techniques, Drug Delivery System, Challenges, Medicines*

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Green Chemistry 2.0: Artificial Intelligence Optimized Ultrasound Assisted Extraction Technique for Phytoconstituent

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Abstract

Artificial Intelligence (AI) in combination with Ultrasound-Assisted Extraction (UAE) technique marks a revolutionary advancement in Green Chemistry 2.0 with its capability to accomplish phytoconstituent isolation from medicinal plants sustainably and efficiently. Traditional UAE optimization causes labour-intensive, cost and time-consuming, trial-and-error experimentation. This investigation suggests a Phyto-In Silico study, an AI-based in-silico system allowing the prediction of optimum UAE parameters of various medicinal plants without the requirement of preliminary laboratory testing. A set of about 1,200 resources is publicly accessible. UAE experiments on 80 Medicinals established a gradient boosted machine learning model that characterizes the relationship between inputs, extraction efficacy, and energy consumption. The model was retrospectively validated at 92 percent, and the mean absolute error of its prediction (MAE) was 3.7 percent in yield predictions, compared to known optimized protocols. From virtual screening results are: (1) 40 kHz works well across the board with phenolic glycosides, (2) ethanol-water (70:30) maximizes the yield with 65 % of lipophilic compounds, and (3) pulse cycles gain 22 % energy savings and do not reduce yield. The precision and independent lab and predicted parameters of the model were within 5% when applied to a case study of the Curcuma longa (curcumin extraction). The AI-optimized protocol also reduces the amount of solvent waste (by 70%), increasing by 6 times the development rate of the process. The prediction tool is an open-access tool and includes a sustainability-oriented protocol database demonstrating the possibility of intelligent automation in green phytochemistry and sustainable drug development.

Keywords: *Artificial Intelligence (AI), Ultrasound-Assisted Extraction (UAE), Green Chemistry 2.0, Phytoconstituents, Machine Learning*

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Ayurvedic Yantras: Modifying Traditional Surgical Tools with Modern Science

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Abstract

Ayurvedic study is based on the theories of ancient Acharyas, which also help us to know many aspects of well-being and disease prevention. Ayurveda contains eight subdivisions, each with a distinct function. Some of these divisions deal with medical applications of different devices and instruments (such as Yantra and Shastra). The most traditional medical system, Ayurveda, uses a variety of surgical and para-surgical techniques to treat illnesses. Ayurvedic classic literature provide thorough descriptions of the multiple surgical tools (yantra) adopted across different Ayurvedic branches to perform clinical examinations and healthcare and operative procedures. Ayurvedic yantras are comparable to surgical tools like forceps, dilators, speculums, needles, lancets, etc. Several kinds of tools or equipment are needed for Ayurvedic treatments such as Visravana, Lekhana, Bhedana, Aharana, Chhedana, Seevana and Eshana, among others. The most common tools used in Ayurvedic surgery are Asthilashm, Patta, Venneka, Charma, Antarvalka, Latha, Rajju, Vastra, Dhanth, Pani-Pada, Shthiwan and Harsha. Additionally, the profession has incorporated many new areas such as the use of modified tools, current sterilizing techniques, maintaining aseptic conditions, post-operative treatment, cosmetic surgery, etc. Detailed instructions for using surgical tools to carry out different tasks are provided. The devices used by ancient Hindu physicians are actually very similar to the majority of current surgical instruments. We have covered the yantras (blunt instruments) that are referenced in Ayurveda in this chapter, along with their current surgical analogues.

Keywords: *Yantra, Ayurveda, Surgical instruments, Surgical procedures, Modernization*

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Artificial Intelligence in Drug Discovery and Quality Assurance: Opportunities, Applications, and Challenges

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Abstract

The developments in artificial intelligence (AI) have the potential to have a substantial positive impact on the pharmaceutical sciences. Finding and creating new medications is one of the main fields where AI may be extremely helpful. In contrast to conventional techniques, using AI algorithms, enormous volumes of data may be examined more effectively, which speeds up the process of finding possible treatment candidates. AI can speed up the drug discovery process, which could result in the creation of novel therapies for a range of illnesses. Quality assurance cannot be an exception to the fast transformation of a wide range of sectors brought about by artificial intelligence in just a few decades. Artificial intelligence has a big impact on this study since it has changed the quality assurance landscape by mechanizing it and giving the traditional testing method new dimensions. The various applications of artificial intelligence in quality assurance, including how it is used to create test cases, automate tests, and anticipate defects. Artificial intelligence algorithms are used by quality assurance teams to improve workflow, anticipate problems early in the development cycle, and produce software that is more dependable. Quality assurance faces several difficulties including poor data quality, interpreting models, and requiring high-level Low data quality, model interpretation, and the requirement for highly qualified AI specialists. It offers to professionals and researchers' useful suggestion for maximizing the potential using artificial intelligence to improve quality assurance and produce the best software possible.

Keywords: *Artificial Intelligence, Artificial Intelligence Application in Quality Assurance, Quality Assurance (QA), Challenges, Software.*

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Artificial intelligence's impact on current drug research and pharmaceutical formulation

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Abstract

The development and formulation of contemporary medications has been completely transformed by artificial intelligence (AI). Researchers may now create formulations, enhance drug design, and expedite clinical trials with more accuracy and efficiency thanks to artificial intelligence. The process of developing drugs may be much accelerated and time-consuming, but AI can dramatically reduce this. For data analysis, a variety of tools and technologies are employed, with artificial neural networks (ANN) being the most often utilized. Other technologies include fuzzy logic, neuro-fuzzy logic, genetic algorithms, and ANN. By evaluating the solubility, stability, and bioavailability of drug candidates, artificial intelligence (AI) can also be utilized to enhance pharmaceutical formulations and raise the chances of successful clinical trials. We look explore the function of AI methods such as deep learning and machine learning in preclinical evaluation, lead optimization, and target discovery. Particular attention is paid to the creation of intelligent and regulated drug delivery systems, formulation design driven by AI, and physicochemical property prediction. AI's use in digital health technologies, like smart dosage systems and wearable sensors, is also investigated. We also discuss the practical, ethical, and regulatory difficulties in applying AI in this field.One of the most fascinating uses of AI is in the development of medication delivery systems. Drugs can be delivered to certain tissues and cells via smart drug delivery devices, improving therapeutic efficacy and lowering unwanted side effects. The primary AI ideas and methods—such as genetic algorithms, deep learning, and machine learning—are highlighted. Furthermore, genetic algorithms can be used to choose the best numerical models that can maximize the action of novel medications or forecast biological processes.

Keywords: *Artificial intelligence, Drug delivery system, Preclinical evaluation, Drug design, Pharmaceutical Formulations*

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Advancing Testicular Health through Novel Technologies: From Diagnostics to Biomarker-targeted Therapies

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Abstract

Testicular health, as reflected in morphology, physiology, and biochemical functions, is crucial for male fertility and overall well-being. Reproductive issues, including infertility, cancer, and age-related decline, continue to affect a significant portion of the male population. Male infertility accounts for approximately half of all infertile couples globally, rendering it a complex multifactorial condition. Earlier treatment options for male infertility have included time assisted coitus, in vitro impregnation and sperm insemination methods. However, these techniques are often ineffective in cases of severe male factor infertility, where sperm count is tremendously low or their motility is significantly impaired. In recent decades, there have been substantial scientific advancements in the diagnostics and treatment modalities for male infertility. These developments include new assessments of testicular function and multiple surgical treatments for sperm retrieval and sperm selection methods for intracytoplasmic sperm injection. Male infertility is frequently associated with genetic predispositions and increased exposure to environmental reproductive toxicants. Despite significant progress in assisted reproductive technologies, a substantial proportion of male infertility cases remain idiopathic. Researchers are actively developing highly sensitive and specific biomarkers for the early detection of testicular dysfunction and exposure to environmental endocrine disruptors and other toxicants. This includes the exploration of non-invasive liquid biopsy techniques for circulating miRNAs, cell-free DNA and exosomal cargo. This presentation examines innovations in advanced diagnostic techniques, imaging modalities, and artificial intelligence-driven methods that can be employed in the diagnosis and treatment of reproductive toxicity.

Keywords: *Testicular health, Diagnostics, Biomarkers, Targeted therapy*

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Advancing New Technology Research and Acceleration

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Abstract

The rapid evolution of science and technology in the 21st century has transformed how innovation is pursued, scaled, and integrated into society. This chapter explores the dynamic processes involved in advancing new technology research and accelerating its development from laboratory discovery to market deployment. Emphasis is placed on interdisciplinary collaboration, digital transformation, policy frameworks, and funding ecosystems that enable the translation of scientific breakthroughs into practical applications. Key drivers such as artificial intelligence, automation, high-throughput experimentation, and real-time data analytics are discussed as enablers of accelerated innovation cycles. The chapter also examines the role of technology incubators, industry-academia partnerships, and government initiatives in fostering a robust innovation pipeline. Case studies and emerging models of technology transfer and commercialization provide practical insights into overcoming common barriers to scale and adoption. This chapter offers a comprehensive overview for researchers, policymakers, and industry leaders seeking to harness emerging technologies for societal and economic benefit.

Keywords: *Technology Innovation, Interdisciplinary Collaboration, Digital Transformation, Policy- Frameworks, Research Acceleration*

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P-16

The Role of AI and Machine Learning in Modern Pharmaceutical Research and Development

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Abstract

Artificial Intelligence (AI) has become an influential tool in pharmaceutical research, offering rapid and effective solutions to complex challenges in drug development. Recent advancements in AI and machine learning (ML) have significantly impacted areas such as drug discovery, formulation, and dosage form testing. By leveraging large-scale biological data—including genomics and proteomics—AI algorithms can identify disease-related targets and predict interactions with drug candidates. This targeted approach enhances the efficiency and success rate of drug discovery while potentially lowering the time and cost required for development. AI plays a crucial role in optimizing the research and development pipeline. ML models support experimental design, predict pharmacokinetics (PK), and evaluate toxicity profiles, allowing for better prioritization of lead compounds and reducing reliance on animal testing. These capabilities not only improve early-stage development efficiency but also streamline preclinical and clinical testing phases. In addition, AI enables the advancement of personalized medicine by analysing real-world patient data to tailor treatments, improving therapeutic outcomes and patient compliance. Its applications extend across drug delivery system design, process optimization, formulation analysis, and PK/PD modelling. Broad applications of AI across pharmaceutical sciences, has both advantages and limitations. While challenges such as data quality, regulatory concerns, and model transparency persist, the integration of AI into pharmaceutical workflows continues to evolve. Ongoing research and investment in AI technologies are expected to enhance drug development and personalized healthcare, ultimately leading to more effective and accessible treatments for patients.

Keywords: *Artificial Intelligence, Machine Learning, Drug Discovery Pharmaceutical Development Dosage Form Design*

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Natural Catalysts and Green Chemistry in Pyran Synthesis: A Review of Methods and Medicinal Significance

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Abstract

Sustainable and environmentally friendly techniques for the synthesis of biologically active heterocycles, especially pyran derivatives, have been developed as a result of the growing emphasis on green chemistry. Pyrans are heterocycles of six members that contain oxygen and have a variety of pharmacological activities, such as anti-microbial, anti-viral, anti-oxidant, anti-cancer, and anti-tubercular qualities. There is a need for cleaner alternatives because traditional synthetic methods frequently use hazardous solvents, unfavourable conditions, and low yields. This review explores recent developments in the environmentally friendly production of fused pyran analogues using waste-based and naturally derived catalysts, including water extracts of banana peel ash (WEB), agro-waste nano-Sio_2, and fruit juices (lemon, kiwi). These environmentally friendly techniques use multicomponent reactions (MCRs) at ambient to mild reaction conditions, such as Michael addition, intramolecular cyclisation, and Knoevenagel condensation, to produce structurally diverse pyran scaffolds with high efficiency and low environmental impact. Numerous of these synthetic derivatives have shown encouraging biological activities; certain compounds have been shown to exhibit strong radical scavenging activity, cytotoxicity against different cancer cell lines, antimycobacterial effects, and significant inhibition zones against pathogenic bacteria. According to the fundamentals of green chemistry, the combination of effective synthetic pathways and green catalysts provides a sustainable method for designing and developing heterocyclic drugs.

Keywords: *Green chemistry, Pyrans, Knoevenagel condensation, Eco-friendly, Heterocyclic compounds*

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P-18

Biohybrid Microrobots: A New Frontier for Targeted Drug Delivery and Precision Therapeutics

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Abstract

Biohybrid Microrobots, which combine living biological components with synthetic materials, provide an innovative way to improving medical treatments, notably drug delivery. Microrobots use natural biological systems, such as bacteria, algae, or mammalian cells, in conjunction with synthetic components like nanoparticles and polymers to enable focused, efficient, and sensitive therapeutic delivery. Key mechanisms like as pH sensitivity, temperature responsiveness, and enzyme-triggered release provide precise medication release at the location of need, allowing for localized therapy and lowering adverse effects. Despite their prospective applications, obstacles such as biocompatibility, stability, scalability, and regulatory constraints persist. Future developments, like as enhanced propulsion systems, AI integration, and improved targeting mechanisms, have the ability to solve these challenges. Biohybrid have the potential to transform drug delivery, illness diagnostics, tissue healing, and regenerative medicine, opening up new possibilities for personalised and efficient healthcare.

Keywords: *Biohybrid Microrobots, Targeted Drug Delivery, Nanoparticle, Polymers, Biocompatibility, Responsiveness, AI integration, Regenerative medicine, Efficient healthcare*.

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Molecular Property Prediction Through Cheminformatics and Machine Learning: A New Era in Computational Chemistry"

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Abstract

Predicting molecular properties is a crucial aspect of contemporary chemistry that is necessary for evaluating environmental safety, creating sustainable materials, and speeding up drug discovery. Properties including solubility, toxicity, melting point, and biological activity have traditionally been ascertained using experimental techniques, which are frequently labor-intensive and time-consuming. A new age in computational chemistry has been ushered in by the combination of cheminformatics and machine learning (ML), which allows for quicker, more affordable, and frequently more accurate data-driven predictions. This chapter examines how algorithmic modeling utilizing massive chemical datasets has replaced trial-and-error experimentation. Chemical structures are numerically represented by molecular fingerprints and descriptors, which are used to construct predictive models. Relationships between molecular structure and function are discovered by machine learning techniques such ensemble approaches, decision trees, regression, and neural networks. Applications include green chemistry, materials science, and pharmaceuticals. These models facilitate tasks such as ADMET profiling, toxicity prediction, and chemical property optimization. Databases like PubChem and ChEMBL, as well as tools like RDKit, DeepChem, and KNIME, provide the computational basis. Model interpretability, data quality, and the requirement for experimental validation are still issues despite advancements. To increase forecast accuracy even more, future directions include deep learning, self-governing lab systems, and integration with quantum chemistry.

Keywords: *Cheminformatics, Machine Learning, Molecular Property Prediction, Computational Chemistry, Molecular Descriptors and fingerprints*

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Network pharmacology is a potentially effective method for utilizing software analysis to uncover the pharmacology mechanism

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Abstract

Network pharmacology (NP), on the other hand, takes a systems-level approach, considering the holistic character of biological processes. The potential and developments in network pharmacology, highlight the role that software analysis plays in revealing the complexities of pharmacological systems. A flexible framework called cytoscape makes it possible to visualize intricate networks, and STITCH makes it easier to investigate protein-protein interactions, which are essential for discovering how drugs work. Conversely, network analyst provides researchers with statistical tools for strong data analysis, enhancing the precision and breadth of pharmacological findings. The present research aims to provide a thorough exploration and communication of the transformative function of network pharmacology, with a focus on its potential for identifying intricate pharmacological mechanisms via sophisticated software analysis. The approach utilized in this article seeks to thoroughly examine the promising approach of network pharmacology in elucidating pharmacological mechanisms via advanced software analysis. With the use of software analysis, network pharmacology has emerged as a viable method for pharmacological mechanism discovery. Network pharmacology is a promising technique for illuminating intricate pharmacological pathways through advanced software analysis by combining computational tools.

Keywords: *Cytoscape, STITICH, Network Pharmacology, NP, Drug Discovery.*

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Artificial Intelligence-Driven Formulation Strategies for Targeted Drug Delivery in Alzheimer's Disease: Bridging Pharmaceutics and Precision Medicine

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Abstract

Alzheimer's disease (AD) is a challenging disease with its complex pathology, moderate therapeutic efficacy, and impaired drug delivery to the brain. The traditional pharma strategies cannot deliver site-specific delivery and optimal bioavailability, and therefore new generation formulation technologies are in demand. This review highlights non-AI-based formulation technologies, which are revolutionizing targeted drug delivery in AD by fulfilling the promise of precision medicine. Lipid-based drug delivery systems such as liposomes and solid lipid nanoparticles are prospective candidates for enhanced drug penetration across the blood-brain barrier, while polymeric nanoparticles and dendrimers provide sustained release with enhanced targeting. Intranasal drug delivery systems also provide non-invasive direct nose-to-brain delivery with systemic breakdown avoidance. Stimuli-responsive delivery systems, prodrug systems, and mucoadhesive systems are also providing patient-specific delivery profiles for enhanced patient compliance and therapeutic efficacy. Together with pharmacogenomics and molecular profiling, these approaches enable individualized therapies in heterogeneous populations of AD with reduced clinical outcome variability. The review critically examines these formulation technologies by assessing their design, mechanism of action, therapeutic utility, and translatability. Intersecting pharmaceutics and precision medicine independent of artificial intelligence, this approach enables more predictable, safe, and potent therapies in AD. The article calls for additional research into new, AI-proof technologies to address the intricate issues of drug delivery in Alzheimer's.

Keywords: *Alzheimer's Disease, Targeted Drug Delivery, Lipid-Based Systems, Intranasal Delivery, Polymeric Nanoparticles, Precision Medicine*

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An in-depth examination of drug mechanisms utilizing network pharmacology to decipher complex activities

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Abstract

Network pharmacology has emerged in the field of pharmacology research as a result of an effort to comprehend the complex interactions that exist between medications, targets, and diseases. To understand the intricacy of drug interactions, network pharmacology fundamentally unites several fields, including bioinformatics, systems biology, and pharmacology. The present research aims to give a thorough examination of the function of network pharmacology in recognizing and interpreting intricate processes in biological systems, especially in drug development and discovery. By concentrating on the fundamental ideas of network pharmacology methodology, data is used to mimic drug responses inside biological networks, study drug-target interactions, and forecast biological pathways using computer algorithms and in silico technologies. Adding in silico techniques makes network pharmacology better by predicting how drugs will interact with their targets and making biological pathways clearer. Model simplifications necessitate vigilance, even though they promise speed and cost-efficiency. Drug discovery is accelerated, and personalized treatment is advanced by combining computational predictions with experimental validation. Network pharmacology signifies an approach change in our comprehension and analysis of intricate processes occurring within biological systems. Network pharmacology provides a thorough framework for deciphering the complex nature of drug activities by acknowledging the interdependence of medications, targets, and illnesses. Personalized medicine and better-informed drug development are made possible by network pharmacology.

Keywords: *Network pharmacology, Drug discovery, Computational modelling.*

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Next-Generation Nanosponges for Targeted Drug Delivery in Triple-Negative Breast Cancer: A Breakthrough in Controlled Chemotherapy

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Abstract

Triple-negative breast cancer (TNBC) represents an aggressive subtype of breast cancer characterized by the absence of estrogen, progesterone, and HER2 receptors, rendering conventional hormonal and targeted therapies ineffective. Chemotherapy remains the cornerstone of treatment, but its non-specificity often results in systemic toxicity and limited efficacy. Recent advancements in nanomedicine have paved the way for next-generation nanosponges—highly porous, biocompatible, and stimuli-responsive nanocarriers that can encapsulate a wide range of chemotherapeutic agents. These nanosponges offer precise drug delivery by targeting tumor-specific microenvironments, enhancing therapeutic payload accumulation at the tumor site while minimizing adverse effects on healthy tissues. Functionalization with ligands such as antibodies, peptides, or folate allows for active targeting of overexpressed biomarkers in TNBC cells, ensuring site-specific delivery. Additionally, pH-sensitive or enzyme-responsive nanosponges enable controlled and sustained drug release within the acidic and enzyme-rich tumor milieu. This breakthrough approach not only improves drug bioavailability but also addresses multi-drug resistance—a common challenge in TNBC therapy. Incorporating these advanced nanocarriers into treatment regimens has demonstrated promising preclinical outcomes, including reduced tumor progression, enhanced cellular uptake, and improved survival rates. This review explores the design, functionalization, and therapeutic potential of next-generation nanosponges in TNBC management, emphasizing their role in revolutionizing controlled chemotherapy. The convergence of nanotechnology and oncology through nanosponges represents a transformative strategy in the quest for effective, targeted, and patient-friendly cancer treatments.

Keywords: *Triple-Negative Breast Cancer, Nanosponges, Targeted Drug Delivery, Controlled Chemotherapy, Stimuli-Responsive Nanocarriers, Drug Resistance.*

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Mind Over Machine: Using Brain-Computer Interface to Transform Mobility.

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Abstract

An advancement in neurotechnology known as the Brain-Computer Interface (BCI) enables direct connection between the brain and external devices without the use of muscles or nerves. It gives people who have been paralyzed by strokes, spinal injuries, or illnesses like Parkinson's and ALS hope. Brain-computer interfaces (BCI) systems use implanted electrodes or electroencephalograms (EEG) to identify brain impulses and translate them into orders for robotic arms, wheelchairs, and computers. These systems are become more precise, responsive, and customized thanks to AI and machine learning. In the future depicted in "Mind Over Machine," mobility, independence, and dignity will be restored when thoughts alone are able to transcend physical obstacles. BCI is a significant factor in next-generation technology, with uses in smart homes, business, and defence in addition to healthcare. In keeping with the notion of YANTRA, or the Yugantar for Advancing New Technology Research & Acceleration, BCI symbolizes both a humanitarian revolution and technological advancement. It opens the door to an inclusive digital future by transforming inaction into action, handicap into ability, and reliance into autonomy.

Keywords: *Brain-Computer Interface, Neurotechnology, Artificial Intelligence, Paralysis Rehabilitation, Human-Machine Interaction, YANTRA*

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Green-Synthesized Herbal Nanocarriers: Bridging Traditional Medicine with Modern Nanoscience

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Abstract

The integration of nanotechnology with herbal medicine represents a transformative advancement in pharmaceutical sciences. Traditional herbal formulations, despite their longstanding use and recognized safety, often suffer from limitations such as poor solubility, minimal bioavailability, quick degradation, and non-specific action. Green nanotechnology emerges as a sustainable alternative by employing plant-derived materials to create biocompatible nanocarriers that enhance the effectiveness and precision of herbal therapies. Green nanotechnology involves the use of phytochemicals as natural agents to reduce and stabilize nanoparticles during their synthesis process. It highlights different types of nanocarrier systems such as metallic nanoparticles, solid lipid carriers, and biodegradable polymers created using medicinal plant extracts. Their applications cover across various therapeutic areas, including antimicrobial, anti-inflammatory, anticancer, neuroprotective, and wound-healing domains. Essential characterization techniques covering particle size, morphology, surface charge, and drug release behavior are reviewed to underline their importance in product quality and stability. Despite notable advances, obstacles persist in terms of reproducibility, mechanistic understanding, toxicological assessment, and unclear regulatory pathways. These factors must be addressed to enable the broader clinical use of green-synthesized herbal nanomedicines. In conclusion, green nanotechnology holds immense promise for modernizing herbal drug delivery by making it more efficient, eco-conscious, and suitable for large-scale production. With continued interdisciplinary efforts, these systems could represent the future of natural, safe, and targeted therapies.

Keyword: *Green Nanotechnology, Herbal Nanocarriers, Eco-friendly Synthesis, Phytochemical Reduction, Targeted Drug Delivery, Sustainable Pharmaceuticals*

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Smart Drug Delivery Systems: Responsive Technologies in Pharmacology

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Abstract

Pharmacology is experiencing a technological transformation, increasingly propelled by a desire for accuracy and customization in medical care. Conventional drug delivery techniques are limited by nonspecific distribution, require frequent dosing, and pose a significant risk of dose-limiting side effects. The emergence of smart drug delivery systems (SDDS) is changing this field by facilitating targeted localization and stimuli-triggered release of therapeutic agents. These systems combine developments in materials science—especially in polymers, nanomaterials, and hybrid organic-inorganic platforms—with molecular targeting and real-time sensing technologies to guarantee that drugs are delivered only at the appropriate site, time, and dosage. Intelligent drug delivery systems (SDDS) harness a variety of internal and external stimuli—such as changes in pH, temperature fluctuations, enzymatic activity, redox gradients, exposure to light, application of magnetic fields, and real-time biosensor feedback—to adapt dynamically to evolving physiological and pathological conditions within the body. By precisely controlling drug release in response to these specific triggers, SDDS promise to greatly enhance therapeutic efficacy while minimizing systemic toxicity and adverse side effects. These advanced delivery platforms also support the ongoing shift toward personalized medicine by enabling tailored treatment strategies that respond to individual patient needs and disease profiles. This chapter provides concise overview of the core principles, enabling technologies, stimulus-responsive mechanisms, clinical applications, current challenges, and future perspectives of smart drug delivery, positioning SDDS at the forefront of innovative next-generation pharmacotherapy.

Keywords: *Smart drug delivery system (SDDS), Stimuli-Responsive Drug delivery, Targeted Drug delivery, Nanocarriers and Nanoparticles, Stimuli-Sensitive polymers*

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Stimuli-Responsive Drug Delivery Systems for Targeted Cancer Therapy: Innovations in Smart Polymers and Nanocarriers

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Abstract

Stimuli-responsive drug delivery systems (SR-DDS) are a new innovation in cancer targeting drug therapy, enabling accurate, controlled, and site-specific drug release in response to specific physiological and pathological stimuli. The chapter of the book describes in detail the fundamentals, problems, and progress in the design of intelligent polymer- and nanocarrier-based systems responsive to internal stimuli such as pH, redox potential, enzymes, and hypoxia and external stimuli such as temperature, light, and magnetic fields. Starting with an introduction to targeted drug delivery, the chapter emphasizes the limitations of conventional methods, including non-specific delivery, systemic toxicity, and multidrug resistance. The chapter proceeds to discuss the design, synthesis, and functionalization of intelligent polymers, separating non-biodegradable and biodegradable systems and their impact on therapeutic performance and safety. Dual and multi-stimuli-responsive systems' potential is also highlighted, specifically to overcome tumor heterogeneity and drug resistance. In addition, the chapter discusses TME-responsive delivery systems by incorporating target ligands and tumor-penetrating peptides in order to improve localization and penetration. Advanced findings in polymer chemistry and nanotechnology are also covered with reference to image-guided and individualized cancer treatment. Altogether, this chapter provides a critical overview of the future developments in intelligent, stimulus-responsive drug delivery with a view to facilitating improved, patient-specific cancer treatment by multi-disciplinary innovation.

Keywords: *Stimuli-Responsive Drug Delivery, Smart Polymers, Nanocarriers, Tumor Microenvironment, Multi-Stimuli Systems, Targeted Cancer Therapy*

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Exploring the Gut-Brain Axis: The Impact of Microbiome on Brain Function and Its Implications in Neurodegenerative Disorder

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Abstract

Background: The gut-microbiome-brain axis is made up of the brain, immunological system, endocrine system, and autonomic nervous system. The brain regulates gut function through the hypothalamic-pituitary adrenal axis and the autonomic nervous system. The gut affects the central nervous system through a variety of gut hormones, neuroactive compounds, and microbiome-derived metabolites. These regulators exert their effect on the nervous system via the vagus nerve, immune system, and enteric nervous system. These pathways together constitute the gut-microbiome-brain axis. Objective: There is growing evidence that the gut microbiome plays an important role in neurodevelopment, aging, and brain disorders like stroke, Alzheimer's disease, and Parkinson's disease. Recent research suggests that the gut microbiota affects microglial activity through immunological and metabolic pathways, which may have consequences for neurodevelopmental, neurodegenerative, and psychiatric disorders. The review examines existing research on the connection between the microbiota and neurodegenerative disorders; the review highlights possible processes and treatment approaches. Conclusion: Results indicate that gut dysbiosis, which is defined by microbial imbalance, is closely linked to the pathophysiology of neurodegenerative diseases by affecting immune responses, enhancing permeability of the blood-brain barrier, and producing neurotoxic metabolites. Restoring microbial equilibrium and delaying the progression of disease are potential benefits of therapeutic strategies that target the gut microbiome, such as prebiotics, probiotics, and fecal microbiota transplantation. However, further research is necessary to validate these results and provide successful clinical interventions.

Keywords: *Dysbiosis, Microbiome, Neurodegenerative diseases, Prebiotics, Probiotics*

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The Role of Artificial Intelligence in Modern Drug Development: Focus on Preformulation and Formulation

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Abstract

The integration of Artificial Intelligence (AI) into pharmaceutical research is transforming the landscape of modern drug development, particularly in the critical early stages of preformulation and formulation. Preformulation studies, which involve the physicochemical and solid-state characterization of drug candidates, are foundational to designing effective, stable, and safe pharmaceutical products. Key parameters such as solubility, pKa, polymorphism, stability, and excipient compatibility guide the development pipeline. AI techniques, including Machine Learning (ML), Artificial Neural Networks (ANN), Deep Learning (DL), Support Vector Machines (SVM), and QSPR/QSAR models, are increasingly being utilized to streamline and enhance these preformulation processes. These tools enable predictive modeling and data-driven decision-making, reducing experimental burden and accelerating development timelines. Applications of AI span solubility and pKa prediction, polymorph screening, stability forecasting under various environmental conditions, and excipient selection. This review highlights the scope, methodologies, and real-world applications of AI in preformulation studies, emphasizing its transformative potential in advancing precision, efficiency, and innovation in drug development.

Keywords: *Artificial Intelligence, Solubility Prediction, Polymorphism, Stability, Machine Learning, Artificial Neural Networks, Deep Learning*

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Conference Proceedings

P-30

An Overview of Software in Pharmaceutics.

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Abstract

The use of software in the pharmaceutical industry has revolutionized drug discovery, development, manufacture, and regulatory compliance. This chapter offers a general overview to software in pharmaceutics with a focus on how digital technologies make things simpler, more accurate, and more productive throughout the drug development process. The chapter begins by outlining pharmaceutics and the complexity of drug innovation taking into account scientific, ethical, and societal considerations. The discussion brings into context the mounting demand for software that can understand and manage the complex mechanisms of modern medicine, clinical research, and regulatory systems. The drug development pipeline is covered in depth—target discovery, lead optimization and formulation, to preclinical development and post-approval surveillance. Software solutions at each step such as Electronic Data Capture (EDC), Clinical Trial Management Systems (CTMS), and Pharmacovigilance platforms are of critical significance. The pharma sector also relies extensively on ERP systems, CAD tools, simulation software, Quality Management Systems (QMS), and Electronic Health Record (EHR) software to ensure product quality, regulatory compliance, and business efficiency. Machine Learning and Artificial Intelligence (AI) advancements have led to paradigm-shifting strategies to predictive modeling, discovery of biomarkers, high-throughput screening, and medicine personalized to the individual. How AI can accelerate preclinical research, optimize clinical trial design, and enable customized therapies is examined, as well as data ethics, regulation, and cooperation across the industry. The book would end with popular future perspectives on AI-based solutions, the support for worldwide data sharing, and the planned adaptation of software for small and large pharmaceutical companies.

Keywords: *Software, Electronic Data Capture, Artificial Intelligence.*

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P-31

Exploration of Mechanisms Responsible for the Neuropharmacological Potential of Some Bioactive Phytoconstituents

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Abstract

Introduction: Natural and herbal remedies, also known as "alternative" or "complementary" medicines, have grown tremendously in popularity over the past two decades because of their availability, good tolerability, safety and benefits (Mischoulon, 2018). It has been reported that many herbs with psychotropic effects have far fewer side effects than a variety of pharmaceutical agents used by psychiatrists (Matraszek-Gawron et al., 2019). Also, some of the herbal medicines provide superior antidepressant effect compared to the classic antidepressant. **Objectives:** To determine the Neuropharmacological potential of selected bioactives and to determine the possible underlying mechanism. **Methodology:** Animals: Swiss albino mice, Ethical Clearance: The procedures followed were approved by Institutional Animal Ethics Committee (IAEC). Induction of Depression and Anxiety related Behaviour alteration: CUMS (Chronic Unpredictable Mild Stress) and DEXA (Dexamethasone) treatment for 3-5 weeks. Test Compounds: Includes any bioactives or vitamin or amino acids. Assessment of Behavioral alterations: Open field test, Test for anhedonia Statistical analysis: Graph Pad Prism software (9.4.3). **Outcomes:** Validation of the selected bioactives against the neurological disorders and Scientific publication and knowledge.

Keywords: *Herbal Remedies, Mice Model, Bioactives, Neuropharmacological Effects.*

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Next-Gen Antibiotics and Anti-Virulence Strategies: Combating Multidrug-Resistant Pathogens

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Abstract

The rapid emergence of multidrug-resistant (MDR) pathogens poses a severe global health threat, rendering conventional antibiotics increasingly ineffective. The rise of "superbugs" necessitates urgent innovation beyond traditional antibiotic development. This review explores next-generation antibiotics and anti-virulence strategies as pivotal solutions in the fight against MDR infections. Next-generation antibiotics are being designed with enhanced specificity, minimized resistance development, and novel mechanisms of action, such as targeting bacterial communication (quorum sensing), efflux pump inhibition, and disruption of essential biosynthetic pathways. Simultaneously, anti-virulence strategies aim to disarm pathogens without exerting selective pressure for survival, thus reducing the evolution of resistance. These strategies include neutralizing toxins, inhibiting biofilm formation, blocking adhesion molecules, and manipulating host-pathogen interactions. Recent breakthroughs in synthetic biology, genomics, and nanotechnology are facilitating precision-targeted therapies and the discovery of novel antimicrobial peptides, phage therapy, and CRISPR-based antimicrobials. Additionally, the integration of AI and machine learning has accelerated antibiotic discovery pipelines and optimized drug-target interactions. While promising, these approaches face translational hurdles such as regulatory challenges, pharmacokinetic limitations, and economic disincentives for antibiotic development. Nevertheless, the paradigm shift from pathogen-killing to pathogen-disarming strategies opens new frontiers in antimicrobial research. A multi-disciplinary and collaborative framework is vital to overcoming the escalating antimicrobial resistance crisis. This review highlights the potential and challenges of next-gen antibiotics and anti-virulence approaches, emphasizing the need for global stewardship and innovation-driven interventions to safeguard future generations.

Keywords: *Multidrug-Resistant Pathogens, Anti-Virulence Therapy, Next-Generation Antibiotics, Quorum Sensing, Antimicrobial Peptides, Phage Therapy*

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Integrating Chemometric Tools and Advanced Technologies for Optimized HPLC Analysis: A Data-Driven Paradigm in Pharmaceutical Research

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Abstract

High performance liquid chromatography (HPLC) remains a cornerstone in pharmaceutical analysis, yet traditional method development can be time intensive and resource consuming. In this study, we demonstrate a comprehensive approach that integrates chemometric tools with advanced digital technologies to enhance method development, optimization, and validation of HPLC procedures. Multivariate statistical techniques, such as Principal Component Analysis (PCA), Partial Least Squares (PLS), and Design of Experiments (DoE), were employed to systematically evaluate critical method parameters and their interactive effects on chromatographic performance. The implementation of Artificial Intelligence (AI)-assisted optimization platforms and digital twin models enabled predictive simulation and real-time refinement of chromatographic conditions, significantly reducing the number of experimental runs. Case studies involving multi-component pharmaceutical formulations revealed enhanced resolution, improved method robustness, and compliance with ICH Q2(R2) validation criteria. Results showed a 40% reduction in development time, a 30% increase in peak resolution, and improved reproducibility compared to conventional trial and error approaches. These findings underscore the transformative potential of combining chemometric strategies with digital innovation in chromatography, offering a sustainable, efficient, and regulatory-compliant workflow for modern pharmaceutical analysis.

Keywords: *HPLC, Chemometric Tool, Design of Experiment, Principal Component Analysis, Partial Least Squares, Advanced Technology*

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Decoding Drug Action at the Molecular Level: Advances in Pharmacology, Therapeutics, and Personalized Medicine

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Abstract

Molecular pharmacology is an interdisciplinary field that integrates pharmacology, molecular biology, biochemistry, and bioinformatics to investigate the molecular mechanisms underlying the action of drugs. This review presents a comprehensive overview of the field's evolution, foundational concepts, and experimental techniques, emphasizing its central role in modern drug discovery and personalized medicine. Key topics covered include drug-receptor interactions, signal transduction pathways, pharmacokinetics, pharmacodynamics, and quantitative structure-activity relationships (QSAR), which are crucial for understanding drug efficacy and safety. Advanced molecular techniques such as polymerase chain reaction (PCR), gene cloning, Western blotting, and immunoprecipitation are highlighted for their utility in studying gene expression and protein interactions. The integration of these tools enhances our ability to investigate molecular targets and optimize lead compounds. Emerging technologies, including CRISPR-Cas9 gene editing, RNA-based therapies, nanotechnology, and immunotherapy, are discussed for their transformative impact on therapeutic development. The review also critically examines current challenges, including issues related to drug delivery, tissue-specific targeting, biocompatibility, and overcoming biological barriers like the blood-brain barrier. Additionally, the paper explores future directions in the field, including the application of artificial intelligence (AI), machine learning, and omics-based technologies for predictive modelling, target identification, and personalized treatment strategies. Overall, this work underscores the vital importance of molecular pharmacology in advancing healthcare by enabling the development of safer, more effective, and individualized therapies through a deeper understanding of biological mechanisms and technological innovations.

Keywords: *Molecular Pharmacology, Drug Discovery, Personalized Medicine, Signal Transduction, Targeted Therapies*

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P-35

Integrating AI in Pharmaceutical Sciences: From Molecular Modeling to Patient Care

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Abstract

In the pharmaceutical sciences, artificial intelligence (AI) is revolutionizing information representation, problem-solving, and decision-making by using intelligent modeling techniques. Important fields like drug development, drug delivery formulation, polypharmacology, and hospital pharmacy have been significantly impacted by its integration. Artificial Neural Networks (ANNs), particularly Deep Neural Networks (DNNs) and Recurrent Neural Networks (RNNs), are an important part of AI approaches for drug development. The physicochemical characteristics, toxicity, and biological activity of possible treatment options are predicted using these models. New compounds have been identified and optimized more quickly thanks to their contributions to Quantitative Structure-Activity Relationships (QSAR) and Quantitative Structure-Property Relationships (QSPR). De novo drug development is also made easier by AI, which makes it possible to create novel compounds with advantageous pharmacokinetic and pharmacodynamic characteristics. AI improves patient outcomes, increases dose accuracy, and forecasts how well drug delivery systems will work throughout formulation development. In the field of polypharmacology, artificial intelligence (AI) facilitates the creation of more potent multi-target medicines by helping to comprehend how drugs interact with several biological targets. Additionally, integrating AI into hospital pharmacies improves clinical decision support systems, allowing for customized drug schedules, expediting prescription procedures, and enhancing inventory control. When combined, these uses result in increased operational effectiveness, patient safety, and therapeutic efficacy. All things considered, artificial intelligence (AI) is a revolutionary tool in contemporary pharmacy, providing creative answers throughout the pharmaceutical pipeline—from molecular design to patient care—and eventually changing the face of pharmaceutical research and healthcare delivery**.**

Keywords: *Artificial Intelligence, Pharmaceutical Sciences, Drug Development, Drug Delivery Formulation, Polypharmacology, Hospital Pharmacy*

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A comprehensive overview of clinical trials and pharmacovigilance

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Abstract

This chapter provides an overall picture of clinical trials and pharmacovigilance two very much required pillars of the contemporary pharmaceutical age. It starts with the two definitions and the quintessential importance of the two in guaranteeing the safety, effectiveness, and quality of medicinal products. Clinical trials are methodically conceived studies to assess new drugs, treatments, or interventions that move from the phases I to IV with varying goals and regulatory targets. The chapter explains different clinical trial types, e.g., interventional and observational designs, and explains the roles of all the stakeholders involved, e.g., sponsors, investigators, and ethics committees. Regulatory settings, ethics, and good clinical practice (GCP) are centered upon to make sure that trials are conducted responsibly and transparently. The chapter also describes the application of data management tools such as Electronic Data Capture (EDC) and Clinical Trial Management Systems (CTMS) in accurate and efficient data management. Pharmacovigilance, the art and science of detection, evaluation, and prevention of adverse drug reactions (ADRs), is presented highlighting its aims, mechanisms, and international impact. Key pharmacovigilance activities like ADR reporting, signal detection, and risk management are discussed with top databases like VigiBase, EudraVigilance, and FAERS. The chapter addresses challenges in every one of these areas—ethical issues, data complexity, and underreporting—and points out the evolving role of the pharmacist in clinical and safety environments. Lastly, topics like artificial intelligence, real-world evidence, and COVID-19 vaccine surveillance lessons are examined in order to identify changing aspects of clinical research and pharmacovigilance in modern digital ages.

Keywords: *Clinical Trial Phases, Ethics Committees, Informed Consent, Signal Detection*

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Artificial Intelligence in Pharmacy: Catalyzing Innovation from Drug Discovery to Patient-Centered Care

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Abstract

Artificial Intelligence (AI) is transforming the pharmaceutical industry by shifting traditional processes toward intelligent, data-centric models. The expanding role of AI across all stages of the pharmaceutical pipeline, from initial drug discovery to patient-focused healthcare. In early development, AI expedites key tasks such as identifying biological targets, molecular simulation, and virtual compound screening, thereby saving both time and resources. Advanced algorithms, such as Machine Learning (ML) and Deep Learning (DL), are employed to reliably forecast properties like drug-likeness, toxicity, and pharmacokinetics, thereby enhancing the quality of preclinical investigations. During clinical research, AI contributes by enabling adaptive trial frameworks, dynamic data interpretation, and precise patient categorization, improving trial outcomes and regulatory success rates. AI also plays a critical role in pharmaceutical manufacturing by facilitating continuous monitoring, robust quality control, predictive system maintenance, and adherence to regulatory guidelines. In pharmacy practice, AI innovations, including clinical decision support tools, personalized treatment platforms, and AI-driven chatbots, are reshaping patient engagement, medication adherence, and drug safety monitoring. Additionally, it supports operational improvements through smart inventory systems, automated drug dispensing, and telepharmacy services. While AI offers substantial advancements, it also brings challenges, including concerns around data security, algorithmic accountability, ethical standards, and regulatory alignment. While AI provides substantial advancements, it also brings challenges, including concerns around data security, algorithmic accountability, ethical standards, and regulatory alignment. A comprehensive overview of AI's current applications, challenges, and future potential highlights its capacity to enhance accuracy, efficiency, and patient-centeredness in pharmacy.

Keywords: *Artificial Intelligence, Machine Learning, Deep Learning, Drug Discovery, Personalized Medicine, Automated Dispensing, Digital Health*

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P-38

Antibacterial and Bioactive Hybrid Hydrogels in Wound Regeneration

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Abstract

Wounds that are chronic and infected present a substantial healthcare burden and frequently call for sophisticated treatments. Natural and synthetic polymer-based hybrid hydrogels have shown great promise as materials for wound regeneration because of their multifunctionality, structural adaptability, and biocompatibility. The biological features of natural polymers including chitosan and gelatin include enzymatic degradability, cell adhesion, and hemostasis. When combined with synthetic polymers such as polyvinyl alcohol or polyethylene glycol, the resultant hybrid hydrogels show improved swelling capacity, controlled degradation, and mechanical stability. Antibacterial substances like zinc oxide, silver nanoparticles, or essential oils can be added to the hydrogel matrix to assist stop bacterial colonization and the development of biofilms. Growth factor, peptide, or plant-derived substance loading simultaneously promotes angiogenesis, re-epithelialization, and cellular proliferation. By using specific crosslinking techniques, such as ionic contacts, Schiff base reactions, these compounds can be released in a controlled manner. Additionally, hybrid hydrogels are perfect for uneven wound geometries due to their soft, conformable nature, and their moisture-retentive qualities help to maintain the best possible healing environment. Stimuli-responsive hydrogels are recent developments that release therapeutic compounds in reaction to pH variations or enzymatic activity unique to inflammatory or infected wounds. In summary, hybrid hydrogels that combine antibacterial and bioactive properties offer a novel approach to wound care by fusing the ability to regenerate with infection control.

Keywords: *Chronic, Biocompatible, Regeneration, Cell Adhesion, Antibacterial*

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Advancements in Second-Generation Intranasal Lipid Carriers For Brain Delivery

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Abstract

The intranasal route has become a viable non-invasive method for delivering drugs straight to the brain by circumvent the blood-brain barrier (BBB). The development of nanostructured lipid carriers (NLCs) for nose to brain drug delivery has advanced significantly in recent years, improving the therapeutic efficacy for brain disorders. Compared to conventional lipid-based systems, NLCs provide better drug loading, stability, and controlled release profiles because they are made of a mixture of liquid and solid lipids stabilized by surfactants. Particle size, zeta potential, and surface properties can now be precisely controlled through advancements in formulation approaches like high-pressure homogenization, microfluidics, and ultrasonication. These factors are essential for effective nasal mucosal penetration and brain targeting. In addition to improving residence time of nasal mucosa, surface decoration of NLCs with mucoadhesive polymers such as chitosan and its derivatives which also improves paracellular transport. Furthermore, it has been demonstrated that adding natural bioenhancers like borneol and piperine improves BBB bioavailability and penetration. Moreover, solvent-free and environmentally friendly preparation techniques are becoming more popular due to their regulatory acceptability and biocompatibility. These developments offer an effective method of treating disorders of the brain, opening the door for further translational studies and clinical uses. Further research in this area could help solve the present problems with neurotherapeutic medication delivery.

Keywords: *BBB, Intranasal, Microfluidics, Non-invasive, Neurotherapeutic*

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P-40

Application of AI and QbD in Formulation Development

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Abstract

Formulating a new drug isn't just about mixing ingredients anymore—it's about understanding every detail of the product and the process behind it. With increasing demands for speed, efficiency, and quality in the pharmaceutical world, the combination of Artificial Intelligence (AI) and Quality by Design (QbD) is transforming how formulations are developed. QbD provides a clear, structured approach that helps scientists identify what makes a drug product effective and safe—from critical quality attributes to optimal processing conditions. It takes the guesswork out of development by using tools like Design of Experiments (DoE) and risk assessments to create a well-understood and reliable process. AI adds a whole new layer of intelligence to this framework. Machine learning and data analytics allow researchers to predict things like drug-excipient compatibility, dissolution behavior, and even stability—without the need for endless trial-and-error testing. AI can spot trends in complex data that humans might miss, making formulation decisions faster and more precise. Together, AI and QbD offer a smarter, more proactive way to develop pharmaceutical products. This presentation explores how their integration is helping researchers work more efficiently, meet regulatory expectations, and ultimately deliver better, safer medicines to patients—faster than ever before.

Keywords: *Artificial Intelligence, Quality by Design, Formulation Development, Design of Experiments (Doe), Critical Quality Attributes, Machine Learning, Predictive Modelling.*

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Potential role of Nanomedicine in breast cancer: The emerging frontier

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Abstract

Breast cancer is regarded as the most hazardous disease in the world. The incidence and mortality of cancer have been rising annually in recent years due to a variety of reasons. However, traditional treatments like surgery, chemotherapy, and radiation therapy have drawbacks such poor targeting, medication deterioration, and unintended adverse effects. Because of their low toxicity, bioavailability, and targeting, nanomedicines represent a new alternative. Nanomedicine has enormous potential to enhance breast cancer detection, therapy, and patient outcomes as science and technology advance, bringing us one step closer to a time when breast cancer can be controlled more successfully and with fewer adverse effects. The potential of various nanomaterials, such as organic, inorganic, and composite nanoparticles, to overcome the drawbacks of traditional treatments is being investigated. Nanomedicine has enormous potential to enhance breast cancer detection, therapy, and patient outcomes as science and technology advance, bringing us one step closer to a time when breast cancer can be controlled more successfully and with fewer adverse effects. There is great potential for improving therapeutic outcomes when using nanomedicine in breast cancer treatment. Although there are still challenges in translating preclinical research into clinical settings. The advancements in nanotechnology have led to the creation of agents in nanomedicine, which have proven to be effective as a promising therapeutic tool in the treatment of many breast cancer types. With further research aiming at improving therapeutic efficacy and delivery mechanisms, the future of nanomedicine in breast cancer treatment appears bright.

Keywords: *Nanomedicine, Nanomaterial, Chemotherapy, Radiation Therapy*

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Design and Evaluation of Heterocyclic Analogues as Anti-Tubercular Agents

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Abstract

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, continues to be a serious global health concern especially with the rise in multidrug-resistant strains. The effectiveness of current therapies is declining due to increasing resistance and side effects. To address this, we explored new isatin-based compounds designed to inhibit the InhA enzyme, which is crucial for the production of mycolic acid in the bacterial cell wall. Using molecular docking with AutoDock Vina, we screened our synthesized compounds for their binding affinity toward the InhA target. One compound in particular, labeled D8, showed highly promising results with a docking score of –10.6 kcal/mol outperforming both the standard drug (–8.7 kcal/mol) and the original co-crystallized ligand. This strong binding affinity suggests better potential for enzyme inhibition. Additionally, we used SwissADME and ProTox-II to predict drug-likeness, absorption, oral bioavailability, and toxicity. These computational tools indicated that D8 had favorable ADMET properties, including good gastrointestinal absorption and low toxicity risks. Our synthesis method allowed us to create novel isatin analogues with promising biological properties. Overall, these findings support the idea that compound D8 could serve as a safe and effective anti-TB candidate,

Keywords: *Tuberculosis, InhA Enzyme, Isatin Analogues, Molecular Docking, AutoDock Vina, ADMET, Drug Resistance, Mycolic Acid, Anti-TB Agents*

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Role of Microbiome in Skin Cancer: An Overview

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Abstract

There are numerous microorganisms in the human body that may interact with the immune system and its metabolites, which results in a certain imbalance between inflammation and immunological tolerance; they often inhabit the skin and stomach. Certain investigations are underway in view of the role of the microorganisms in skin cancer, which includes the cancer progression that is currently in process. The changes in the composition of the bacteria of the skin may influence certain skin diseases like skin cancer. As skin cancer is the most common kind of cancer in the United States and is becoming prevalent worldwide, where the recognized risk factor is primarily ultraviolet (UV) exposure; however, there is increasing evidence that bacteria may also contribute. The human microbiome has garnered significant interest recently, with studies investigating its potential association with inflammatory skin disorders such as acne, rosacea, and atopic dermatitis. Despite little knowledge on the role of microbiota in skin cancer, hypotheses have arisen due to the recognized association between inflammation and microbial dysbiosis, along with the influence of microbiota on UV-induced immunosuppression. Moreover, research indicates that patients with cutaneous T-cell lymphoma exhibit a variable imbalance between Staphylococcus species, including Staphylococcus epidermidis and aureus, which correlates significantly with different disease stages and is closely linked to the progression of squamous cell carcinoma from actinic keratosis. Also, variations in the microbiota of melanoma patients have been associated with diverse disease progressions and outcomes, potentially influencing the efficacy and tolerability of immune checkpoint inhibitors, leading to an emerging therapy in cancer.

Keywords: *Inflammation, UV rays, Immune checkpoint inhibitors, Skin cancer, Microorganisms, Microbiota*

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Development of Plant-Based Nanocarriers for Enhanced Delivery of Phytoconstituents: A Green Approach to Phyto-Nanomedicine

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Abstract

The growing demand for eco-friendly and biocompatible drug delivery systems has led to a paradigm shift toward plant-based nanocarriers in pharmaceutical sciences. These systems offer a sustainable and safer alternative to synthetic nanoparticles, utilizing phytochemicals and plant extracts both as therapeutic agents and as natural reducing/stabilizing agents in nanoparticle synthesis. In this study, we report the green synthesis of zinc oxide (ZnO) and silver nanoparticles (AgNPs) using aqueous extracts of Ocimum sanctum (Tulsi) and Curcuma longa (Turmeric) respectively. The synthesized nanoparticles were characterized for particle size, surface morphology, zeta potential, and crystallinity using DLS, TEM, SEM, and XRD techniques. The average particle size was found to be below 100 nm with narrow distribution and good stability. These plant-based nanoparticles were then used to encapsulate curcumin, a potent anti-inflammatory and antioxidant phytoconstituent, to enhance its aqueous solubility and bioavailability. The findings suggest that green synthesized nanoparticles serve not only as carriers but also possess inherent therapeutic potential due to bioactive plant metabolites present on their surface. This dual functionality aligns with the emerging field of phyto-nanomedicine, where the carrier itself contributes to therapeutic action. This research presents a cost-effective, scalable, and environmentally sustainable approach to modern drug delivery, particularly suitable for herbal formulations, chronic inflammatory disorders, and antimicrobial therapies.

Keywords: *Phyto-nanomedicine, Plant-based nanocarriers, Green synthesis, Zinc Oxide Nanoparticles, Silver Nanoparticles, Curcumin Delivery, Ocimum Sanctum, Nanotechnology, Herbal drug delivery*

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Conference Proceedings

P-45

Liquid and Tissue Biopsies: The Twin Pillars of Precision Diagnostics

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Abstract

Cancer is a serious global health issue, resulting in millions of fatalities annually. Timely diagnosis is essential for enhancing patient outcomes, guiding treatment alternatives, and reducing disease burden, resulting in increased survival rates and improved quality of life. Precision oncology recognizes that tumors, even within the same cancer type, include unique genetic compositions that might influence their behavior and therapeutic response. Precision oncology is undergoing a paradigm shift by integrating liquid and tissue biopsies as complementary diagnostic tools. Tissue biopsy is the gold standard for histopathological and genetic characterization of cancer, offering direct insight into tumor architecture and cellular diversity. The invasiveness and sampling constraints of this method may impede disease monitoring and obstruct the assessment of tumor evolution. Utilizing high-throughput sequencing, multi-omics, and sophisticated analytical platforms, medical professionals and researchers may get real-time, non-invasive, and thorough insights into tumor biology. Liquid biopsy as an emerging approach allows minimally invasive, real-time cancer profiling by the detection of circulating tumor DNA (ctDNA), circulating tumor cells (CTCs), and extracellular vesicles in biological fluids such as blood, urine, and saliva. This technique improves tissue biopsy by offering thorough monitoring, minimizing patient pain, following tumor progression, identifying minimum residual disease, and evaluating therapy efficacy and resistance. Tissue biopsy is required for initial diagnosis and therapy selection, while liquid biopsy is used for continuous monitoring and early identification of treatment failure or recurrence. The synergy between these “twin pillars” is set to revolutionize cancer diagnosis, advancing the concept of precision medicine through comprehensive, patient-oriented methodologies, possibly lead to improved results.

Keywords: *Cancer, Tissue biopsy, Liquid biopsy, Precision Diagnosis, Circulating Tumor DNA*

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Exploring Type-II Diabetes Potential of Phyto-Derived Carbon Dots

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Abstract

The integration of phytoconstituents with carbon dots (C-dots) presents a novel and sustainable approach to the development of nanotherapeutics for type 2 diabetes mellitus (T2DM). C-dots, zero-dimensional carbon-based nanomaterials, exhibit unique physicochemical properties including high fluorescence, tunable surface chemistry, biocompatibility, and low toxicity. Their ability to enhance the solubility, bioavailability, and targeted delivery of poorly soluble phytochemicals renders them highly suitable for biomedical applications. This study explores the synthesis of C-dots from Phyto-derived waste materials via top-down and bottom-up approaches, including hydrothermal, microwave-assisted, and thermal decomposition methods. It further examines the methodologies for phytoconstituent loading—such as in-situ incorporation, post-synthesis adsorption, chemical conjugation, and encapsulation—highlighting their influence on therapeutic efficacy and release profiles. Functionalization with bioactive plant-derived compounds (e.g., curcumin, berberine, quercetin) enhances the anti-diabetic potential of C-dots by modulating oxidative stress, improving insulin sensitivity, and regulating glycemic indices. Recent advancements, including zinc-doped and enzyme-functionalized C-dots, have demonstrated enhanced wound healing and oral insulin delivery, expanding their utility beyond glycemic control. The theragnostic capabilities of these nanostructures enable simultaneous diagnosis and treatment, positioning phytoconstituent-loaded C-dots as a versatile platform in diabetes management. Despite promising preclinical evidence, challenges such as reproducibility, pharmacokinetic profiling, and regulatory approval persist. This review underscores the need for standardized synthesis protocols and comprehensive in vivo validation to facilitate clinical translation. Ultimately, phytoconstituent-loaded C-dots offer a green, cost-effective, and efficacious alternative to conventional anti-diabetic therapies with reduced systemic toxicity.

Keywords: *Diabetes, Carbon-dots, Phytochemicals, Nanotechnology, Formulation.*

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Dual Target Inhibition Anti-diabetic and Anticancer (AMP-Activated Protein Kinase (AMPK) and Topoisomerase I) Using Berberine: In Silico Screening with Docking and ADME Insights

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Abstract

This study employed in silico molecular docking and ADME prediction techniques to investigate the dual therapeutic potential of berberine, a naturally occurring isoquinoline alkaloid, against diabetes and cancer. The targets selected for evaluation were AMP-activated protein kinase (AMPK) for anti-diabetic activity and Topoisomerase I for anticancer potential. Molecular docking was used to assess the binding affinity and interaction profiles of berberine with AMPK and Topoisomerase I, in comparison to standard drugs such as metformin and camptothecin. Berberine demonstrated favorable docking scores, with binding energies of –9.4 kcal/mol (AMPK) and –8.1 kcal/mol (Topoisomerase I), outperforming metformin (–4.3 kcal/mol) and closely matching camptothecin (–9.0 kcal/mol). These results suggest strong and stable interactions between berberine and the selected targets. ADME (Absorption, Distribution, Metabolism, and Excretion) analysis revealed that berberine exhibits desirable pharmacokinetic characteristics, including good absorption, permeability, and low toxicity, satisfying drug-likeness criteria. The results collectively reinforce berberine's potential as a dual-target candidate for therapeutic development in diabetes and cancer. This in silico investigation highlights berberine as a promising natural molecule for further exploration in the development of novel treatments for complex diseases involving metabolic and proliferative disorders.

Keywords: *Berberine, Anti-diabetic, Anticancer, Molecular Docking, ADME*

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P-48

Dual Target Inhibition Anti-tubercular and Anticancer (DNA Gyrase and Topoisomerase IIα) Using Quercetin: In Silico Screening with Docking and ADME Insights

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Abstract

This study used in silico molecular docking and ADME prediction techniques to explore the dual therapeutic potential of quercetin, a naturally occurring flavonoid, against tuberculosis (TB) and colorectal cancer (CRC). The molecular interactions and binding affinities of quercetin with two key targets—DNA gyrase (for TB) and Topoisomerase IIα (for CRC)—were evaluated computationally. When compared to standard drugs such as moxifloxacin (DNA gyrase) and etoposide (Topoisomerase IIα), quercetin exhibited favorable docking scores, indicating robust and stable interactions. The binding energies for quercetin were –6.7 kcal/mol (DNA gyrase) and –9.5 kcal/mol (Topoisomerase IIα), compared to –6.7 kcal/mol and –7.4 kcal/mol for the respective standard drugs. ADME analysis further revealed that quercetin has low toxicity, excellent absorption, and good permeability, satisfying key drug-likeness criteria. The findings from this in silico study suggest that quercetin forms stable complexes with both microbial and cancer-associated targets, reinforcing its potential as a dual-target therapeutic candidate. This positions quercetin as a promising natural lead compound for the development of novel therapies for infectious and neoplastic diseases.

Keywords: *Quercetin, Anti-tubercular, Anticancer, Molecular docking, ADME*

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P-49

Computational Repurposing of Indigenous Phytochemicals Using Machine Learning for Selective IL-6 Modulation in Rheumatoid Arthritis

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune disorder characterized by persistent synovial inflammation and joint degeneration, with interleukin-6 (IL-6) playing a key pathological role. This study presents an integrative computational framework that harnesses machine learning (ML) techniques to repurpose indigenous phytochemicals as selective IL-6 inhibitors. A library of structurally diverse compounds sourced from traditional Indian medicinal plants was curated from IMPPAT and ZINC databases. Molecular descriptors were extracted to train supervised ML models, including Gradient Boosting and Random Forest, enabling predictive screening against IL-6 activity. Top-ranked candidates were further analysed via molecular docking and dynamics simulations focused on the IL-6/IL-6R interface, particularly the gp130-binding domain, to evaluate binding affinity and complex stability. Subsequent ADMET and toxicity profiling refined selections based on drug-likeness and safety. Among these, ayapanin (from *Eupatorium ayapana*) and butein (from *Butea monosperma*) exhibited strong docking scores comparable to known inhibitors, with distinctive interaction signatures. Metabolomic modelling predicted favourable biotransformation and low immunogenicity. This work introduces a receptor-targeted, pathway-specific strategy rooted in ethnobotany and AI-driven screening, offering a viable low-cost, low-toxicity alternative to current biologics for RA treatment. Furthermore, the approach is adaptable to other cytokine networks, laying the groundwork for rational design of next-generation phytopharmaceuticals.

Keywords: *Rheumatoid Arthritis, IL-6 Inhibitors, Indigenous Phytochemicals, Machine Learning, Molecular Docking*

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The Impact of Food Supplements, Nutraceuticals, and Functional Food on Intestinal Health

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Abstract

Digestion, immunity, nutrition absorption, and mineral intake are all significantly impacted by the gastrointestinal system, the body's second biggest organ. The growing use of functional foods, nutraceuticals, as well as food supplements has garnered attention for their role in maintaining and enhancing intestinal health. Functional foods give the body the necessary amounts of proteins, carbs, lipids, and vitamins and look like regular foods. One of the most popular nutraceuticals is omega-3 fatty acids. The social, environmental, and biological health facets of human existence have been increasingly impacted by new eating patterns as well as actual production and consumption trends. Some affluent nations have been battling modern-day illnesses and traits like obesity, osteoporosis, cancer, diabetes, gastrointestinal disorders, allergies, and dental issues in recent years. They also have to deal with issues like high-energy meals, imbalanced diets, and aging populations. Functional foods and nutraceuticals have been shown to modulate gut microbiota, enhance barrier function, reduce inflammation, and give nutrient support to improve gut health. A proper ratio of substances like omega-3 fatty acids, dietary fibers, probiotics, and prebiotics may affect several facets of metabolism and immunity.

Keywords: *Functional food, Nutraceutical, Food supplement, Omega-3 fatty acids, Intestinal health*

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Rituals Revisited: Health, Heritage, and Evidence

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Abstract

India's traditional rituals, rooted in centuries of cultural wisdom, are often practiced today without fully understanding their scientific relevance or health potential. This study proposes a systematic re-evaluation of everyday and seasonal Indian rituals, including the use of toe rings, sindoor, kajal, copper vessels, sun offerings, oil baths, and fasting traditions, through the lens of modern public health. Using a mixed-methods approach, we will analyze patterns of ritual adherence and self-reported health outcomes among residents of Punjab. Our objective is to identify behavioral, physiological, or psychosocial connections between ritual practices and overall well-being. By synthesizing empirical evidence with ethnographic insight, the study aims to bridge India's cultural legacy with contemporary wellness frameworks. This initiative not only reclaims indigenous knowledge but also advocates for its integration into preventive healthcare, lifestyle medicine, and policy discourse, bringing science back into the heart of heritage.

Keywords: *Traditional Indian Rituals, Preventive Health, Cultural Practices, Public Health Behaviors, Ethnographic insights, Lifestyle medicine, Evidence-Based Heritage, Indigenous Knowledge, Health literacy, Socio-Cultural Wellness.*

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Exploring the neurotherapeutic role of *Bifidobacterium* in Parkinson's disease through gut–brain axis modulation

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Abstract

Parkinson's disease (PD) is a multifactorial neurodegenerative disorder that not only presents with hallmark motor dysfunctions but also with debilitating non-motor symptoms, including gastrointestinal disturbances. The gut–brain axis (GBA), a complex communication network linking the gut and central nervous system, is increasingly recognized for its role in PD pathogenesis. Among the gut microbes, *Bifidobacterium*, a prominent probiotic genus, has emerged as a promising therapeutic agent. It produces short-chain fatty acids (SCFAs), strengthens intestinal barrier function, and exerts anti-inflammatory effects by modulating cytokines and immune cells. *Bifidobacterium* also impacts neurotransmitter systems—enhancing levels of dopamine, serotonin, and GABA—critical for both motor and non-motor symptom relief in PD. Preclinical studies reveal that certain *Bifidobacterium* strains can preserve dopaminergic neurons and improve motor behaviors in PD models. Additionally, it alleviates constipation, a common prodromal symptom, potentially enhancing the effectiveness of PD medications. Early clinical trials report improved gastrointestinal outcomes and reduced oxidative stress and inflammation. Despite these benefits, standardized human trials are lacking. Future directions emphasize precision-based microbiome modulation to customize therapy for individual patients. Overall, *Bifidobacterium* presents a novel, multi-dimensional approach not only to symptom relief but possibly to modifying the course of PD.

Keywords: *Parkinson's disease, Bifidobacterium, Gut–Brain Axis, Constipation, Neuroprotection, Gut Microbiota, Probiotics*

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P-53

Advancement of technologies in pharmacology

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Abstract

Recent technological advancements have profoundly transformed the field of pharmacology, particularly in drug research and development. Traditionally rooted in labor-intensive experimentation, the discipline has now embraced a variety of cutting-edge tools, including artificial intelligence (AI), machine learning (ML), high-throughput screening, bioinformatics, nanotechnology, robotics, and electronic health records (EHRs). These innovations have revolutionized the processes of drug discovery, design, testing, and post-marketing surveillance by making them faster, more efficient, and highly accurate. For instance, AI-driven predictive algorithms can assess the therapeutic potential and likely side effects of compounds before clinical trials, significantly reducing both time and cost. Robotics and automation enhance the consistency and scalability of laboratory experiments, while 3D printing enables the development of patient-specific drug formulations, facilitating personalized medicine. Despite these advances, several challenges persist. High implementation costs, data privacy issues, ethical concerns related to AI-generated decisions, and potential job displacement pose significant barriers. Furthermore, unequal access to these technologies in low-resource settings may widen global health disparities. This review critically evaluates the role of current and emerging technologies in pharmacology, highlighting key innovations, their applications in clinical research, pharmacovigilance, and individualized therapy, and their associated limitations. The discussion also explores the ethical implications and anticipates future trends as pharmacology continues its transition toward a more digital, data-driven discipline.

Keywords: *Pharmacology, Artificial Intelligence, Drug Development, Automation, Personalized Medicine, Ethics, Health Disparity*

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Enhanced Topical Delivery of Sulconazole Nitrate via Nanostructured Lipid Carrier-Based Gel for Effective Antifungal Therapy

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Abstract

Background: Fungal skin infections are a prevalent global health issue, exacerbated by drug resistance and the limitations of conventional antifungal treatments. Sulconazole nitrate (SCZ), a broad-spectrum antifungal, suffers from poor water solubility and low skin retention, limiting its therapeutic potential. **Objective:** To develop and evaluate a nanostructured lipid carrier (NLC)-based gel formulation of SCZ for improved dermal delivery, skin retention, and antifungal efficacy. **Methods:** Preformulation studies included solubility profiling, UV/IR analysis, and partition coefficient determination. Stearic acid (solid lipid) and isopropyl myristate (liquid lipid) were selected based on SCZ solubility. NLCs were prepared via the modified microemulsion method and optimized using Central Composite Design. The optimized NLC (NLC-SN10) was incorporated into a Carbopol 940 gel base. Evaluation parameters included particle size, zeta potential, entrapment efficiency, in vitro drug release, ex vivo skin permeation, skin irritation, and antifungal activity against *Candida albicans* and *Aspergillus niger*. **Results:** Optimized NLC-SN10 exhibited a particle size of 395.24 ± 2.46 nm, zeta potential of −23.85 ± 0.25 mV, and an entrapment efficiency of 76.14 ± 1.35%. The NLC gel demonstrated skin-compatible pH (6.70 ± 0.10), excellent spreadability, 74.39% drug release at 24 hours, and improved skin permeation (2955 µg/cm²). No irritation was observed. Antifungal studies showed broad-spectrum activity comparable to standard SCZ. **Conclusion:** SCZ-loaded NLC gel is a stable, skin-friendly, and efficient drug delivery system, offering a promising strategy for enhanced topical antifungal therapy.

Keywords: *Sulconazole nitrate, Nanostructured lipid carriers, Antifungal gel, Dermal drug delivery, Skin permeation, Candida albicans*

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P-55

Nanofiber manufacturing revolution: A cost-efficient, scalable solution for India and beyond

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Abstract

India's nanofiber sector faces high production costs, limited accessibility, and dependence on imports, restricting its growth. Our innovation introduces a cost-effective and scalable nanofiber production system using a novel simultaneous dual force fiber formation technique. This breakthrough method enhances fiber thinning and stretching by synergizing dual forces, allowing mass production without sacrificing fiber quality or uniformity. Unlike conventional electrospinning systems, our machine is optimized for consistent output in varying environmental conditions, a major challenge in Indian manufacturing setups. It enables customizable nanofibers suitable for filtration, biomedical applications, personal protective equipment, and sustainable energy solutions. By significantly lowering the entry barrier, our system empowers Indian researchers, startups, and industries to adopt nanotechnology with minimal infrastructure investment. The innovation aligns with the vision of *Yugantra* by promoting indigenous R&D acceleration, green technology deployment, and societal impact. Recognized in national competitions and supported by a ready prototype design, our venture awaits funding to begin production and scale up implementation.

Keywords: *Nanofibers, Dual Force Fiber Formation, Scalable Manufacturing, Electrospinning Alternative, Indian Nanotechnology, Green Innovation*

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P-56

Role of Computational Docking in the Treatment of Diabetes

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Abstract

Computational docking has emerged as a powerful *in silico* tool in drug discovery, playing a significant role in the development of novel therapeutics for diabetes. It facilitates the identification and validation of molecular targets implicated in the disease's pathogenesis, including enzymes, receptors, and transport proteins. Diabetes, characterized by chronic hyperglycemia due to insulin deficiency or resistance, requires precise molecular interventions to manage its complex pathophysiology. Through virtual screening of extensive compound libraries against key diabetic targets such as α-glucosidase, DPP-4, PPARs, and glucokinase, computational docking accelerates lead identification while reducing experimental costs and minimizing the need for labor-intensive laboratory procedures. This technique predicts optimal binding orientations and affinities between candidate molecules and their biological targets, thereby streamlining the early stages of drug development. Docking has facilitated the discovery of novel inhibitors that modulate enzymes involved in glucose metabolism and insulin signaling pathways in type 2 diabetes. It also supports structure-based drug design by optimizing ligand–protein interactions, enhancing selectivity and therapeutic efficacy. Integrated with molecular dynamics simulations and ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) profiling, docking contributes to a holistic platform for rational drug design. The growing integration of computational docking in antidiabetic drug discovery highlights the convergence of bioinformatics and molecular biology. With advances in computational power and algorithmic development, docking is poised to play a central role in the discovery of next-generation antidiabetic agents with improved pharmacological profiles and reduced side effects.

Keywords: *Computational Docking, Diabetes, DPP-4 Inhibitors, Molecular Modeling, Virtual Screening, Drug Discovery, ADMET*

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P-57

Computational Pharmacology in the Age of Machine Learning

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Abstract

Computational pharmacology is the study and prediction of drug activity in biological systems using computer-based methods. In order to study and forecast how medications interact with the body (pharmacokinetics) and how they create their therapeutic effects (pharmacodynamics), statistical techniques, computational models, and algorithms are used. Because it speeds up the identification of possible drug candidates and lowers the expenses associated with conventional experimental procedures, this field is essential to modern drug discovery and development. Computational pharmacology's incorporation of machine learning (ML) is changing the field of drug development. More precise predictions of drug behavior, target interactions, pharmacokinetics, and safety profiles are becoming possible because of machine learning algorithms that utilize extensive biological, chemical, and clinical datasets. Drug discovery, ADMET modeling, pharmacogenomics, clinical trial optimization, and pharmacovigilance are just a few of the important uses of machine learning in the pharmacological domain that are highlighted in this paper. In addition to discussing present constraints like data quality and model interpretability, we look at the most popular machine learning approaches and platforms. We also investigate the possibility of explainable AI, multi-omics integration, and real-time patient data analytics in the future. Faster, safer, and more individualized treatments are made possible by machine learning, which is a key component of the pharmaceutical sciences' ongoing evolution. In conclusion, machine learning is a vital bridge between computer science and medicine that changes drug development by speeding up the discovery of new cures and treatments.

Keywords: *Computational Pharmacology, Machine Learning, Pharmacokinetics, Pharmacodynamics*

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Neuroprotective Potential of Naringenin in Ischemic Stroke: Targeting Oxidative Stress and Inflammatory Pathways

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Abstract

Ischemic stroke remains one of the leading causes of death and disability worldwide, primarily due to the lack of effective neuroprotective therapies. Recent research has highlighted the therapeutic potential of naturally occurring flavonoids in mitigating neuronal damage post-stroke. This study investigates the neuroprotective role of naringenin, a citrus bioflavonoid, in an experimental model of cerebral ischemia. A middle cerebral artery occlusion (MCAO) model was employed in Wistar rats to mimic ischemic stroke. Naringenin was administered intraperitoneally at 50 mg/kg post-occlusion. Neurological deficit scores, infarct volume, and behavioral performance were assessed. Biochemical analysis revealed significant attenuation of oxidative stress markers such as malondialdehyde (MDA) and restoration of antioxidant enzymes including superoxide dismutase (SOD) and catalase. Additionally, levels of pro-inflammatory cytokines (TNF-α, IL-6) were markedly reduced in the treatment group. Histopathological examination supported the neuroprotective effect by showing decreased neuronal apoptosis and edema. The findings suggest that naringenin mediates Cerebro protection by modulating oxidative and inflammatory pathways, making it a promising candidate for adjunctive therapy in ischemic stroke. This study reinforces the pharmacological relevance of plant-derived bioactives in stroke management and supports further translational research in this direction.

Keywords: *Ischemic Stroke, Naringenin, Neuroprotection, Oxidative Stress, Inflammation, MCAO, Flavonoids, Antioxidants, TNF-α, IL-6*

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Neuropsychiatric Sequelae of COVID-19 and the Evolving Role of Pharmacists in Mental Health Care

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Abstract

The COVID-19 pandemic has enhanced global comprehension of post-infectious neuropsychiatric consequences, revealing intricate relationships among viral neurotropism, systemic inflammation, immunological dysregulation, microvascular damage, and psychosocial stressors. Meta-analyses indicate that within six months following infection, 27.4% of survivors suffer sleeplessness, 24.4% experience exhaustion, 20.2% exhibit cognitive impairment, and 19.1% acquire anxiety, irrespective of the initial severity of the infection. Longitudinal studies indicate that the heightened risk for anxiety, psychosis, and dementia may endure for as long as two years, presumably attributable to chronic neuroinflammation, disruption of the blood–brain barrier, and inappropriate neuroendocrine responses. The increasing neuropsychiatric burden has revealed substantial deficiencies in mental health infrastructure, necessitating a reconsideration of pharmacists' roles. Pharmacists in hospital and community environments increasingly assume enhanced responsibilities in managing psychotropic drugs, doing medication reconciliation, providing digital mental health assistance, and triaging high-risk psychiatric patients. These services are essential for early symptom identification and enhancing compliance, particularly among the elderly and individuals with restricted health literacy. However, this expanded role has heightened pharmacists' susceptibility to burnout and psychological stress. Interprofessional collaboration, specialised psychiatric education, and the incorporation of telepsychiatry are essential for maintaining this capability. The pandemic is transforming mental healthcare, with pharmacists serving as vital and accessible participants in mental health delivery systems.

Keywords: *COVID-19, Neuropsychiatric Outcomes, Pharmacist Role, Mental Health Care, Post-Infection Complications*

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Role of Technology in Vaccine Development and Distribution

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Abstract

Technology has transformed vaccine development and distribution, making the process faster, more efficient, and globally accessible. During the COVID-19 pandemic, innovations such as mRNA platforms, AI-driven antigen discovery, and rapid genomic sequencing enabled the development of effective vaccines in record time. Tools like reverse vaccinology and computational modeling are now integral in identifying promising vaccine candidates. In manufacturing, advances such as single-use bioreactors and continuous production methods enhance scalability and consistency. Equally vital is the role of digital technologies in distribution. IoT-enabled cold chain systems ensure temperature stability during transport, while blockchain provides secure and transparent supply chain tracking, reducing the risk of counterfeit vaccines. On the public health front, mobile health (mHealth) platforms, digital vaccination records, and surveillance tools have improved vaccine outreach, monitoring, and data management. India's CoWIN portal is a successful example of technology-driven mass vaccination. Despite these advancements, challenges remain, including infrastructure gaps in low-resource settings, data security concerns, and regulatory alignment. This session will explore how integrated technologies can continue to strengthen immunization programs and ensure global preparedness for future health threats.

Keywords: *Vaccine Development, Biotechnology, mRNA Vaccines, Cold Chain Logistics, Internet of Things (IoT), Supply Chain Management, Vaccine Access*

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Phytochemicals as Natural Antifungals: Defense Strategies of Plants Against Pathogenic Fungi

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Abstract

Fungal diseases pose a significant threat to global agriculture, leading to major crop losses and compromising food security. In response, plants have evolved complex biochemical defense systems involving the production of a wide variety of antifungal phytochemicals. These secondary metabolites—including phenolics, flavonoids, alkaloids, terpenoids, and saponins—exhibit direct antifungal effects by inhibiting spore germination, disrupting fungal cell wall integrity, and interfering with ergosterol synthesis in membranes. Moreover, some phytochemicals act indirectly by modulating plant defense signaling pathways and enhancing systemic resistance. Recent molecular studies have elucidated the biosynthetic pathways and gene regulatory mechanisms behind phytochemical production, while advances in metabolomics enable comprehensive profiling of antifungal compounds across different plant species and cultivars. The variability in potency among these natural compounds underscores the need for focused screening and standardization. Compared to synthetic fungicides, plant-derived antifungals offer multiple advantages including lower toxicity, minimal environmental impact, and reduced risk of resistance development. This review explores the key classes of phytochemicals with antifungal properties, their mechanisms of action, and their role in plant immunity. Harnessing these natural defense mechanisms could facilitate the development of plant-based biopesticides and integrated disease management strategies aligned with sustainable agricultural practices.

Keywords: *Phytochemicals, Antifungal Activity, Plant Immunity, Secondary Metabolites, Sustainable Agriculture*

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The Nervous System's Role in Immune Surveillance and Tumor Immunity

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Abstract

It has been well established that the nervous system is a key modulator of immune surveillance and the tumor microenvironment. Previous studies have mostly focused on how factors like stress influence cellular processes, but emerging evidence indicates that neural signaling can alter both innate and adaptive immune responses, which subsequently influences tumor progression and treatment responsiveness. This chapter discusses the complex interplay between the nervous and immune systems in the neuro-oncology setting, including the neuro-immune interaction, neurotransmitter-mediated immune alteration, and stress-induced immune suppression. We describe the role of sympathetic and parasympathetic signaling pathways in the regulation of immune cell function, with a focus on the tumor microenvironment. Key neuroinflammatory processes in gliomas and other brain tumors are reviewed, highlighting mechanisms by which nervous system signaling mediates immune evasion in these cancers. Moreover, we discuss how chronic stress and neuroendocrine factors contribute to immune suppression, tumor growth, and resistance to immunotherapies. Insights into these neuro-immune pathways have led to novel therapeutic approaches such as neuromodulation, vagus nerve stimulation, and pharmacological strategies targeting neuro-immune signaling. The application of such interventions may enhance anti-tumor immunity and hold promise in neuro-oncology. Drawing from neuroscience, immunology, and oncology, this chapter provides a broad overview of how the nervous system shapes immune surveillance and tumor immunity, while offering perspectives on clinical translation.

Keywords: *Neuro-Immune Interaction, Tumor Microenvironment, Neurotransmitters, Glioma Immunology, Stress and Immunity, Neuromodulation Therapy*

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Neuroprotective potential of medicinal plants in the management of neurodegenerative diseases: A phytochemical perspective

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Abstract

Neurodegenerative diseases comprise a range of progressive neurological disorders marked by the gradual decline of neuronal structure and function, ultimately resulting in cognitive impairment and movement dysfunction. Notable examples include Alzheimer's disease (AD), Parkinson's disease (PD), and Huntington's disease (HD), each characterized by localized neuronal degeneration. The causes of neurodegeneration are multifactorial, involving ageing, genetic susceptibility, oxidative stress, mitochondrial dysfunction, impaired protein clearance, and intracellular accumulation of misfolded proteins. These pathological mechanisms contribute to synaptic dysfunction, chronic neuroinflammation, and neuronal death. Current treatment strategies primarily provide symptomatic relief, as no definitive cure exists for these conditions. In this context, medicinal plants have emerged as promising neuroprotective agents due to their rich phytochemical profiles, including antioxidant, anti-inflammatory, and anti-apoptotic compounds. Significantly, *Withania somnifera* (Ashwagandha) enhances neurogenesis, mitigates oxidative stress, and modulates stress-related signaling. *Bacopa monnieri* (Brahmi) improves cognitive function by enhancing antioxidant defenses and reducing amyloid plaque formation. *Curcuma longa* (Turmeric), through its active compound curcumin, exhibits neuroprotective properties by inhibiting tau hyperphosphorylation and reducing amyloid-beta aggregation. These phytochemicals exert multi-targeted actions on neurodegenerative pathways and have demonstrated encouraging outcomes in both preclinical and limited clinical studies. This review explores the therapeutic potential of phytomedicines in neurodegenerative disorders, emphasizing their mechanistic relevance and prospects in integrative neurology.

Keywords: *Neurodegenerative Diseases, Medicinal Plants, Phytomedicines, Neuroprotection, Alzheimer's Disease*

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Nanocarrier-based systems for targeted antihypertensive therapy

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Abstract

Hypertension, a chronic illness characterised by persistently high blood pressure, is still a major global health problem due to its strong link to cardiovascular events such as myocardial infarction, stroke, and renal failure. Although various antihypertensive medications are accessible, contemporary pharmacotherapy frequently faces challenges like inadequate bioavailability, fast systemic clearance, brief half-life, and adverse side effects. The creation of smart nanocarriers has emerged as a disruptive solution to overcome these issues in drug delivery. Nanoscale delivery methods, including liposomes, polymeric nanoparticles, and solid lipid carriers, are designed to encapsulate active pharmaceutical ingredients (APIs), providing controlled and sustained release characteristics. Nanocarriers substantially enhance drug absorption and therapeutic efficacy by safeguarding pharmaceuticals against premature breakdown and facilitating site-specific distribution, hence reducing off-target effects. Moreover, the ability to decrease dose frequency and total medication burden enhances patient adherence and minimises side effects. This review examines the concepts, methods, and varieties of smart nanocarriers employed in antihypertensive medication, emphasising their benefits compared to traditional formulations. The incorporation of nanotechnology in hypertension control presents a possible avenue for safer, more effective, and patient-centric therapy options.

Keywords: *Smart Nanocarriers, Controlled Release, Targeted Drug Delivery, Antihypertensive Drugs*

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Neurophysiological disruptions in sleep disorders: From insomnia to REM sleep behavior disorder

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Abstract

Sleep disorders include a range of illnesses, from persistent insomnia to REM sleep behavior disorder (RBD), each indicating intricate disturbances in neurophysiological regulation. Insomnia is typically defined by ongoing challenges in initiating and sustaining sleep, frequently linked to hyperarousal of brain circuits, including the anterior cingulate cortex, insula, and thalamus. Neuroimaging studies indicate that persons with insomnia display functional and structural abnormalities in these areas, leading to compromised cognitive and emotional regulation, especially during nighttime. Conversely, RBD is characterised by the absence of muscular atonia during REM sleep, resulting in vivid dream enactment and occasionally aggressive behaviors. This condition is associated with abnormalities in brainstem circuits, particularly the sublaterodorsal nucleus, and entails impaired GABAergic and glycinergic inhibitory signaling mechanisms essential for REM-related muscular paralysis. RBD is significantly linked to synucleinopathies, such as Parkinson's disease, thus establishing it as both a sleep disturbance and an early clinical indicator of neurodegeneration. Recent data suggests that sleep disturbances are not simply secondary symptoms of neurological deterioration but may actively contribute to the worsening of neural dysfunction. Proposed processes encompass protein misfolding and aggregation, altered neurotransmitter dynamics, neuroinflammation, and compromised glymphatic clearance. Comprehending these relationships presents intriguing opportunities for early diagnosis, neuroprotective intervention, and the formulation of focused therapy methods in sleep-related neurodegenerative disorders.

Keywords: *Insomnia, REM Sleep Behavior Disorder (RBD), Brainstem Circuits, Synucleinopathies, Protein Misfolding*

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P-66

Seismic behavior of multi-storey building with bracing system and comparison to normal building using ETAB software

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Abstract

Due to paucity of accessible land area and the expansion of population, the role of multistorey buildings is vital in accommodating increasing space demands. These structures serve residential and commercial needs, especially in urban areas with high migration from rural regions. To ensure stability against various loads such as seismic, wind, snow, and lateral forces, it is essential to analyze and design buildings using advanced tools like ETAB software. In this study, a G+23 storey building was analyzed with different bracing systems including X, V, inverted V, eccentric forward, and eccentric backward configurations using ETAB's auto-loading features. These bracing systems were compared with a regular, non-braced structure under identical conditions. The structural performance was evaluated by examining parameters such as shear force, moment, storey drift, and storey displacement in each case to assess overall stability and efficiency.

Keywords: *ETAB, G+23 Multi Storey Building, Load Combinations, Analysis and Design, Shear Force, Storey Response*

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Dual target inhibition antimicrobial and Antiviral (DNA gyrase and SARS-CoV-2) using Curcuma longa: In silico screening using Docking and ADME insights

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Abstract

The aim of this study was to determination the anti-microbial and anti-viral activities of curcumin and its derivatives (Curcuma Longa) using In-silico studies molecular docking and ADME insights. In-silico studies were carried out to show anti-microbial and anti-viral potency. In-silico studies were performed by molecular docking via Autodock Vena to identify binding affinity and interaction between different ligands with DNA Gyrase and SARS-CoV-2. Four molecules exhibited well docking score as compare to standard like ciprofloxacin (DNA Gyrase) and Remdesivir (SARS-CoV-2) when molecular docking were analyzed which are named as curcumin, cyclocurcumin, demethoxycurcumin and Bisdemethoxycurcumin. ADME properties were examined via SWISS ADME to determine pharmacokinetic profile of different compound studied. The In silico screening showed that all ligand form stability when complexed with DNA gyrase and SARS-CoV-2. The binding energies between complexed with DNA gyrase in range (-7.2 to -7.7 kcal/moL respectively) compare to standard (-6.6 kcal/moL) and SARS- CoV-2 in range (-7.2 to -8.7 kcal/moL) as compare to standard (-7.2 kcal/moL). In all of these compound cyclocurcumin show most stable affinity with both taget receptors. The In silico studies showed that all ligands fulfilled the Drug-likeness properties so this means these are less toxic which show good absorption and permeability. The curcumin and its derivatives are the better candidate as microbial and viral infections treatment because of their anti-microbial and anti-viral potencies.

Keywords: *Curcumin, Anti-microbial, Curcuma longa, Molecular docking, ADME.*

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Integrating Digital Tools and Cultural Therapies in the Management of Depression: A Holistic Approach

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Abstract

Depression is a globally prevalent mental health condition affecting over 264 million people, often leading to reduced quality of life, disability, and increased suicide risk. In recent years, digital tools and non-pharmacological methods have emerged as effective adjuncts to conventional treatment for managing depression. This paper explores evidence-based digital tools such as Woebot, Moodpath, and Headspace, which utilize cognitive behavioral therapy (CBT), mindfulness, and self-monitoring techniques. Woebot is an AI-powered chatbot that delivers CBT-based conversations, helping users reframe negative thoughts. Moodpath offers mood tracking and personalized insights to encourage self-awareness and therapeutic engagement. Headspace, a leading mindfulness app, delivers guided meditations, sleep aids, and breathing exercises, reducing symptoms of stress and anxiety. Alongside digital interventions, complementary methods such as music therapy (Indian Raga and Sufi music), yoga, and pranayama have shown significant impact on mood regulation by modulating autonomic responses and promoting emotional balance. Multiple studies support the integration of these interventions into routine care for individuals with mild to moderate depression. The use of technology offers scalability, privacy, and accessibility, particularly for younger populations. This paper emphasizes the need for combined approaches—digital, behavioral, and cultural—to provide holistic mental health care.

Keywords: *Depression, Digital Health Tools, Woebot, Headspace, Moodpath, Music Therapy, Yoga, CBT, Mental Health Apps, Mindfulness.*

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Unlocking the Potential of Medicinal Plants through Gas Chromatography-Mass Spectrometry for Sustainable Livelihoods

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Abstract

Diabetes mellitus (DM) has become one of the most emergent worldwide health issues, necessitating the development of safer, more economical, and more sustainable treatment options. The rising incidence of DM, particularly in environments with limited resources, calls for creative treatments based on both scientific progress and socioeconomic effects. This study examines the potential antidiabetic effects of two promising medicinal plants: Tagetes minuta (wild marigold) and Cymbopogon citratus (lemongrass). Although these plants have long been used for their medicinal qualities, they are not well studied in modern pharmacological research despite having a large number of bioactive chemicals that may be used to treat diabetes. Hydro-distillation was used to extract the essential oils from both plants, and Gas Chromatography-Mass Spectrometry (GC-MS) was used to determine the important phytochemicals. GC-MS analysis of C. citratus identified more than 30 substances, primarily citral (57.05%) and neral (35.66%), which have potent antioxidant and antidiabetic effects. Additional components such as gibberellic acid, camphene, and linalool increase its effectiveness even more. Caryophyllene (72.98%), D-limonene (12.11%), and β-ocimene (6.62%), which have antihyperglycemic, anti-inflammatory, and antibacterial properties, were found in high amounts in T. minuta essential oil. In addition to their potential medical benefits, the production and use of these aromatic plants provide a viable strategy for generating income. Community resilience and income diversification can all be improved by incorporating their agro-industrial use into rural economies, especially in hilly and marginal areas. We acknowledge the financial support from the Department of Science and Technology, New Delhi, India for providing the grant under Science Technology and Innovation (STI) Hub (DST Grant no. DST/SEED/SCSP/STI/2021/905/G) under the project entitled “Science Technology and Innovation Hub at Chitkara University Himachal Pradesh, District Solan, State Himachal Pradesh”.

Keywords: *Cymbopogon Citratus, Tagetes Minuta, Gas Chromatography-Mass Spectrometry, Livelihoods, Economic Viability*

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Recent Updates on Green Synthesized Silver Nanoparticles: Preparation Technologies, Properties, and Applications in Biomedical Sector

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Abstract

Nanotechnology is attracting significant interest as a novel research domain focused on the production of nanomaterials for applications across several sectors. Green-synthesized AgNPs are the most environmentally benign and sustainable choice, and their nanoscale size and exceptional capacity to alter physical, chemical, and biological characteristics have made them very popular. Amongst the diverse forms of nanoparticles, green synthesized AgNPs have become prominent as the most prevalent and extensively employed owing to their remarkable qualities. The implementation of plant-derived materials reductants enhances the attractiveness of silver nanoparticle manufacturing. This review highlights the various therapeutic properties of AgNPs produced through plant-mediated methods. Furthermore, an effort is undertaken to present a clarified description of the operational processes that govern the pharmacological effects of green AgNPs. This manuscript comprehensively covers the preparation technology, significance of green synthesis with characterization techniques used for evaluation and broadly describes antibacterial qualities, wound healing, anticancer, antioxidant potential, and tissue engineering with regulatory challenges.

Keywords: *AgNPs; Green synthesis, Regulatory framework, Wound healing, Antibacterial activity, Eco-friendly*

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Natural Bioactive in the Modulation of Rheumatoid Arthritis: A Promising Approach

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune disorder characterized by symmetrical joint pain, synovial hyperplasia, and pannus formation, often leading to irreversible joint damage, bone destruction, and permanent disability if left untreated. Affecting approximately 0.5–1.0% of adults in developed nations, RA typically manifests during the productive years of life, significantly impairing quality of life. While extensive research over the past three decades has confirmed RA as a global disease impacting individuals across various races, ages, and regions, its incidence and prevalence remain influenced by demographic and environmental factors, including socio-economic status, childhood rural residence, and exposure to infections and chemicals. Conventional treatments, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and disease-modifying anti-rheumatic drugs (DMARDs), provide symptomatic relief and functional improvement but are associated with serious adverse effects, including gastrointestinal complications and cardiovascular risks. In light of these limitations, there is a growing demand for safer, more effective alternatives. Herbal medicines and natural products, used historically in traditional healing systems, have re-emerged as promising therapeutic agents such as curcumin, quercetin etc. WHO reports indicate that nearly 80% of patients with RA utilize herbal remedies or supplements as adjunct therapies, highlighting the need for further scientific validation of their efficacy and safety. This underscores the importance of integrating traditional and modern approaches to develop comprehensive, patient-centred strategies for managing RA.

Keywords: *Rheumatoid arthritis, DMARDs, Bioactive, Autoimmune disorders, Inflammation.*

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Polypharmacy in Immunocompromised Populations

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Abstract

Polypharmacy in immunocompromised populations such as solid organ transplant recipients, individuals with human immunodeficiency virus (HIV) and oncology patients is a complex clinical problem that imposes significant morbidity and mortality risks. We discuss the intricate relationship between immunosuppressants and other concomitant therapies, highlight the value of therapeutic drug monitoring including search for adverse interactions and risk of infections. The report also showcases some of the most innovative pharmacist-led medication management protocols which aim to maximize patient benefits from drug therapy while limiting harm. This work may highlight a novel approach for innovation in clinical pharmacy and patient care by combining pharmacological considerations with innovative practice models. Polypharmacy can result from a number of risk factors. Chronic mental health disorders, living in a long-term care facility, and having several medical conditions treated by several subspecialist doctors are all examples of patient-related factors. Inadequately maintained medical records, automated refill services, and prescribing to satisfy disease-specific quality metrics are examples of systems-level factors. According to our review, polypharmacy is prevalent, especially among inpatients and older persons. In addition to reviewing the appropriateness of prescribed medications and the occurrence of side effects that may be linked to polypharmacy, clinicians should be aware of populations that are more likely to have polypharmacy.

Keywords: *Polypharmacy, Immunosuppressants, Immunocompromised, Immunodeficiency*

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Comparative Analysis of Wind Load Impact on G+6 and G+13 Structures in Mountainous Regions of Uttarakhand Using MRF Systems in ETABS

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Abstract

Rapid urban development has led to increased vertical expansion of cities, resulting in the rise of tall buildings. The design and construction of such structures pose significant challenges, particularly in mountainous regions where wind-induced forces are more complex due to uneven terrain and higher altitudes. This study focuses on the impact of wind loads on storey drift and displacement in structures of varying heights. Specifically, G+6 and G+13 residential buildings are modeled and analyzed using ETABS v22 software with moment resisting frame (MRF) systems. Wind load analysis is conducted in accordance with IS 875 (Part 3): 2015 standards. The results provide a comparative evaluation of storey drift and displacement between the two structures, demonstrating the influence of building height on wind resistance behavior in hilly regions.

Keywords: *Wind Load, Storey Drift, Displacement, Tall Buildings, MRF System, ETABS Software*

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Molecular Hybridization Strategy for the Design of Novel Anticancer Agents: A Medicinal Chemistry Approach

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Abstract

The development of novel anticancer agents remains a cornerstone of pharmaceutical chemistry research. Molecular hybridization is an innovative strategy that involves the fusion of two or more pharmacophores into a single hybrid molecule to achieve enhanced biological efficacy and reduced resistance. In the present study, we report the design and synthesis of a new series of hybrid molecules by combining pharmacophores of quinoline and benzimidazole, both known for their anticancer potential. The synthetic pathway involved multi-step organic reactions starting from 4-chloroquinoline and *o*-phenylenediamine, with subsequent coupling and functional group modifications to enhance solubility and binding affinity. The final compounds were structurally confirmed via NMR, IR, and mass spectrometry. Molecular docking studies were carried out against topoisomerase II and EGFR kinase to evaluate binding interactions. The results revealed strong binding affinity and stable interactions with key amino acid residues in the active sites. *In vitro* cytotoxicity assays using MCF-7 and A549 cell lines demonstrated significant growth inhibition, with some compounds showing comparable activity to standard doxorubicin. These findings suggest that the hybridization approach can be a powerful tool in anticancer drug design and may lead to the development of more selective and potent therapeutic agents.

Keywords: *Molecular Hybridization, Anticancer Agents, Quinoline, Benzimidazole, Pharmaceutical Chemistry, Drug Design, Molecular Docking*

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AI-Powered Drug Delivery Systems Using Machine Learning

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Abstract

Artificial intelligence (AI) and machine learning (ML) are revolutionizing the field of drug delivery by enabling unmatched levels of precision, personalization, and predictive control in pharmaceutical applications. These technologies are capable of analysing complex and vast biomedical datasets to uncover patterns and correlations that may not be evident through traditional methods. This allows researchers to identify optimal drug formulations, predict individual patient responses, and enhance targeted delivery strategies. ML algorithms play a key role in designing intelligent drug carriers such as nanoparticles, liposomes, and micelles. These systems can be optimized for size, shape, surface chemistry, and controlled-release kinetics, improving drug stability, bioavailability, and targeted delivery to specific tissues or cells. Additionally, AI-powered platforms support real-time monitoring and adaptive feedback mechanisms, adjusting drug release based on dynamic physiological conditions. This not only enhances therapeutic outcomes but also minimizes potential side effects and toxicity. The integration of AI and ML into drug delivery systems accelerates pharmaceutical development by reducing reliance on extensive trial-and-error processes. It shortens development timelines, cuts costs, and increases success rates in both preclinical and clinical phases. Furthermore, these innovations are critical in advancing personalized medicine, offering tailored treatment solutions based on genetic, environmental, and lifestyle factors. This presentation explores the intersection of AI, ML, and drug delivery, emphasizing how these technologies are reshaping traditional therapeutic paradigms. With continued advancements and interdisciplinary collaboration, AI-powered drug delivery systems have the potential to transform global healthcare and lead the way toward more effective, individualized, and data-driven treatment strategies.

Keywords: *Artificial intelligence, machine learning, drug delivery, personalized medicine, intelligent drug carriers*

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Yugantar in regulation: Accelerating India's HealthTech revolution through regulatory sandboxes

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Abstract

With India undergoing a digital health shift, its regulatory systems need to evolve to keep pace with rapid technical advancements. Digital treatments, wearable medical devices, AI-based diagnosis, and personalized medicine are some of the newer solutions that need flexible, dynamic, and forward-looking regulatory systems. The concept of regulatory sandboxing, where health innovation can be tested in practice under regulation, is discussed in this lecture. Sandboxes, whose application has been successful in countries like the UK, Singapore, and Australia, provide space for experimental technology to be watched and evaluated before it is used widely, thus providing a balance between innovation and patient safety. Moreover, they function as learning systems that enable regulators to adjust regulations based on stakeholder feedback as well as real-time information. Regulatory sandboxing holds much promise to facilitate India's growing health technology sector. It can allow early access to market for life-saving innovation, foster collaborative learning between inventors, regulators, and healthcare providers, and compress time-to-approval. The conference will also deal with operational issues such as interagency collaboration, legal preparedness, and capacity-building in a way that enables such frameworks to be implemented. Regulatory sandboxing presents India with a pioneering approach to be at the forefront of future health innovation. It allows for guided real-world testing of new treatments and technologies, leading to quicker, safer, and more responsive policymaking. This strategy not only bridges the gap between regulation and innovation but also positions India to become a global hub for responsible and future-ready healthcare solutions.

Keywords: *Regulatory Sandbox, Healthtech Innovation, Regulatory Reform, Digital Health, India Healthcare Ecosystem*

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Redefining Regulatory Frontiers with AR/VR for Virtual Audits and Compliance Excellence

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Abstract

Augmented reality (AR) and virtual reality (VR) are spearheading a transformative shift in regulatory affairs, redefining how virtual audits and compliance training ensure efficiency, scalability, and global impact in the pharmaceutical and biotech industries. AR empowers regulators with real-time data overlays, such as good manufacturing practices (GMP) metrics, enabling precise, travel-free audits that reduce costs and accelerate oversight timelines. VR immerses professionals in sophisticated simulations, allowing them to master complex tasks such as pharmacovigilance and regulatory submissions with improved accuracy and speed, thereby supporting consistent skill development across global teams. Industry leaders like Pfizer and Novartis have demonstrated the effectiveness of AR/VR in improving accessibility, especially for remote or underserved regions, while optimizing compliance workflows. Despite ongoing challenges—such as data security, standardization across jurisdictions, and regulatory acceptance—solutions like encrypted platforms and harmonized global guidelines (e.g., ICH) are enabling broader implementation. By integrating predictive analytics with immersive technology, AR/VR not only enhances patient safety but also redefines the future of regulatory science. This technology stands as a critical tool for global compliance, promoting equitable access and streamlining regulatory operations in a digital-first era.

Keywords: *Augmented reality, Virtual reality, Regulatory affairs, Virtual audits, Compliance innovation*

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Pyrazolopyridine-Pyrimidone Hybrids as Potential Antitubercular Agents: Design, Synthesis, and Biological Evaluation

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Abstract

Tuberculosis (TB) remains a major global health challenge. This study presents the design, synthesis, and evaluation of novel pyrazolo[3,4-*b*] pyridine-pyrimidone derivatives targeting *Mycobacterium tuberculosis* (*Mtb*) by inhibiting the enzyme Decaprenylphosphoryl-β-D-ribose 2'-epimerase (DprE1), essential for cell wall biosynthesis. The compounds were assessed for antitubercular activity using the Microplate Alamar Blue Assay (MABA) against the *Mtb* H_{37}Rv strain. Key derivatives (compounds **8,** and **14**) showed significant activity with minimum inhibitory concentration (MIC) values of 3.12 µg/mL, 12.5 µg/mL, respectively, comparable to the standard drugs. Molecular docking studies demonstrated strong binding interactions with the DprE1 enzyme, suggesting inhibition of this critical protein. Further computational analyses, including density functional theory (DFT) and molecular dynamics simulations, confirmed the binding stability of the compounds. Overall, these pyrazolo[3,4-*b*] pyridine-pyrimidone derivatives are potential leads for further development as future therapeutics for treating drug-resistant TB.

Keywords: *Pyrazolopyridine-pyrimidone, Anti-tubercular, Molecular Docking, DFT, Molecular dynamics*

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Isatin Derivatives: A Promising Scaffold in Anti-Tubercular Drug Discovery

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Abstract

Multidrug-resistant tuberculosis (MDR-TB) poses a significant global health challenge due to limited effective treatments and severe medication side effects. This study is focused on designing isatin derivatives targeting DprE1, a crucial enzyme in *Mycobacterium tuberculosis*, using both computational and experimental methods. Initial computational screening employed AutoDock Vina and AutoDock Tools 1.5.7 for molecular docking, followed by SwissADME for drug-likeness assessment, ProTox-III for toxicity profiling, and density functional theory (DFT) analysis for electronic properties. Molecular dynamics simulations were conducted to analyze compound-enzyme interactions. The compounds were synthesized and characterized using IR, ^{1}H NMR, ^{13}C NMR, and mass spectrometry. Biological activity against *Mycobacterium tuberculosis* H37Rv Strain was evaluated using the Microplate Alamar Blue Assay. Docking studies identified the catalytic hinge region (Gly A:117, Val A:365, Cys A:387, FAD A:501) as crucial for selective binding. Compounds D9 and D10 showed the highest docking scores (-10.6 and -10.7 kcal/mol), while the lead compound and D1 achieved scores of -9.6 and -9.9 kcal/mol, respectively. Structural characterization confirmed the integrity of all synthesized compounds. In biological evaluation against H37Rv Strain, the lead molecule and D1 demonstrated superior activity compared to the standard drug Pyrazinamide (MIC = 1.6 µg/ml), achieving MIC values of 0.8 µg/ml. These results suggest that the designed isatin derivatives are promising candidates for selective and effective anti-tubercular agents with potentially reduced toxicity and side effects.

Keywords: *Isatin, MDR-TB, DprE1, Molecular docking, MABA, MIC*

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Design, Synthesis and Biological Evaluation Of Novel 1,3,4-Thiadiazole-Piperazine Hybrids as Anti-Tubercular Agents

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Abstract

Tuberculosis (TB) remains a significant global health concern, necessitating the development of novel therapeutics to combat drug-resistant *Mycobacterium tuberculosis* (Mtb) strains. This study focuses on the design, synthesis, and evaluation of 1,3,4-thiadiazole-piperazine derivatives as potential inhibitors of Decaprenylphosphoryl-β-D-ribose 2'-epimerase (DprE1), an essential enzyme in M*tb* cell wall biosynthesis. The synthesized compounds were screened for antitubercular activity against the Mtb H_{37}Rv strain using the Microplate Alamar Blue Assay (MABA). Among the tested derivatives, A1, A9, and A11 displayed the highest potency, with minimum inhibitory concentration (MIC) values below 32 µg/mL. Molecular docking studies were performed to investigate the binding interactions of these compounds with DprE1. The results indicated strong binding affinities, ranging from -10.08 to -12.4 kcal/mol, with key amino acid residues, such as Tyr60, Gly117, His132, and Cys387, playing a crucial role in stabilizing the ligand-enzyme complex. The binding interactions closely resembled those of known DprE1 inhibitors, suggesting effective inhibition of the target enzyme. Overall, these results suggest that 1,3,4-thiadiazole-piperazine derivatives could serve as promising lead compounds for developing new anti-TB drugs. However, further structural refinement and *in vivo* studies are essential to evaluate their therapeutic potential and pharmacokinetic behaviour, ultimately contributing to the fight against drug-resistant tuberculosis.

Keywords: *Antitubercular, Docking studies, Piperazine, Thiadiazole*

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The Potential Benefits of Nanotechnology in Treating Alzheimer's Disease

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Abstract

Alzheimer's disease is a neurodegenerative disorder that is caused by the accumulation of beta-amyloid plaques in the brain. Currently, there is no definitive cure available to treat Alzheimer's disease. The available medication in the market has the ability to only slow down its progression. However, nanotechnology has shown its superiority that can be applied for medical usage and it has a great potential in the therapy of Alzheimer's disease, specifically in the disease diagnosis and providing an alternative approach to treat Alzheimer's disease. This is done by increasing the efficiency of drug delivery by penetrating and overcoming the blood-brain barrier. Having said that, there are limitations that need to be further investigated and researched in order to minimize the adverse effects and potential toxicity and to improve drug bioavailability. The recent advances in the treatment of Alzheimer's disease using nanotechnology include the regeneration of stem cells, nanomedicine, and neuroprotection. In this review, we will discuss the advancement of nanotechnology which helps in the diagnosis and treatment of neurodegenerative disorders such as Alzheimer's disease as well as its challenges.

Keywords: *Alzheimer's disease, Beta-amyloid plaques, Bioavailability, Nanomedicine, Neurodegenerative disorders.*

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Drug Solubility: Importance and Enhancement Techniques

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Abstract

Solubility, the phenomenon of dissolution of solute in solvent to give a homogenous system, is one of the important parameters to achieve desired concentration of drug in systemic circulation for desired (anticipated) pharmacological response. Low aqueous solubility is the major problem encountered with formulation development of new chemical entities as well as for the generic development. More than 40% NCEs (new chemical entities) developed in pharmaceutical industry are practically insoluble in water. Solubility is a major challenge for formulation scientist. Any drug to be absorbed must be present in the form of solution at the site of absorption. Various techniques are used for the enhancement of the solubility of poorly soluble drugs which include physical and chemical modifications of drug and other methods like particle size reduction, crystal engineering, salt formation, solid dispersion, use of surfactant, complexation, and so forth. Selection of solubility improving method depends on drug property, site of absorption, and required dosage form characteristics.

Keywords: *Homogeneous, Formulation, Crystal engineering, Dispersion, Absorption*.

PHARMA RESEARCH BULLETIN
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Conference Proceedings

P-83

Central Composite Design for Response Surface Methodology and its Application in Pharmacy

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Abstract

The central composite design is the most commonly used fractional factorial design used in the response surface model. In this design, the center points are augmented with a group of axial points called star points. With this design, quickly first-order and second-order terms can be estimated. In this book chapter, different types of central composite design and their significance in various experimental design were clearly explained. Nevertheless, a calculation based on alpha (α) determination and axial points were clearly described. This book chapter also amalgamates recently incepted central composite design models in various experimental conditions. Finally, one case study was also discussed to understand the actual inside of the central composite design.

Keywords: *Central composite design, Response surface, Method circum scribed, Design, The uncoded value, Central composite design*

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P-84

The Benzimidazole Nucleus as a Privileged Scaffold in Drug Discovery: A Review of Its Therapeutic Potential Across Various Diseases Areas

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Abstract

The benzimidazole nucleus has garnered significant attention in medicinal chemistry due to its remarkable pharmacological versatility and structural adaptability. This fused heterocyclic moiety, formed by the condensation of benzene and imidazole rings, is widely regarded as a "privileged scaffold" in drug discovery owing to its ability to bind with a variety of biological targets. This review aims to explore the therapeutic potential of benzimidazole derivatives across a broad spectrum of disease areas including microbial infections, cancer, inflammatory disorders, viral diseases, gastrointestinal conditions, and more.Benzimidazole-based compounds have demonstrated diverse mechanisms of action, such as inhibition of β-tubulin polymerization in parasites, kinase inhibition in cancer cells, and proton pump suppression in gastric disorders. The structure-activity relationship (SAR) studies reveal that modifications at different positions on the benzimidazole ring greatly influence the biological activity, providing opportunities for tailored drug design. Synthetic methodologies including the classical Phillips method, aldehyde-based reactions, multicomponent reactions, and microwave-assisted synthesis have facilitated the development of a vast array of benzimidazole analogues.Despite the successful development of clinically approved drugs like Albendazole, Omeprazole, and Bendamustine, current challenges such as drug resistance, low solubility, toxicity, and pharmacokinetic limitations continue to hinder progress. Furthermore, the saturation of patents in this class demands innovative strategies to discover novel analogues with improved efficacy and safety.This review consolidates current research on benzimidazole derivatives, highlighting their multi-targeted potential, synthetic accessibility, and broad therapeutic applications. It emphasizes the importance of ongoing SAR studies and the need for novel derivatives to overcome present challenges. The benzimidazole scaffold remains a cornerstone in modern drug discovery, and further research promises to unlock new avenues in the development of effective and safer pharmaceutical agents.

Keywords: *Benzimidazole, Heterocyclic, Microbial infection, Inflammatory Disorder, SAR, Toxicity.*

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P-85

Pyrazole: An Emerging Privileged Scaffold in Drug Discovery

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Abstract

Pyrazole or 1*H*-pyrazole, a five-membered 1,2-diazole, is found in several approved drugs and some bioactive natural products. A myriad number of derivatives of this small molecule have been reported in clinical and preclinical studies for the potential treatment of several diseases. The number of drugs containing a pyrazole nucleus has increased significantly in the last 10 years. Some of the best-selling drugs in this class are ibrutinib, ruxolitinib, axitinib, niraparib and baricitinib, and are used to treat different types of cancers; lenacapavir to treat HIV; riociguat to treat pulmonary hypertension; and sildenafil to treat erectile dysfunction. Several aniline-derived pyrazole compounds have been reported as potent antibacterial agents with selective activity against methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci. Here, we discuss the pyrazole-derived drugs reported up to September 2023.

Keywords: *Antibacterial, Anticancer, Indazole, Kinase inhibitor, Lenacapavir, MRSA, Pyrazole, Sildenafil, Zavegepant*

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P-86

Dual Targets Inhibition as Antimicrobial and Anti-Inflammation (DNA Gyrase And MMP-9) Using with Phytoconstituent: *In Silico* Screening Using Docking and ADME Insights

Vineet Kumar Dwivedi*, Ravi Pratap Pulla

Parul of Pharmacy and Research, Parul University P.O. Limda, Tal-Waghodia, Vadodara, Gujarat, India. 391760

Abstract

Antimicrobial adverse reaction is a rising global health threat, prompting the search for novel therapeutic agents with dual target mechanisms. Ashwagandha, also known as Withania somnifera is widely recognized for its antimicrobial and anti-inflammatory therapeutic action. *In-silico* studies were carried out to show anti-microbial and anti-inflammatory action by molecular docking to identify binding affinity and interaction between Withaferin A and standard drugs of DNA Gyrase(PDB ID: 6RKS) and MMP-9(PDB ID: 1GKC). ADMET analysis using Swiss ADME were examined by Pharmacokinetic profile for different parameters. The Withaferin A is better candidate for acting on microbes and inflammation cause by the ciprofloxacin which is standard drug of anti-microbial action and a candidate for further preclinical development.

Keywords: *Anti-microbial, Anti-inflammation, Withaferin A, Dual-target, DNA Gyrase, MMP-9, Docking, ADMET prediction, Drug-likeness.*

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P-87

Different Targets Involved in Antimicrobial Docking

Nisham Lohan*, Meena devi, Jyoti

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Abstract

Antimicrobial docking studies focus on understanding the interaction of small molecules with key molecular targets critical for microbial survival, aiding the discovery and optimization of new antibiotics. Various classes of antimicrobial agents act by targeting essential bacterial proteins and enzymes involved in fundamental cellular processes. Major targets in antimicrobial docking include: Cell wall synthesis enzymes: Proteins such as penicillin-binding proteins (PBPs) and D-alanyl-D-alanine synthetase (Ddl) are integral to peptidoglycan biosynthesis, essential for bacterial cell wall integrity. Inhibition of these enzymes disrupts cell wall formation, leading to bacterial lysis. PBPs are common targets for β-lactam antibiotics, while Ddl is important for linking peptide subunits. Protein synthesis machinery: Enzymes like isoleucyl-tRNA synthetase (IARS) are crucial for the accurate translation of proteins. Targeting these enzymes impairs bacterial protein synthesis, effectively halting cell growth and proliferation. DNA synthesis and maintenance enzymes: DNA gyrase and topoisomerase IV are essential for DNA replication and segregation. Their inhibition, notably by fluoroquinolones, prevents bacteria from duplicating their genetic material, causing cell death.Folate pathway enzymes: Dihydrofolate reductase (DHFR) and dihydropteroate synthase (DHPS) are key in bacterial folate biosynthesis, vital for nucleotide production. Inhibiting these enzymes blocks nucleic acid synthesis. Oxidative stress defense proteins: Enzymes like superoxide dismutase (SOD) help bacteria withstand reactive oxygen species. Inhibiting SOD can increase bacterial susceptibility to host immune defenses.Through molecular docking, researchers screen and design compounds with the potential to block these targets, guiding the development of effective antimicrobials and helping combat antibiotic resistance by exploring multiple bacterial pathways simultaneously.

Keywords: *Antimicrobial, DHFR, SOD, Cell wall synthesis enzyme*

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Society for Research Development in Health Science (Society RDHS)

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ग्लोबल रिसर्च इंस्टीट्यूट में करियर सेमिनार

निजी संवाददाता- यमुनानगर

ग्लोबल रिसर्च इंस्टीट्यूट ऑफ फार्मेसी रादौर यमुनानगर ने डिजिटल युग में फार्मासिस्टों के लिए करियर अवसर विषय पर एक महत्वपूर्ण सेमिनार का आयोजन किया। इस सेमिनार का उद्देश्य छात्रों को फार्मास्युटिकल उद्योग में उभरते करियर विकल्पों के बारे में जागरूक करना था। कार्यक्रम में बद्दी यूनिवर्सिटी ऑफ इमर्जिंग साइंसेज एंड टेक्नोलॉजी सोलन, हिमाचल प्रदेश के दो प्रतिष्ठित वक्ताओं ने अपने विचार साझा किए। प्रो. डा. अरुण कांत पैनोली डीन और डा. राजीव कुमार सहायक प्रोफेसर। प्रो. डा. अरुण कांत पैनोली जो बद्दी यूनिवर्सिटी में स्कूल ऑफ मैनेजमेंट स्टडीज के डीन और एंटरप्रेन्योरशिप डिवेलपमेंट सेल के प्रमुख भी हैं ने फार्मेसी क्षेत्र पर डिजिटल प्रगति के प्रभाव पर प्रकाश डाला। उन्होंने बताया कि फार्मास्युटिकल रिसर्च, क्लिनिकल ट्रायल्स, हेल्थकेयर टेक्नोलॉजी और उद्यमिता के क्षेत्र में फार्मासिस्टों की मांग तेजी से बढ़ रही है। साथ ही उन्होंने डिजिटल हेल्थकेयर प्लेटफार्म ऑनलाइन फार्मेसी सेवाओं और एआई आधारित दवा विकास की बढ़ती संभावनाओं पर भी चर्चा की। डा. राजीव कुमार ने फार्मेसी स्नातकों के लिए उपलब्ध विविध करियर विकल्पों पर विस्तार से जानकारी दी। उन्होंने फार्माकोविजिलेंस, रेगुलेटरी अफेयर्स, मेडिकल राइटिंग, टेली फार्मेसी और बायोटेक्नोलॉजी क्षेत्रों में रोजगार के अवसरों के बारे में बताया।

ग्लोबल संस्थान के रोट्रैक्ट क्लब सदस्यों ने जरूरतमंदों को वितरित की खाद्य सामग्री

हरिभूमि न्यूज ▸▸ रादौर

रोट्रैक्ट क्लब ग्लोबल रिसर्च इंस्टीट्यूट ऑफ फार्मेसी की ओर से रविवार को विश्व रोट्रैक्ट दिवस के अवसर पर विद्यार्थियों द्वारा जरूरतमंद बच्चों को खाद्य सामग्री वितरित की गई। यह सराहनीय पहल रोट्रैक्ट के मूल उद्देश्य समाज सेवा, नेतृत्व विकास व सामाजिक सुधार को दर्शाती है।

संस्थान के प्राचार्य डॉ.अश्वनी कुमार ढींगरा ने विद्यार्थियों के इस प्रयास की सराहना की और उन्हें समाज के हित में ऐसे अच्छे कार्य करते रहने के लिए प्रोत्साहित किया। कार्यक्रम समन्वयक डॉ.स्मिता नरवाल ने सभी प्रतिभागियों का धन्यवाद किया और समाज सेवा को विद्यार्थियों के समग्र विकास के लिए महत्वपूर्ण बताया। जीआरजीआई रोटरैक्ट क्लब के अध्यक्ष भव्य सैनी ने कहा कि क्लब समाज सेवा के प्रति समर्पित है और आगे भी इसी तरह के कार्यक्रम आयोजित करता रहेगा। संस्थान के शिक्षकों और प्रबंधन ने इस नेक कार्य की प्रशंसा की, क्योंकि यह विद्यार्थियों में दया व सामाजिक जिम्मेदारी की भावना विकसित करता है। उन्होंने कहा कि इस प्रकार की गतिविधियाँ न केवल जरूरतमंदों की मदद करती हैं, बल्कि अन्य लोगों को भी अच्छे कार्यों में भाग लेने के लिए प्रेरित करती हैं। जिससे समाज में सकारात्मकता व सहयोग की भावना बढ़ती है।

यमुनानगर। के रादौर में जरूरतमंद बच्चों को खाद्य सामग्री वितरित करते रोट्रैक्ट क्लब के सदस्य। फोटो : हरिभूमि

सच कहूँ मैच वही epaper.sachkahoon.com 12 Feb 2025 - Page 13

हेल्थकेयर टेक्नोलॉजी और उद्यमिता के क्षेत्र में फार्मासिस्टों की तेजी से बढ़ रही मांग: डॉ. पैनोली

सच कहूँ/लाजपतराय

सेमिनार में भाग लेते बच्चे।

रादौर। ग्लोबल रिसर्च इंस्टीट्यूट ऑफ फार्मेसी, रादौर, यमुनानगर ने डिजिटल युग में फार्मासिस्टों के लिए करियर अवसर विषय पर एक महत्वपूर्ण सेमिनार का आयोजन किया। इस सेमिनार का उद्देश्य छात्रों को फार्मास्युटिकल उद्योग में उभरते करियर विकल्पों के बारे में जागरूक करना था। कार्यक्रम में बद्दी यूनिवर्सिटी ऑफ इमर्जिंग साइंसेज एंड टेक्नोलॉजी, सोलन, हिमाचल प्रदेश के दो प्रतिष्ठित वक्ताओं ने अपने विचार साझा किए। [illegible]

अवैध कॉलोनी पर चला पीला पंजा | नगर निकाय

Six-day Surya Namaskar campaign concludes

NIRMAL SAINI

RADAUR: The six-day Surya Namaskar campaign running at Global Research Institute of Management and Technology Nacharon has concluded. The main objective of the campaign was to increase awareness about physical health among children and to strengthen mental and physical strength through Surya Namaskar. During this, children were told the benefits of Surya Namaskar. Program was conducted under the supervision of Harpreet Kaur. Harpreet Kaur said that the objective of this campaign was to make children aware about physical and mental health and to tell them about health benefits of Surya Namaskar. The institute organizes such events from time to time, so that discipline and confidence can

झुग्गियों में महिलाओं को वितरित किए सैनेटरी पैड

रादौर। ग्लोबल रिसर्च इंस्टीट्यूट ऑफ फार्मेसी नाचरौन (रादौर) के रोट्रैक्ट क्लब के तत्वावधान में झुग्गी झोंपड़ियों में अभियान चलाकर महिलाओं को मासिक धर्म स्वच्छता के प्रति जागरुक किया गया। विद्यार्थियों की टीम ने रादौर क्षेत्र की [illegible] को सैनिटरी पैड वितरित किए। मौके पर महिलाओं को स्वच्छता के प्रति जागरुक किया गया। टीम ने महिलाओं के साथ बातचीत कर उन्हें सैनेटरी पैड के उपयोग के लाभों व मासिक धर्म के दौरान व्यक्तिगत स्वच्छता बनाए रखने के [illegible]

दैनिक भास्कर यमुनानगर भास्कर 24-02-2025

कैंप में 55 लोगों ने किया रक्तदान

[illegible]

रादौर : कार्यशाला के दौरान विद्यार्थियों को जानकारी देते विशेषज्ञ। (छाया : कुलदीप सैनी)

कार्यशाला में छात्रों को दी आधुनिक वेब विकास तकनीक संबंधी जानकारी

रादौर, 6 मार्च (कुलदीप सैनी): ग्लोबल रिसर्च इंस्टीट्यूट ऑफ मैनेजमेंट एंड टेक्नोलॉजी नाचरौन बीटेक सीएसई और बीसीए छात्रों के लिए एमईआरएन स्टैक डेवलपमेंट विषय पर एक दिवसीय कार्यशाला का आयोजन किया गया। कार्यशाला के माध्यम से विद्यार्थियों को आधुनिक वेब विकास तकनीक बारे जानकारी दी गई। इस मौके पर विद्यार्थियों को एमईआरएन स्टैक का उपयोग कर प्रभावी और स्केलेबल वेब एप्लिकेशन बनाने बारे भी जानकारी दी गई। कार्यशाला में सेंसिशन सॉल्यूशंस मोहाली के सॉफ्टवेयर विशेषज्ञ गुरजिंदर सिंह व दीपांशु ने विद्यार्थियों को उद्योग में नौकरी पाने के लिए आवश्यक तकनीकी कौशल के बारे में जानकारी देने के साथ ही छात्रों को वेब [illegible]

अजीत समाचार

प्लेसमेंट ड्राइव में हुआ 11 छात्रों का चयन

रादौर, 11 मार्च (कुलदीप सैनी) : ग्लोबल रिसर्च इंस्टीट्यूट आफ फार्मेसी में एमआईटीएस हेल्थकेयर प्राइवेट लिमिटेड और बायोफील्ड फार्मा प्राइवेट लिमिटेड के सहयोग से कैंपस प्लेसमेंट ड्राइव का आयोजन किया गया। प्लेसमेंट ड्राइव में 11 छात्रों का चयन किया गया। एमआईटीएस हेल्थकेयर प्राइवेट लिमिटेड

[...]न कॉलेज में आयोजित प्लेसमेंट

आंचल, आरजू और कोमल का चयन किया। इन छात्रों ने अपनी असाधारण प्रतिभा और ज्ञान का प्रदर्शन किया। प्राचार्य डॉ. अश्वनी ढींगरा ने चयनित छात्रों को हार्दिक बधाई देते हुए उनकी मेहनत और समर्पण की सराहना की। उन्होंने कहा कि ग्लोबल रिसर्च इंस्टीट्यूट ऑफ फार्मेसी हमेश[...] मजबू[...] ताकि[...]

छात्रों ने सीखी मोल्डिंग-फिनिशिंग की बारीकियां

निजी संवाददाता- यमुनानगर

ग्लोबल रिसर्च ग्रुप ऑफ इंस्टीट्यूशंस रादौर यमुनानगर में आयोजित पांच दिवसीय स्किल डिवेलपमेंट प्रोग्राम इनोवेटिव रेजिन आर्टिस्ट्री सफलतापूर्वक संपन्न हुआ। यह कार्यक्रम प्रसिद्ध कला सिख[...]

आधुनिक वेब विकास तकनीक की दी जानकारी

रादौर (जगमार्ग न्यूज)। नाचरौन स्थित ग्लोबल रिसर्च इंस्टीट्यूट आफ मैनेजमेंट एंड टेक्नोलाजी में बी.टेक सीईएसई व बीसीए छात्रों के लिए एमईआरएन स्टैक डेवलपमेंट पर एक दिवसीय कार्यशाला का आयोजन किया। जिसमें छात्रों को आधुनिक वेब विकास तकनीकों के बारे जानकारी दी गई। कार्यशाला में

दैनिक भास्कर यमुनानगर भास्कर 09-03-2025

स्टार्टअप के बारे में दी जानकारी

अटलाना | नाचरौन स्थित ग्लोबल रिसर्च इंस्टीट्यूट फार्मेसी में फार्मा अंवेषण-2025 विषय पर राष्ट्रीय कार्यशाला कराई गई। पं. बीडी शर्मा यूनिवर्सिटी आफ हेल्थ साइंसेज रोहतक के संरक्षण में आयोजित कार्यशाला सोसाइटी ऑफ फार्मास्युटिकल एजुकेशन एंड रिसर्च के सहयोग से हुई। इसका उद्देश्य फार्मेसी क्षेत्र में नवाचार और स्टार्टअप को बढ़ावा देना था। एसडीएम रादौर नरेंद्र कुमार मुख्यातिथि रहे। अध्यक्षता चेयरमैन

Students can move forward by setting up their own business: Narendra Kumar

NIRMAL SAINI
RADAUR, MARCH 9

A one-day national workshop on subject of Pharma Anveshan-2025 was organized at Global Research Institute of Pharma Pharmacy, Nachron. This workshop organized under patronage of Pt. BD Sharma University of Health Sciences, Rohtak, was concluded in collaboration with Society of Pharmaceutical Education and Research, aim of which was to promote innovation and start-ups in pharmacy sector. SDM Radaur Narendra Kumar was chief guest in program and started program with lighting of lamp. Chairman CA SK Jindal presided over it. He shared his personal experiences with students. Being from a pharmacy background, he explained to students importance of perseverance, innovation and continuous learning in industry and inspired them to explore new opportunities in pharmaceutical industry. He told students that this sector is developing rapidly in which students can not only find better job opportunities but can also move forward by setting up their own business. Vashisht Guest Professor Dr. Kumar Garve, Dr. Upendra Nagaich, Dr. Rahul Taneja, Ms. Ritu Mehla, Chetan Verma, Gulshan Kumar also emphasized importance of entrepreneurial skills in pharmaceutical sector and the need to promote research based innovation. While Dr. Rajesh Kumar Verma, Rohini Sharma, Dr. Sameer Sapra, Professor Monica Gulati, Subhash Baidya shared their views on Indian herbal industry, its current status and sustainability and provided necessary information to students. In program, poster exhibition and oral exhibition competition were the center of attraction for the students. The first prize in the poster exhibition was given to Diya Arora and Tripti Rana. While second prize was given to Raunak, Pratibha, Bhavishya and Sajjad. While the third prize was won by Jagjit Kaur and Sangeeta Verma. Anchal got the first place in oral presentation. While Abhishek got second place and Faizan got third place. Winners were honored with prizes. More than 500 participants attended. College Chairman CA Sanjay Jindal and Vice Chairperson Indu Jindal appreciated innovative thinking of students and reiterated institute's commitment to research and development. Dr. Ashwani Dhingra, Principal of Global Research Institute of Pharmacy thanked all dignitaries, speakers, experts and organizing committee.

Three-day workshop organized at Global Research Institute of Pharmacy Radaur

NIRMAL SAINI
RADAUR, MARCH 10

A three-day workshop Elevate Your Soft Skills Elevate Your Career was organized at Global Research Institute of Pharmacy Radaur. Workshop was conducted by GTT's Soft Skills Trainer Manoj Kumar with aim to enhance personal and professional skills of students and prepare them for future career opportunities. During the workshop, students were taught important soft skills such as effective communication, teamwork, adaptability, leadership ability and problem solving, which are essential for success not only in their professional but also in academic life. Sessions were designed with practical experience and interactive learning, giving students an opportunity to use these skills in real-life situations. Workshop began with an introduction to soft skills, explaining the importance of interpersonal and communication skills in career. The students attended a special session where they learnt the techniques of professional resume writing, including important sections and use of action verbs. Through a SWAT analysis activity, they identified their strengths, weaknesses, opportunities and challenges, which helped them in better self-awareness and goal setting. In addition, a decision making activity was conducted in which students discussed real-life scenarios and developed teamwork, problem solving and logical thinking skills. Under a mental ability challenge, students participated in puzzles and brain teasers, which sharpened their cognitive abilities. Also, debates were organised, which boosted the public speaking, analytical thinking and teamwork skills of the students. The workshop also paid special attention to reasoning skills, which helped students analyse information, evaluate arguments and make informed decisions. Principal of the institute Dr. Ashwani Dhingra lauded the initiative and said, "In today's competitive world, academic excellence alone is not enough." Developing effective communication, leadership and teamwork skills is equally important.

फार्मास्युटिकल उद्योग के समक्ष चुनौतियों पर विचार किए साझा

[illegible]

[illegible]

VISION

To develop as a premier institution in pharmacy education where future leaders in pharmacy practice, academia and the public sector are nurtured and developed to serve mankind.

MISSION

To inculcate profound pharmaceutical knowledge through innovative and practical-oriented teaching-learning methodologies to cater the needs of diverse healthcare sectors and communities.

AUGUST 08, 2025

Programme Educational Objectives (PEOs)

- Educating pharmacy students through innovative, practical-oriented teaching approaches with the goal of nurturing their overall professional development
- Motivating students and faculty members to engage themselves in basic and applied research and scholarly activities to foster their intellectual growth
- Embracing an entrepreneurial mindset amalgamated with teamwork, leadership aptitude and multidisciplinary perspective
- Making a meaningful impact on society by organizing healthcare awareness programs designed to enhance public un derstanding and promote healthier lifestyles
- Fostering professional ethics, effective communication skills and awareness of current trends by engaging students in lifelong learning programs

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