



SOUVENIR CUM SCIENTIFIC ABSTRACT



International Conference
on

**Artificial Intelligence and the Future of Pharma:
Bridging Academia and Industry Imperatives**

Organized by

R.V. Northland Institute & P.R.S Educational Trust

in collaboration with

Biotenic Pharma Pvt. Ltd.

Sponsored by

Indian Pharmacy Graduate's Association

Venue

Constitution Club of India, New Delhi

Weser Books

International Conference on Artificial Intelligence and the Future of Pharma: Bridging Academia and Industry Imperatives 2026

Editor

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Weser Books

Published By: Weser Books

Weser Books,

No. 79737 Äussere Weberstr. 57

02763 Zittau, Germany

Email: weserbooks@gmail.com

Editor: Dr. Akhil Sharma

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Publication Year: 2026

Pages: 242

ISBN: 978-3-96492-740-8

Price: € 18/-



Mr. Puneet Sharma

Secretary, R.V. Northland Institute, Gautam Buddha Nagar

MESSAGE

It gives me immense pleasure to extend my warm greetings to all participants, delegates, speakers and organizers of the International Conference on “Artificial Intelligence and the Future of Pharma: Bridging Academia and Industry Imperatives.” This prestigious international forum brings together eminent academicians, researchers, industry leaders, healthcare professionals, and students from across the globe to exchange knowledge, share innovations, and deliberate on emerging trends shaping the future of the pharmaceutical and healthcare sectors.

Artificial Intelligence is rapidly transforming pharmaceutical research, drug discovery, clinical development, manufacturing and healthcare delivery. The convergence of advanced computational technologies with pharmaceutical sciences offers unprecedented opportunities to enhance efficiency, precision and patient-centric outcomes. I am delighted that this conference provides a vibrant platform for interdisciplinary dialogue, fostering meaningful collaboration between academia and industry and encouraging the translation of innovative ideas into practical solutions.

The publication of this abstract book stands as a reflection of the collective intellect, dedication, and scientific rigor of all contributors. It is not merely a compilation of research abstracts, but a testament to the spirit of innovation, inquiry and technological advancement driving progress in pharmaceutical sciences and allied disciplines.

I extend my sincere appreciation to R.V. Northland Institute and P.R.S. Educational Trust, in collaboration with Biotenic Pharma and the entire organizing committee, for their tireless efforts in making this conference a grand success. I also congratulate all the authors and presenters whose valuable research has found a place in this souvenir. I am confident that the deliberations and outcomes of this conference will inspire future research, foster collaborations, and contribute significantly toward a smarter, more innovative and patient-focused pharmaceutical ecosystem.

Best Regards,
Mr. Puneet Sharma
Patron



Prof. (Dr.) Sanjar Alam

Principal, R.V. Northland Institute, Gautam Buddha Nagar

MESSAGE

It is with great pleasure that I extend a warm welcome to all esteemed delegates, academicians, researchers, industry professionals and students participating in the International Conference on “Artificial Intelligence and the Future of Pharma: Bridging Academia and Industry Imperatives,” scheduled to be held on 31st January 2026 in hybrid mode at the Constitution Club of India, New Delhi. This conference represents a meaningful convergence of knowledge, innovation and expertise, bringing together thought leaders and emerging researchers who are shaping the future of pharmaceutical sciences and healthcare.

The pharmaceutical sector is undergoing a transformative shift driven by the integration of Artificial Intelligence across drug discovery, development, manufacturing, and clinical practice. Conferences of this nature play a vital role in facilitating the exchange of ideas, dissemination of cutting-edge research, and exploration of AI-driven solutions to complex challenges in healthcare. Over the course of this conference, participants will engage in insightful discussions, present innovative research and explore collaborative opportunities that strengthen the bridge between academia and industry.

I take this opportunity to sincerely commend the organizing committee for their dedicated efforts and meticulous planning in curating a program that reflects both academic rigor and industry relevance. Their commitment has ensured a platform that encourages intellectual exchange, interdisciplinary collaboration and meaningful networking among participants from diverse backgrounds.

Such academic gatherings are essential in translating research into real-world applications, fostering innovation, and nurturing partnerships that contribute to sustainable advancements in pharmaceutical sciences. I am confident that the deliberations, presentations, and interactions during this conference will be intellectually enriching and will inspire future research initiatives and collaborative endeavors.

As we embark on this journey of learning and innovation, I encourage all participants to actively engage, share their expertise, and embrace the collaborative spirit of this conference. I wish all attendees a stimulating, insightful, and successful conference experience

Best Regards,

Prof. (Dr.) Sanjar Alam

Convenor



Dr. Akhil Sharma

P.R.S Educational Trust, Greater Noida

MESSAGE

I am delighted to extend a warm welcome to all distinguished delegates, researchers, academicians, industry professionals, and students participating in the International Conference on “Artificial Intelligence and the Future of Pharma: Bridging Academia and Industry Imperatives,” scheduled to be held on 31st January 2026 in hybrid mode at the Constitution Club of India, New Delhi. This conference represents a significant convergence of intellectual thought, technological innovation, and scientific excellence, bringing together experts and emerging scholars from diverse domains of pharmaceutical sciences and allied disciplines.

The rapid integration of Artificial Intelligence into pharmaceutical research, drug discovery, clinical development, and healthcare delivery is redefining the future of the industry. This conference aims to provide a dynamic and inclusive platform for the exchange of pioneering research, innovative ideas, and practical insights, while fostering meaningful dialogue between academia and industry. By encouraging interdisciplinary collaboration, the conference seeks to address contemporary challenges and explore AI-driven solutions that can enhance efficiency, precision, and patient-centric outcomes in pharmaceutical sciences.

The abstracts featured in this souvenir reflect the scholarly rigor, creativity, and dedication of the contributors. Together, they showcase recent research advancements and underscore the growing role of intelligent technologies in driving the next generation of pharmaceutical innovation. This compilation stands as a testament to the collective commitment of researchers and professionals to advancing knowledge and translating research into meaningful real-world impact.

I extend my sincere gratitude to the organizing committee, speakers, partners, and participants for their dedicated efforts in making this international conference a success. I am confident that the discussions and collaborations fostered here will inspire future research, strengthen academia-industry partnerships, and contribute meaningfully to the advancement of the pharmaceutical and healthcare ecosystem.

I wish all participants a stimulating, insightful, and rewarding conference experience

Best Regards,

Dr. Akhil Sharma

Director

P.R.S Educational Trust

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AI-DRIVEN INSIGHTS INTO MUPIROCIN–SILVER NITRATE SYNERGISTIC PLATFORMS FOR ADVANCED WOUND HEALING: A REVIEW OF FUTURE PHARMACEUTICAL INNOVATION

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Abstract

Chronic and infected wounds pose increasing therapeutic challenges due to microbial resistance, biofilm formation, and delayed tissue regeneration. Dual antimicrobial systems, particularly the combination of mupirocin and silver nitrate, offer a promising synergistic approach for broad-spectrum antibacterial activity and enhanced wound repair. This review compiles current scientific evidence on the pharmacodynamics, wound-healing benefits, and limitations of both agents, while positioning the combination within the emerging technological landscape of AI-enhanced pharmaceutical development. The rapid evolution of artificial intelligence in pharma, advanced tools such as predictive modelling, machine-learning-driven drug polymer compatibility analysis, and AI-powered release-kinetic simulation can significantly accelerate the design of novel mupirocin–silver nitrate delivery systems. AI-assisted optimization of hydrogels, sprayable platforms, nano-enabled carriers, and smart wound dressings enables more precise control of antimicrobial release, minimization of toxicity, and improved patient-specific therapy customization. Furthermore, AI-based antimicrobial resistance prediction can guide appropriate dosing strategies to reduce resistance development. Although no single formulation currently co-delivers both agents in a clinical product, AI-driven formulation screening and automated material selection present new opportunities for translating this dual therapy into scalable, industry-ready wound-care technologies. This review highlights the potential of integrating AI, sustainable polymeric materials, and dual antimicrobial mechanisms to create next-generation wound-healing systems.

Keywords: Sprayable hydrogels, AI-enabled formulation design, Wound healing, Innovative delivery systems, Controlled release, antimicrobial therapy, Artificial Intelligence

INTRANASAL POLYMERIC NANOPARTICLES FOR BRAIN TARGETING OF RIVASTIGMINE IN TREATMENT OF ALZHEIMER'S DISEASE

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Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline and memory loss. The blood-brain barrier (BBB) poses a significant challenge for delivering therapeutic agents like rivastigmine, a cholinesterase inhibitor used to manage AD symptoms, to the brain. This study aimed to develop and evaluate intranasal polymeric nanoparticles as a non-invasive and efficient drug delivery system to bypass the BBB and enhance the brain targeting of rivastigmine. Polymeric nanoparticles were prepared using a modified nanoprecipitation technique with biodegradable polymers like poly (lactic-co-glycolic acid) (PLGA) and stabilized with polyvinyl alcohol (PVA). The formulations were meticulously characterized for their particle size, zeta potential, polydispersity index (PDI), encapsulation efficiency, and drug loading. An optimized formulation was selected for further evaluation, including in vitro drug release studies and ex vivo permeation studies using sheep nasal mucosa to simulate nasal administration. The effectiveness of the nanoparticles in targeting the brain was assessed through in vivo pharmacokinetic and pharmacodynamic studies in animal models, comparing the intranasal nanoparticle formulation to an oral rivastigmine solution. The optimized nanoparticles exhibited a desirable particle size, a high encapsulation efficiency, and a sustained drug release profile. Ex vivo studies demonstrated significantly enhanced permeation of rivastigmine through the nasal mucosa when delivered as nanoparticles compared to the drug solution. In vivo studies confirmed that the intranasal administration of the developed nanoparticles resulted in a higher concentration of rivastigmine in the brain, a greater brain-to-blood ratio, and a superior therapeutic effect compared to oral administration. These findings suggest that intranasal polymeric nanoparticles are a promising strategy for targeted brain delivery of rivastigmine, offering the potential to improve the efficacy of AD treatment and reduce systemic side effects, ultimately enhancing patient compliance.

Keywords: Alzheimer's disease (AD), blood-brain barrier (BBB), polyvinyl alcohol (PVA), nanoparticles, rivastigmine.

***CURCUMA LONGA*–BASED DRY POWDER INHALERS AS A BIOMEDICINE
APPROACH FOR PULMONARY DISEASES**

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Abstract

Curcuma longa (turmeric) is widely recognized for its potent anti-inflammatory, antioxidant, and immunomodulatory properties, primarily attributed to curcumin. Despite its therapeutic potential, the clinical application of curcumin is severely limited due to poor aqueous solubility, rapid metabolism, and low systemic bioavailability following conventional oral administration. Pulmonary drug delivery offers an attractive alternative route by enabling direct drug deposition at the site of action, rapid onset of therapeutic effect, and reduced systemic exposure. Among pulmonary delivery systems, dry powder inhalers (DPIs) are particularly advantageous due to their stability, ease of use, and propellant-free nature.

Keywords: *Curcuma longa*, Curcumin, Dry powder inhaler, Pulmonary drug delivery, Aerosolization

EXTRACTION, STANDARDIZATION, AND SYNTHESIS OF NANOPARTICLES FROM SEED EXTRACT OF ABELMOSCHUS MOSCHATUS

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Abstract

Herbal medicines have been widely used since ancient times for the prevention and treatment of various diseases. In this study, the seed extract of *Abelmoschus moschatus* was utilized for the extraction, standardization, and green synthesis of nanoparticles. The main objective was to explore the potential of *A. moschatus* seed extract in the formulation of eco-friendly nanoparticles with medicinal relevance. The prepared nanoparticles were evaluated for particle size, stability, phytochemical constituents, and possible therapeutic applications. Standardization of the extract was performed using qualitative and quantitative phytochemical analysis. The synthesized nanoparticles were characterized by UV-visible spectroscopy, FTIR, SEM, and particle size analysis, confirming the successful formation of stable nanoparticles. The results indicate that the seed extract of *Abelmoschus moschatus* is a promising natural reducing and stabilizing agent in the green synthesis of nanoparticles. Thus, the present study highlights a simple, economical, and eco-friendly approach for nanoparticle synthesis with potential pharmaceutical applications.

Keywords: *Abelmoschus moschatus*, seed extract, nanoparticles, green synthesis, phytochemical analysis

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL SCIENCES: BRIDGING ACADEMIA AND INDUSTRY THROUGH PHARMACIST-LED INTERVENTIONS TO IMPROVE MATERNAL HEALTH

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Abstract

Facilitating data-driven decision-making, predictive analytics, and precision-based therapeutic approaches, artificial intelligence (AI) is quickly redefining pharmaceutical research and healthcare delivery. It is also bolstering cooperation between academic institutions and the pharmaceutical industry. These developments are improving the translation of research findings into clinical practice by speeding up drug discovery, streamlining clinical trial design, and assisting in the creation of real-world evidence. Simultaneously, pharmacist-led training programs have shown substantial therapeutic benefit in the treatment of pregnancy-related anemia, a serious public health issue linked to poor outcomes for both the mother and the fetus. Pharmacists' growing clinical role is complemented and enhanced by AI-enabled solutions that support drug development optimization, patient stratification, adherence monitoring, risk prediction, and customized care planning. The results of the interventional trial show that, in comparison to standard treatment, structured pharmacist counseling greatly enhances medication adherence, dietary understanding, iron supplementation practices, hemoglobin levels, and mothers' quality of life. A scalable and translational strategy for connecting academics and business is to combine AI-driven findings with pharmacist-led instructional approaches. Such integration highlights the changing position of pharmacists as important contributors to AI-augmented healthcare systems, enables individualized maternity healthcare, and facilitates evidence-based practice. This combination approach has the potential to advance patient-centered pharmaceutical care and enhance maternal health outcomes.

Keywords: Artificial Intelligence (AI); Clinical Pharmacy; Pharmacist-Led Educational Intervention; Anemia in Pregnancy; Maternal Health; Precision Medicine

HEPATOPROTECTIVE ACTIVITY OF SECONDARY METABOLITE PLANTS

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Abstract

Aim & objectives: The liver is one of the major cellular organs that carries out a critical role in the balancing of miscellaneous processes, among which the metabolism, secretion, storage, and detoxification of endogenous and exogenous substances are important. Despite tremendous advances in modern medicine, no entirely possible medications that boost hepatic activities, provide complete protection, or aid in the renewal of hepatic cells have been identified. As a result, finding pharmacological substitutes for liver abnormalities is required to make these alterations more accurate and less damaging.

Methods: The use of plants, their secondary metabolites, and fruit eating all played important roles in human health maintenance. A wide range of scientific research has argued that the presence of bioactive chemicals in plants confers medicinal capabilities. Based on experimental evidence, natural bioactive components generated from plant secondary metabolites have been recognized as effective options for predicting and mitigating hepatotoxic effects and chronic problems.

Results and conclusions: The current research includes discoveries from plant extracts and bioactive substances research, which may give new alternatives for the limited treatment possibilities that exist currently in the management of hepatic disorders.

Keywords: Plant Secondary metabolites; Medicinal plants; hepatotoxicity; hepatoprotective effect.

MICROSPONGES AS AN ADVANCED APPROACH IN CONTROLLED DRUG DELIVERY SYSTEMS

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Abstract

Microsponges are porous, polymer-based drug delivery systems developed to achieve controlled and sustained release of active pharmaceutical ingredients. Their unique sponge-like structure enables high drug loading capacity and allows the drug to be released gradually over an extended period, thereby improving therapeutic efficacy and reducing dose-related side effects. Microsponges are generally prepared using techniques such as liquid–liquid suspension polymerization and quasi-emulsion solvent diffusion, which help in producing stable and uniform porous particles. These delivery systems have gained considerable attention in pharmaceutical research due to their ability to enhance drug stability, improve patient compliance, and reduce dosing frequency. Microsponges are widely used in topical, oral, and cosmetic formulations, particularly in dermatological applications where controlled drug release and reduced skin irritation are essential. Additional advantages include improved bioavailability, better formulation stability, and minimized systemic exposure. Owing to these benefits, microsphere technology represents a promising and effective approach for controlled drug delivery in modern pharmaceutical formulations.

Keywords: Microsponges, Controlled drug delivery, Polymeric carriers, Novel drug delivery system

**FORMULATION, DEVELOPMENT, AND IN VIVO-IN VITRO EVALUATION OF
MOUTH DISSOLVING FILM FOR MANAGEMENT OF GINGIVITIS, HALITOSIS,
AND SORE THROAT**

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Abstract

Oral diseases such as gingivitis, sore throat, and halitosis are highly prevalent and often require multiple therapeutic interventions, including mouthwashes, gels, and lozenges. However, conventional dosage forms suffer from limitations such as poor patient compliance, inaccurate dosing, limited retention time, and unpleasant taste. In recent years, Mouth Dissolving Films (MDFs) have emerged as a novel oral drug delivery system offering rapid disintegration, ease of administration, and enhanced local action without the need for water or swallowing. The present research aims to develop a multifunctional mouth-dissolving film prepared using the solvent casting technique with Hydroxypropyl Methylcellulose (HPMC E5) as the primary film-forming polymer, that combines the proven antimicrobial efficacy of Chlorhexidine Gluconate with the synergistic therapeutic benefits of herbal actives Eugenol (Clove oil) for antiseptic and anti-halitosis action, Menthol for cooling and soothing effect, and Gingerol for anti-inflammatory and anti-sore throat properties. The prepared films were subjected to detailed physicochemical evaluation along with antimicrobial activity assessment against oral pathogens. In-vivo evaluation was conducted using an appropriate animal model to assess therapeutic effectiveness. The overall objective is to create a broad-spectrum, patient-friendly oral film that can effectively address multiple oral conditions in a single formulation.

Keywords: Gingivitis, Mouth Dissolving Films (MDFs), eugenol, antiseptic, anti-halitosis action

DEVELOPMENT, CHARACTERIZATION, AND IN-VITRO EVALUATION OF ANTIHISTAMINIC ORAL THIN FILMS OF EBASTINE

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Abstract

Ebastine is a poorly water-soluble antihistamine that undergoes significant first-pass metabolism, reducing its oral bioavailability. This study developed and optimized fast-dissolving oral films of Ebastine to circumvent this metabolism, enhance compliance, and ensure rapid action. Using a factorial design, films were formulated to be thin, uniform, and mucosally compatible, with excellent drug content uniformity. Analysis showed that increasing the concentrations of HPMC and Chitosan polymers improved mechanical strength but, at very high levels, increased film thickness and disintegration time. Despite this, all films disintegrated rapidly in simulated saliva (12–32 seconds). In vitro drug release was swift, with the best formulation (F3) releasing approximately 39% of the drug within 2 minutes and 99% within 25 minutes. Statistical optimization identified an ideal composition of 15 mg HPMC and 25 mg Chitosan. This optimized film combined a very fast disintegration time of 12.7 seconds, 99.7% drug content, and nearly complete drug release, achieving a high desirability score. The study successfully demonstrates the potential of mouth-dissolving films as an effective delivery system for Ebastine.

Keywords: Ebastine, Mouth Dissolving Film, Fast Dissolving Oral Film, 3² Factorial Design, Optimization, Disintegration Time, Dissolution, HPMC, Chitosan, Antihistamine.

N-ETHYLCARBAZOLE-3-CARBOXALDEHYDE DERIVATIVES: DESIGN, SYNTHESIS, CHARACTERIZATION, MOLECULAR DOCKING, AND ANTIDIABETIC ASSESSMENT

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Abstract

Introduction: Diabetes mellitus is among the most common metabolic diseases. The massive global burden of diabetes necessitates the development of safer and more effective medications. The current study focuses on the evaluation of carbazole as an antidiabetic drug.

Materials and Methods: Thirteen novel carbazole-schiff base compounds were synthesized, analyzed using various spectroscopic techniques, and tested against the enzyme α -glucosidase.

Results: Compared with acarbose (IC₅₀ value of 283.7 $\pm$ 4.808 μ M), the reference medication, all synthesized derivatives exhibit better inhibitory activity against α -glucosidase (IC₅₀ values in the range of 38.66-152.5 μ M).

Discussion: In contrast to acarbose, substitution of the *p*-methylbenzene group with an aliphatic methyl substituted C6 (IC₅₀: 38.66 $\pm$ 3.47 μ M), the *p*-methoxybenzene group with an aliphatic methyl substituted C4 (IC₅₀: 49.73 $\pm$ 5.38 μ M), and the phenyl group with an aliphatic methyl substituted C11 (IC₅₀: 42.02 $\pm$ 4.78 μ M), showed excellent inhibitory activity.

Conclusion: The molecular docking analysis has provided important information on the interactions between α -glucosidase proteins and the produced 9-ethyl-3-((E)-(((Z)-1-phenylethylidene) hydrazineylidene) methyl)-9H-carbazoles (C1-13). The findings might lead to new therapeutic approaches, shed light on binding affinity, and identify important interaction areas for controlling postprandial glucose levels in diabetics.

Keywords: Alpha(α)-glucosidase, ADMET, carbazole, SAR, Schiff base, Bis-Schiff base, antidiabetic activity, molecular docking, Synthesis, inhibition.

SYNERGISTIC ANTI-INFLAMMATORY EFFECTS OF *COCCINIA GRANDIS* AND *CURCUMA LONGA* EMULGEL: AN IN VIVO STUDY

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Abstract

The present study aimed to develop, optimize, and evaluate a novel topical emulgel combining *Coccinia grandis* and *Curcuma longa* extracts for synergistic anti-inflammatory and anti-ulcer activity using a Design of Experiments (DOE)–based approach. Hydroalcoholic extracts of both plants were incorporated into an oil-in-water emulgel system and systematically optimized by response surface methodology to achieve desirable physicochemical characteristics, including viscosity, spreadability, globule size, drug release, and bioadhesive strength. The optimized formulation was validated through confirmatory batches, demonstrating good agreement between predicted and observed responses. In-vivo anti-inflammatory activity was assessed using the carrageenan-induced paw edema model in rats. The optimized combination emulgel showed significantly greater inhibition of paw edema at all time points compared to crude extracts and individual emulgels, with anti-inflammatory activity comparable to the standard diclofenac gel.

Keywords: *Coccinia grandis*, *Curcuma longa*, anti-inflammatory, anti-ulcer, emulgel

**SYNTHESIS, MOLECULAR DOCKING RESEARCH ON DUAL ENOYL ACP
REDUCTASE AND MTDHFR ENZYME INHIBITORS, AND BIOLOGICAL
ASSESSMENT OF SEVERAL NOVEL 4-(1H-PYRROL-1YL) BENZOHYDRAZIDE
DERIVATIVES AS ANTIMYCOBACTERIAL AGENTS**

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Abstract

Aim: The objective of this study was the synthesis of N'-((2-hydroxynaphthalen-1-yl) (substituted)methyl)-4-(1H-pyrrol-1yl) benzohydrazide derivatives 4(a-j), evaluation there *in vitro* as antimycobacterial activity and showing the molecular docking. **Materials and Methods:** A new series of N'-((2-hydroxynaphthalen-1-yl) (substituted)methyl)-4-(1H-pyrrol-1yl) benzohydrazide derivatives 4(a-j) were prepared, underwent spectroscopic characterization and tested their antibacterial and antimycobacterial activities. The Swiss ADME online tool was used to estimate molecular ADME characteristics, and the ProTox-II web server was used to evaluate possible toxicological profiles. Molecular docking studies were conducted against the InhA inhibitor (PDB ID: 6R9W) and the *MtDHFR* inhibitor (PDB ID: 1DF7) to identify the crucial interactions underlying antimycobacterial activity using Auto Dock Tool 1.5.6. **Result:** FTIR, ¹H NMR, ¹³C NMR, and mass spectrum analysis confirmed the chemical structures and purity. Promising *in vitro* antibacterial and antimycobacterial properties were established by compounds **4a** and **4f** at the lowest dose of 0.8 µg/mL among the examined compounds. *In silico study* indicated that molecules are connected to enzymes like *InhA* and *MtDHFR*. **Conclusion:** N'-((2-hydroxynaphthalen-1-yl) (substituted)methyl)-4-(1H-pyrrol-1yl) benzohydrazide derivatives were synthesized in a few steps with high yields. Some synthesized derivatives showed promising antibacterial and antimycobacterial activity. All of these compounds have drug-like properties, according to the results of the expected ADMET studies. The Auto Dock Tool 1.5.6 program was used to dock inhibitors into InhA and *MtDHFR* enzymes, revealing the inhibitors' crucial interactions and binding conformation.

Keywords: *In silico*, Pyrrolyl Benzohydrazides, Antibacterial activity, Antimycobacterial activity, Enoyl ACP reductase (InhA), *Mycobacterium tuberculosis* dihydrofolate reductase (*MtDHFR*)

PLANT-BASED COLOURING AGENTS: A GREEN INITIATIVE IN THE COSMETIC INDUSTRY

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Abstract

The growing demand for sustainable and eco-friendly solutions in cosmeceuticals has led to an increased interest in natural colourants derived from plant, mineral, and biological sources. Natural colorants have gained significant attention in recent years due to their eco-friendly, non-toxic, and biodegradable properties. The use of these colorants in herbal cleansers aligns with the growing demand for sustainable and chemical-free personal care products. This paper explores the potential of natural colourants in cosmeceuticals, highlighting their advantages, sources, extraction methods, and functional properties. Emphasis is placed on the green chemistry approaches in the extraction and formulation processes, which align with the principles of sustainability and minimal environmental impact. Furthermore, the paper discusses challenges such as stability, regulatory hurdles, and scalability, offering insights into future innovations that could enhance the integration of natural colourants into mainstream cosmeceutical products. especially for coloring herbal cleansers. These natural colorants not only provide aesthetic appeal but also offer additional therapeutic benefits such as antioxidant, antimicrobial, and anti-inflammatory properties. The integration of natural colorants into herbal cleansers can enhance consumer appeal while promoting the use of safe, natural ingredients in the cosmetic industry. This study aims to establish the current advancements and development in the application of natural colorants in herbal cleansers, their stability, safety, and efficacy, and to provide insights into their prospects in the formulation of eco-conscious skincare products. Ultimately, the use of natural colourants represents a promising step toward greener, safer, and more efficacious cosmetic formulations.

Keywords: Cleansers, natural colourants, cosmeceuticals, green chemistry, bioactive properties, sustainability, eco-friendly, plant-based dyes.

INTEGRATION OF COMPUTATIONAL TECHNIQUES IN RECENT SYNTHETIC METHODOLOGIES: A CRITICAL REVIEW

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Abstract

Computer-Aided Drug Design (CADD) has emerged as a powerful and innovative strategy in contemporary pharmaceutical research, facilitating the systematic identification and optimization of new therapeutic molecules through computational techniques. Conventional drug discovery processes are often expensive, lengthy, and characterized by high attrition rates. CADD overcomes many of these limitations by combining principles of computational chemistry, molecular biology, bioinformatics, and artificial intelligence to improve efficiency and decision-making during drug development. The central aim of CADD is to predict and analyze the interactions between potential drug molecules and biological targets such as enzymes, receptors, and nucleic acids—prior to experimental testing. CADD approaches are generally divided into structure-based and ligand-based drug design methodologies. Structure-based drug design focuses on the three-dimensional architecture of target biomolecules, typically obtained through X-ray crystallography or nuclear magnetic resonance (NMR) spectroscopy, to design and optimize ligands with enhanced binding affinity. In contrast, ligand-based drug design depends on information derived from known bioactive compounds to identify essential pharmacophoric features and develop quantitative structure–activity relationship (QSAR) models. Computational tools, including molecular docking, virtual screening, and molecular dynamics simulations, are widely employed to assess binding interactions, conformational flexibility, and the stability of ligand–target complexes.

Keywords: Computer-Aided Drug Design, Quantitative structure–activity relationship, Nuclear magnetic resonance, Ligand-based drug design, Structure-based drug design.

INVESTIGATING THE ROLE OF TUMOR NECROSIS FACTOR ALPHA IN AUTOIMMUNE DISEASE

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Abstract

Tumor Necrosis Factor (TNF- α) is produced and activated by macrophages, T-lymphocytes, and natural killer cells. It is a major regulator of inflammatory responses, and it's involved in the pathogenesis of some inflammatory and autoimmune diseases. TNF- α exists in two forms: soluble and transmembrane form. TNF- α facilitates various biological activities through two receptors – TNFR1 and TNFR2. TNF- α binds to these two receptors and then transmits a molecular signal for biological functions such as cell survival, differentiation, and proliferation. Excessive activation of TNF causes chronic inflammation and eventually leads to the development of pathological complications, such as autoimmune diseases, such as Rheumatoid arthritis, inflammatory bowel disease, psoriatic arthritis, psoriasis, and noninfectious uveitis are mainly induced by abnormal secretion of TNF α . To combat the TNF α , their inhibitors have been successfully developed and applied in clinical treatment of autoimmune diseases such as Crohn's disease and rheumatoid arthritis. These are the approved clinical inhibitors are Etanercept, infliximab, adalimumab, golimumab, and certolizumab. Major side effects include infections (bacterial, fungal, viral, or atypical infections), congestive heart failure NYHA Class III or IV showed poor cardiac outcomes, and drug-induced lupus. In this study, we reviewed major occurrences of adverse events and their pathogenesis.

Keywords: TNF- α , autoimmune disease, TNF- α inhibitors, rheumatoid arthritis, psoriatic arthritis, inflammatory bowel disease.

SPATIAL OMICS FOR TUMOR MICROENVIRONMENT CHARACTERIZATION: A REVIEW

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Abstract

The tumor microenvironment is a dynamic, complicated ecosystem, the elements of which, such as malignant cells, immune cells, stromal components, endothelial cells, and also the components of the extracellular matrix, interrelate to control the initiation, progression, and therapy response of tumors. Spatial omics has been introduced as a disruptive collection of technologies that combine high-resolution imaging with transcriptomic, proteomic, and metabolomic profiling. It talks about the utility of spatial omics in order to describe the immune landscape, tumor stroma interactions, intratumoral heterogeneity, and clonal evolution through the identification of spatially defined biomarkers and drug targets. In addition, it explores the computational integration and data mining for the translation of complex spatial datasets into biological information. But many challenges exist due to technical complexity, data standardization, and increasing computational demands. In general, spatial omics is an excellent framework that can be used to unravel the spatial structure of the TME and has significant potential to promote precision oncology and individualized cancer treatment.

Keywords: Immune landscape, Malignant cells, Spatial omics, Transcriptomics, Tumor microenvironment.

DEVELOPMENT AND OPTIMIZATION OF AJOENE-LOADED HYDROGEL FOR FUNGAL INFECTION

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Abstract

Fungal infections of the skin are among the most common infectious diseases worldwide and are frequently associated with recurrence, prolonged therapy, and poor patient compliance. Conventional topical antifungal treatments show limitations such as systemic toxicity, inadequate penetration into keratinized tissues, and emergence of drug resistance. Therefore, this study aimed to develop and optimize an ajoene-loaded hydrogel as a novel topical delivery system for effective management of fungal infections. Ajoene, a sulfur-containing bioactive compound derived from garlic, exhibits potent antifungal activity with minimal resistance potential. Ajoene-loaded hydrogels were formulated using Carbopol 940 as a gelling agent and propylene glycol as a penetration enhancer. A 3^2 factorial design was applied to evaluate the influence of polymer and penetration enhancer concentrations on viscosity and in vitro drug release. Formulations were characterized for appearance, pH, spreadability, viscosity, drug content, stability, and in vitro release. Compatibility studies using FTIR and DSC confirmed the absence of significant drug–excipient interactions. The optimized formulation showed suitable pH, good spreadability, uniform drug content, and sustained drug release for eight hours. In vitro antifungal studies demonstrated significant inhibition against fungal strains, comparable to clotrimazole. Stability studies under accelerated conditions confirmed good physical and chemical stability. The ajoene-loaded hydrogel represents an approach.

Keywords: Ajoene, Hydrogel, Topical drug delivery, Antifungal activity, Carbopol 940, Factorial design, In-vitro drug release, Fungal infection

ANTI-RHEUMATOID ACTIVITY OF RUTIN IN COLLAGEN-INDUCED ARTHRITIS IN RATS

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Abstract

Aim: The purpose of this study is to assess the anti-arthritic effects of oral Rutin, a plant-based medication, on rats with collagen-induced arthritis (CIA). **Methods:** 36 Wistar rats (age range: 6–8 weeks; average weight: 200 ± 10 g) were used in the study. Of these, six will be used as a negative control group (group A). The remaining 30 rats, known as CIA rats, were randomly assigned to four groups and treated for 28 days with normal saline (group B), low-dose NCL (group C), high-dose NCL (group D), and diclofenac sodium (group E). All groups will have their body weight, arthritic index, ankle swelling, and footpad thickness measured both before and after treatment. Tumor necrosis factor alpha (TNF- α), interleukin 1 beta (IL-1 β), and IL-6 serum levels will be examined at the conclusion of the therapy period together with a sampling of articular synovial tissue to assess the pathological alterations. **Result:** A high dose of oral Rutin considerably decreased the arthritis index, footpad thickness, and ankle swelling after four weeks of treatment. Rats treated with high-dose oral medication or intramuscular injection of diclofenac sodium will have significantly lower serum levels of inflammatory biomarkers, such as TNF- α , IL-1 β , and IL-6, when compared to groups B and C. A high dose of Rutin dramatically decreased inflammatory cell infiltration, synovial hyperplasia, and bone and cartilage degradation, according to histopathological analysis. **Conclusion:** In rats with arthritis, rutin can successfully reduce pathological alterations, inflammatory markers, joint swelling, and clinical ratings.

Keywords: Arthritic Score, Biomarkers, Collagen-induced arthritis, Rheumatoid arthritis, Rutin

EXPLAINABLE ARTIFICIAL INTELLIGENCE (XAI) IN BREAST CANCER: BRIDGING BLACK-BOX MODELS AND CLINICAL DECISION-MAKING

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Abstract

Background: Artificial Intelligence (AI)- driven models have demonstrated high accuracy in breast cancer detection, prognostic assessment, and therapeutic decision support; however, their limited interpretability poses a significant barrier to clinical translation.

Insights: Explainable Artificial Intelligence (XAI) has emerged as a critical methodological advancement aimed at enhancing transparency, accountability, and trust in AI-assisted oncology. This presentation focuses on the technical foundations and clinical relevance of XAI frameworks applied to breast cancer imaging, pathology, and predictive modeling. Contemporary XAI techniques- including SHapley Additive exPlanations (SHAP), Local Interpretable Model-Agnostic Explanations (LIME), Grad-CAM, attention mechanisms, and counterfactual explanations- enable visualization and quantification of feature contributions influencing model outputs. In breast imaging and digital pathology, these methods highlight diagnostically relevant regions such as tumor margins, microcalcifications, stromal architecture, and immune cell infiltration. Integration of XAI with multimodal datasets further supports bias detection, model validation, and robustness assessment across diverse patient populations.

Conclusion: By transforming black-box models into interpretable decision-support systems, XAI plays a pivotal role in enabling ethical, reliable, and clinically actionable AI deployment in breast cancer precision oncology.

Keywords: Explainable Artificial Intelligence (EAI), Black-Box, Breast Cancer, SHAP, LIME, Clinical decision.

EFFECT OF HPMC CONCENTRATION ON FLOATING & MATRIX INTEGRITY OF A GASTRORETENTIVE FILM

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Abstract

Floating gastroretentive drug delivery systems (GRDDS) in the form of single-unit oral films have gained increasing attention due to their ability to prolong gastric residence time and improve bioavailability of drugs with a narrow absorption window. Among the various formulation variables reported in the literature, the concentration of hydroxypropyl methylcellulose (HPMC) has been identified as a critical factor influencing both floating performance and matrix integrity of gastroretentive films. These abstract reviews and analyzes findings from previously published studies focusing on the effect of HPMC concentration on floating time and structural stability of single-unit gastroretentive films.

Published research indicates that HPMC concentration directly affects film density, swelling behaviour, and mechanical strength, which collectively govern buoyancy and matrix integrity in acidic gastric conditions. Lower HPMC concentrations often result in insufficient gel formation, leading to rapid erosion or loss of matrix integrity during floating studies. Conversely, increasing HPMC concentration enhances gel strength and swelling capacity, thereby improving total floating duration and maintaining film integrity over extended periods. However, excessively high polymer levels have been reported to cause increased film thickness, reduced flexibility, and delayed hydration, which may adversely affect floating lag time.

Overall, studies indicate that an optimized HPMC concentration is essential to balance immediate buoyancy, prolonged floating time, and adequate matrix integrity in single-unit gastroretentive films. Understanding the concentration-dependent behaviour of HPMC provides a rational basis for the design and optimization of floating oral films for gastroretentive drug delivery.

Keywords: Gastroretentive, Floating film, Matrix, Buoyancy, lag time.

AI-DRIVEN INTELLIGENT DRUG DELIVERY: REVOLUTIONIZING PERSONALIZED & SAFER CANCER TREATMENT

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Abstract

Background: Conventional cancer therapies often suffer from non-specific action and dose-limiting toxicities, resulting in poor patient compliance and suboptimal treatment outcomes. Recent advancements in Novel Drug Delivery Systems (NDDS), especially when integrated with Artificial Intelligence (AI), offer highly targeted, responsive, and patient-tailored cancer treatments.

Objectives: To evaluate how AI-driven personalization and optimization of drug delivery enhance therapeutic precision, minimize adverse effects, and improve overall patient compliance in cancer therapy.

Method: The study focused on finding, reading, and comparing new smart drug delivery system used in cancer treatment, such as pH-sensitive nanoparticles, enzyme-responsive carriers, magnetic and oxygen-sensitive particles, liposomes, dendrimers, and exosomes. The role of artificial intelligence and machine learning in designing and improving these systems was also examined.

Results: AI algorithms support patient-specific selection and personalized dosing of nanocarriers, optimize drug release at tumor sites and reduce systemic toxicity. Stimuli-responsive NDDS further ensure on-demand and site-specific drug release. AI-powered pharmacovigilance systems provide real-time monitoring, reporting, and early management of adverse effects. Together, these innovations significantly improve patient compliance, comfort, and therapeutic success in oncology therapy.

Conclusion: Combining AI with a smart drug delivery system can make cancer treatment safer, more personalized, and more comfortable for patients. Recent research from 2022 to 2025 confirms that these innovations lead to better outcomes and improved patient safety in oncology pharmacy practice.

Keywords: Artificial Intelligence, Drug Delivery, Oncology, Nanoparticles, Patient Compliance.

ARTIFICIAL INTELLIGENCE AND THE FUTURE OF PHARMA: BRIDGING ACADEMIA AND INDUSTRY IMPERATIVE

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Abstract

Artificial Intelligence (AI) is accelerating pharmaceutical innovation at a historically unmatched pace, with reports indicating that AI-driven platforms can shorten early drug discovery timelines by up to 70% while reducing associated R&D costs by 40–50%. Yet, the full potential of AI remains underutilized due to a persistent disconnect between academic training and real-world industry needs. This study evaluates the transformative impact of AI across the pharma value chain, ranging from target prediction, molecular de-novo design, and ADMET forecasting to supply-chain optimization and automated manufacturing. Evidence shows that over 60% of global pharma companies now integrate AI models into decision-making pipelines, highlighting the urgent need for academia to realign its curriculum with industry's digital demands. Strengthening academia–industry collaboration through AI-centric coursework, data-science laboratories, industrial internships, and joint research centers can significantly enhance translational efficiency. The findings emphasize that AI is not only a technological revolution but a strategic framework that will define the competitiveness of the future pharma workforce. Bridging this gap is therefore imperative to build a globally competent, innovation-driven pharmaceutical ecosystem.

Keywords: Artificial Intelligence, Pharmaceutical Innovation, Academia–Industry Gap, Digital Drug Discovery, Automation, Pharma 4.0

**THIAMINE HYDROCHLORIDE-ASSISTED ONE-POT, MULTICOMPONENT
SYNTHESIS OF 1,3 DIARYL-3-ARYLAMINO-PROPAN-1-ONE DERIVATIVES: A
SUSTAINABLE AND GREENER APPROACH**

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Abstract

In this efficient approach, thiamine hydrochloride serves as an organocatalyst for the rapid synthesis of 1,3-diaryl-3-arylamino-propan-1-ones through a one-pot, multicomponent reaction (MCR). This protocol enables the production of β -amino carbonyl compounds using acetophenones with various substituted aromatic amines and aromatic aldehydes via a Mannich condensation reaction. The method offers several advantages, such as adhering to sustainable practices, following green chemistry principles, and providing an easy work-up process, yielding 1,3-diaryl-3-arylamino-propan-1-ones in moderate to excellent quantities.

Keywords: Multicomponent reactions, Thiamine hydrochloride, β -amino carbonyl derivatives, green synthesis

FROM GUT TO HEART-THE ROLE OF MICROBIAL METABOLITES IN ATHEROSCLEROSIS IN SOUTH INDIAN POPULATION-AN EXPLORATORY STUDY

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Abstract

Background: Cardiovascular diseases (CVDs) are a leading cause of mortality in India, with atherosclerosis being a major contributing factor. The study aims to provide a treatment strategy focusing on metabolites produced by gut microbes, particularly Trimethyl Amine N-Oxide (TMAO).

Aim & Objectives: To investigate the association between plasma TMAO levels and atherosclerotic plaque formation in CVD patients in a South Indian population.

Methods: A prospective exploratory study was conducted involving 13 patients with cardiovascular disease. Plasma TMAO levels were quantified and analyzed using liquid chromatography-mass spectrometry (LC-MS).

Results & Discussion: The result shows that plasma TMAO levels were elevated in patients with known cases of atherosclerosis. Plasma TMAO concentrations ranged from 4.12 to 5.85 μM , with the majority exceeding the established atherosclerotic risk threshold of 4.5 μM , indicating a risk of atherosclerosis. Elevated TMAO levels were also observed among individuals with a non-vegetarian diet, smoking, and alcohol consumption.

Conclusion: This study suggests that TMAO may serve as a biomarker of atherosclerotic plaque formation and directs a new pathway of treatment strategy concentrating on gut microbial metabolites.

Keywords: TMAO, Atherosclerosis, Cardiovascular Disease, Gut Microbiota.

ARTIFICIAL INTELLIGENCE AS A TRANSLATIONAL TOOL IN PHARMACEUTICAL SCIENCES: CONNECTING ACADEMIA WITH INDUSTRY

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Abstract

Artificial intelligence (AI) is rapidly transforming pharmaceutical research by enabling faster, more accurate, and cost-effective drug discovery and development processes. Traditional pharmaceutical research is time-consuming, expensive, and often limited by trial-and-error approaches. AI-driven technologies such as machine learning, deep learning, molecular Modeling, and data analytics are overcoming these limitations by efficiently analysing large biological and chemical datasets. In drug discovery, AI plays a crucial role in target identification, virtual screening, molecular docking, and the prediction of pharmacokinetic and toxicity profiles. These approaches significantly reduce experimental workload and enhance success rates in lead optimization. Furthermore, AI is revolutionizing clinical trials by improving patient selection, predicting treatment responses, and monitoring drug safety in real time. In pharmaceutical manufacturing, AI contributes to process optimization, quality control, and predictive maintenance, ensuring regulatory compliance and product consistency. The integration of AI also strengthens collaboration between academia and industry by accelerating translational research, reducing development timelines, and supporting data-driven decision-making. However, challenges such as data quality, algorithm transparency, ethical concerns, and regulatory acceptance must be addressed for widespread implementation. In the future, AI integration is expected to accelerate drug development, support personalized medicine, and strengthen academia-industry collaboration in pharmaceutical research.

Keywords: Artificial Intelligence, Drug Discovery, Pharmaceutical Sciences, Academia- Industry Collaboration, Molecular Modeling, Clinical Trials, Pharmaceutical Manufacturing.

BEYOND THE BOTTLE: THE ERA OF THE DIGITAL TABLET WHERE AI MEETS 3D PRINTING

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Abstract

Three-dimensional (3D) printing involves fabricating objects from digital designs by sequentially layering materials along the X, Y, and Z axes. Although this technology has existed since the 1960s, it follows a one-size-fits-all approach, which has failed to meet the specific requirements of patients with unique medical conditions. The technique offers numerous advantages, such as cost-effectiveness, product customization, and efficient material usage. Several methods, such as inkjet printing, extrusion printing, and beam-based printing, are employed, utilizing materials ranging from lactose and hydroxypropyl methylcellulose to bioinks like chitosan and hyaluronic acid. Among these techniques, fused deposition modelling (FDM) is particularly remarkable for its versatility in both biodegradable and non-biodegradable applications. Advances in 3D printing have paved the way for innovative pharmaceutical uses, including the production of complex oral dosage forms, drug delivery systems, and medical devices such as prosthetics. Emerging insights have extended into bioprinting, organ-on-a-chip technologies, and robotics. However, several challenges hinder broader adoption, including limited compatibility with thermosensitive materials, difficulties in scaling production, and maintaining quality control. This review explores the key 3D printing techniques, materials, and trends relevant to pharmaceuticals, while addressing resource constraints, intellectual property issues, and regulatory hurdles. It concludes by identifying future directions for research and development, emphasizing the need to optimize these technologies for widespread pharmaceutical applications.

Keywords: Three-dimensional (3D), bioprinting, organ-on-a-chip technologies, robotics

DEVELOPMENT, CHARACTERIZATION, AND IN-VITRO EVALUATION OF ANTIHISTAMINIC ORAL THIN FILMS OF EBASTINE

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Abstract

Ebastine is a poorly water-soluble antihistamine that undergoes significant first-pass metabolism, reducing its oral bioavailability. This study developed and optimized fast-dissolving oral films of Ebastine to circumvent this metabolism, enhance compliance, and ensure rapid action. Using a factorial design, films were formulated to be thin, uniform, and mucosally compatible, with excellent drug content uniformity. Analysis showed that increasing the concentrations of HPMC and Chitosan polymers improved mechanical strength but, at very high levels, increased film thickness and disintegration time. Despite this, all films disintegrated rapidly in simulated saliva (12–32 seconds). In vitro drug release was swift, with the best formulation (F3) releasing approximately 39% of the drug within 2 minutes and 99% within 25 minutes. Statistical optimization identified an ideal composition of 15 mg HPMC and 25 mg Chitosan. This optimized film combined a very fast disintegration time of 12.7 seconds, 99.7% drug content, and nearly complete drug release, achieving a high desirability score. The study successfully demonstrates the potential of mouth-dissolving films as an effective delivery system for Ebastine.

Keywords: Ebastine, Mouth Dissolving Film, Fast Dissolving Oral Film, 3² Factorial Design, Optimization, Disintegration Time, Dissolution, HPMC, Chitosan, Antihistamine.

THERAPEUTIC GENE MODULATION IN BREAST CANCER: PRESENT STATUS AND FUTURE PROSPECTS

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Abstract

Breast cancer remains one of the leading causes of cancer-related morbidity and mortality among women worldwide, despite significant progress in early diagnosis and conventional treatment strategies. Increasing understanding of the molecular and genetic heterogeneity of breast cancer has positioned therapeutic gene modulation as a promising approach for targeted and personalized therapy. Gene modulation strategies aim to correct or suppress aberrant gene expression involved in tumour initiation, progression, metastasis, and drug resistance. Current approaches include gene replacement therapy, gene silencing using small interfering RNA (siRNA) and microRNA (miRNA), antisense oligonucleotides, and genome-editing technologies such as CRISPR/Cas systems. Several tumour suppressor genes, oncogenes, and signalling pathways, including BRCA1/2, HER2, p53, and PI3K/AKT, have been explored as potential therapeutic targets. Advances in delivery systems, particularly viral vectors and nanocarrier-based non-viral platforms, have significantly improved the stability, specificity, and safety of gene-based interventions. However, challenges such as off-target effects, immune responses, and limited clinical translation remain major obstacles. This review highlights the present status of therapeutic gene modulation strategies in breast cancer and discusses emerging technologies and prospects that may overcome existing limitations. Integration of gene modulation with conventional therapies holds potential to improve treatment efficacy and clinical outcomes in breast cancer patients.

Keywords

Breast cancer, Gene modulation, Gene therapy, Targeted therapy

SHOWING ARTIFICIAL INTELLIGENCE IN THE SENSING OF BREAST CANCERAanchal Dahiya¹, Dr. Nakul Gupta², Satyendra Kumar Mishra³

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Breast cancer is one of the most common causes of mortality among women worldwide, highlighting the importance of early detection and accurate diagnosis. Artificial intelligence (AI) has emerged as a transformative tool in breast cancer detection, particularly through machine learning and deep learning applications. These technologies analyze mammograms, ultrasounds, and histopathological images with greater speed and precision, offering significant improvements over conventional methods. Data preprocessing techniques such as image enhancement and noise reduction further strengthen model performance, while evaluation metrics like sensitivity, specificity, and accuracy ensure reliability. However, challenges remain, including the availability of high-quality datasets, ethical concerns, interpretability of AI models, and integration into clinical practice. Addressing these issues is crucial for widespread adoption. AI also shows promise in personalized healthcare by combining imaging with genetic and clinical data, paving the way for tailored treatment approaches. Mammogram-based automated detection plays a particularly vital role, as mammography remains a cost-effective and accessible screening tool. AI-driven improvements in this area have the potential to enhance early diagnosis, optimize treatment planning, and ultimately save lives. Collaboration among healthcare providers, researchers, and policymakers will be essential to fully realize the benefits of AI in breast cancer management. Few extensive surveys have been provided to quickly analyse approaches for identifying breast cancer.

Keywords: Breast cancer, artificial intelligence, mammography, machine learning, personalized care.

CHALCONES: MOLECULAR VERSATILITY AND ADVANCES IN CLAISEN-SCHMIDT MEDIATED SYNTHESIS

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Abstract

Chalcones are a significant group of open-chain flavonoids characterized by an α , β -unsaturated carbonyl structure that connects two aromatic rings, resulting in substantial chemical reactivity and structural flexibility. This unique framework makes chalcones important scaffolds in medicinal chemistry because of a broad range of pharmacological effects, including anticancer, antimicrobial, anti-inflammatory, antioxidant, antidiabetic, & antimalarial activities. The development of synthetic chalcone derivatives further enhances this biological diversity, creating opportunities for the optimization of structure-activity relationships and drug development. The Claisen-Schmidt Condensation reaction is the most common and adaptable synthetic method for obtaining chalcones, which involves the base or acid-catalysed condensation of an active methylene ketone with an aromatic aldehyde. This methodology offers high yield, structural diversity, and compatibility with functional groups, enabling quick assembly of chalcone libraries for biological testing. Chalcone synthesis is now more efficient, sustainable, and scalable due to recent advancements in synthetic methods like microwave activation, solvent-free conditions, ionic liquids, and nano-catalysis. Chalcone derivatives continue to be of interest beyond synthesis because of their biological profiles and therapeutic potential against chronic diseases and drug-resistant pathogens. Despite extensive research, there are still gaps in knowledge of specific molecular pathways and *in-vivo* behaviours, which motivates further investigation.

Keywords: Chalcones, Claisen-Schmidt Condensation, Flavonoids, Antimicrobial, Aromatic Aldehydes, Drug Development.

ROLE OF ARTIFICIAL INTELLIGENCE IN BRIDGING THE GAP BETWEEN ACADEMIC RESEARCH AND INDUSTRIAL DRUG DEVELOPMENT

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Abstract:

Background: The demand for customized treatments, long development times, and growing R&D expenses have put the pharmaceutical sector at a turning point. At the same time, artificial intelligence (AI) has developed from a disruptive promise into a set of useful tools that can anticipate molecular activity, decode biological complexity, and improve clinical trials. However, a persistent gap between academic innovation and industrial implementation continues to limit the full revolutionary potential of AI in drug discovery and Development.

Objective: This presentation will argue that a fundamental reorganization of the connection between academics and industry is not just advantageous but necessary to fully utilize AI for the future of pharmaceuticals. The complementary strengths and crucial deficiencies in both sectors that this synergy needs to fill will be examined.

Methodology: We will look at case studies and new forms of cooperation, such as embedded fellowship programs, shared data ecosystems, and pre-competitive consortia. Target Identification & Validation, Generative Chemistry & De Novo Design, Clinical Trial Optimization, and Pharmacovigilance & Real-World Evidence are the main areas of focus for analysis.

Conclusion: The upcoming landscape of the pharmaceutical industry will be shaped by entities that can establish flexible and accessible connections between academic research and industry development. Transitioning from conventional vendor-client or grant-based interactions to more profound, strategic alliances is essential. This collaboration will expedite the introduction of safer, more effective, and more accessible medications, ultimately revolutionizing healthcare results worldwide. The conference will wrap up with a suggested framework for creating these vital collaborative environments.

Keywords: Artificial Intelligence, Translational Research, Academic-Industry Collaboration, Digital Health, Machine Learning, Precision Medicine, Drug Discovery, Generative AI.

AI FOR DRUG REPURPOSING: ACADEMIC INNOVATION TO INDUSTRIAL TRANSLATION

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Abstract

Drug repurposing has emerged as a time-efficient and cost-effective strategy to identify new therapeutic indications for existing drugs, reducing the risks associated with early-stage discovery. Artificial Intelligence (AI) is increasingly transforming this domain by enabling rapid screening of large-scale biomedical data and uncovering hidden drug-disease relationships. This conference abstract highlights how AI-driven drug repurposing bridges academic innovation and industrial translation through integrated computational workflows. Advanced machine learning (ML) and deep learning models utilize multi-omics datasets, electronic health records, clinical trial repositories, and scientific literature to predict novel indications, prioritize candidate molecules, and generate mechanistic insights. Network pharmacology and knowledge graph-based methods further enhance target identification by mapping complex interactions among genes, proteins, pathways, and drugs. Despite these advancements, successful translation into industry requires overcoming key challenges such as data heterogeneity, model interpretability, reproducibility, and regulatory acceptance. Standardization of data pipelines, explainable AI frameworks, and robust validation using *in vitro*, *in vivo*, and real-world evidence are crucial for industrial adoption. Additionally, academia-industry partnerships, shared data ecosystems, and translational research platforms can accelerate proof of concept development into clinical candidates. Overall, AI-enabled drug repurposing offers a promising pathway to deliver affordable and effective therapies faster, supporting precision medicine and addressing unmet medical needs with greater efficiency and scalability.

Keywords: Drug repurposing, Artificial Intelligence (AI), machine learning (ML), academia-industry partnerships

OPTIMIZATION OF VIDANG FRUIT EXTRACTION METHOD BY FACTORIAL DESIGN

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Abstract

Objectives: The objectives of this study were to optimize the extraction method for vidang fruits with factorial design and evaluate the %yield and phenolic content in optimized conditions.

Methodology: In the preliminary study, different extraction techniques - Sonication, Soxhlet, Shaker, and Microwave-assisted were carried out using methanol as solvent, and % yields were quantified. Among techniques, Soxhlet extraction yielded the highest percentage, which was then optimized using a 2³ factorial design, where heating time, extraction temperature, and solid to solvent ratio were selected as independent variables, while % yields and total phenolic content were considered dependent responses. Total phenolic content was estimated using the Folin-Ciocalteu method, and Statistical analysis was performed using ANOVA to evaluate the significance of variables and their interactions.

Results: The optimized extraction variables were found to be heating time of 5 hours, temperature of 45°C, and solid-to-solvent ratio of 45% w/v. Under these conditions, the experimental results showed a percentage yield of 15.59% w/w and phenolic content of 3.13% w/w, which closely matched the predicted values, confirming the validity of the model.

Conclusion: Optimized Soxhlet extraction methods proved to be the most effective method for extracting bioactive constituents from vidang fruits. These optimized extraction conditions showed significant yields and phenolic content.

Keywords: vidang fruits, Folin-Ciocalteu method, 2³ factorial design, Soxhlet extraction method

A COMPREHENSIVE REVIEW OF THE PHARMACOLOGICAL AND PHYTOCHEMICAL, AND NUTRACEUTICAL PROFILES OF EUGENOL DERIVATIVES AS POTENTIAL AGENTS

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Abstract

Eugenol, a naturally present compound primarily found in clove oil and its derivatives, possesses a diverse range of pharmacological properties, making it valuable in various applications. This systematic review examines the multidisciplinary uses of eugenol and its derivatives, like Methyl Eugenol (4-Allyl-1,2-dimethoxybenzene), Acetyl Eugenol (4-Allyl-2-methoxyphenyl acetate), 3. Isoeugenol (4-Propenyl-2-methoxyphenol), etc., highlighting their potential across pharmaceutical, nutraceutical, cosmeceutical, and industrial applications. Eugenol possesses remarkable analgesic, antispasmodic, anticancer, antiinflammatory, antioxidant, cardioprotective, neuroprotective, hepatoprotective, and immunomodulatory effects. Eugenol (1-hydroxy-2-methoxy-4-allylbenzene) is a phenolic compound; the natural sources are clove, basil, and cinnamon. To extract eugenol from a natural source, many methods are practiced globally. The primary mechanisms involved in its therapeutic effects are free radical scavenging activity, blocking the generation of reactive oxygen species, inhibiting the production of reactive nitrogen species, enhancing cytoantioxidant potential, and disrupting DNA and proteins. Nutraceuticals impart many benefits in treating chronic diseases such as diabetes, obesity, cardiovascular conditions, and cancer. Nutraceuticals are available as food supplements, functional food, and medicinal food. The product's efficacy relied upon bioavailability, making this product effective by using a suitable carrier. The motive of using a carrier was to protect the encapsulated molecule from external conditions, preserve functionality, and deliver effectively to the target site. It is free from unwanted effects and is cheaper because it is obtained from a natural source.

Keywords: Eugenol, clove, basil, cinnamon, Nutraceutical, pharmacological, phytochemical

TOPICAL DELIVERY OF BOSWELLIC ACID-LOADED TRANSFEROSOMES FOR RHEUMATOID ARTHRITIS

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Abstract

An efficacious, successful treatment cannot be achieved in most cases, such as the occurrence of hepatic first-pass metabolism, adverse side effects, the rejection of invasive treatments, and poor patient compliance. To overcome these problems, one promising approach is the use of transdermal delivery systems. Nanoencapsulation using a lipid-based vesicular system, such as liposomes, has been used to overcome the aforesaid challenge. Liposomes facilitate drug transport through the skin, but they do not deeply penetrate into the viable skin and blood circulation. These major obstacles have led to the discovery and development of other novel vesicles such as niosomes, sphingosomes, bilosomes, chitosomes, transferosomes, ethosomes, and invasomes. Transferosomes were used for non-invasive delivery of drugs into or across the skin. Transferosomes are also known as elastic liposomes or flexible vesicles, which have better penetration ability than conventional liposomes. Boswellic acid is a series of pentacyclic terpenoid molecules produced by plants in the genus *Boswellia*. *Boswellia* is an effective anti-inflammatory (useful in rheumatic arthritis) and may prevent loss of cartilage. Rheumatoid Arthritis (RA) is the most common inflammatory disorder. It may cause joint deformity if not treated timely. Rheumatoid Arthritis is characterized by chronic pain, swelling at joints, and destruction of joints. The transferosomes were prepared by the modified hand-shaking, lipid film hydration technique.

Keywords: Transdermal drug delivery, Transferosomes, Elastic liposomes, Nanoencapsulation, Lipid-based vesicular systems, Boswellic acid, Rheumatoid arthritis, Anti-inflammatory therapy, Modified hand-shaking method, Lipid film hydration technique, Non-invasive drug delivery, Novel vesicular carriers.

**NEUROPROTECTIVE EFFECTS OF INDOLE-3-CARBINOL AGAINST
SCOPOLAMINE-INDUCED COGNITIVE AND MEMORY IMPAIRMENT IN RATS:
MODULATION OF OXIDATIVE STRESS, INFLAMMATORY AND CHOLINERGIC
PATHWAYS**

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Abstract

Indole 3-carbinol (I3C), a compound derived from cruciferous vegetables, has shown neuroprotection due to its potential for modulation of oxidative stress, inflammation cholinergic pathways. This study aimed to investigate the potential of I3C in preventing scopolamine-induced cognitive impairment in rats. Male Wistar rats were divided into six groups: Control, Scopolamine (1 mg/kg), I3C (25 mg/kg), I3C (50 mg/kg), I3C (100 mg/kg), and Donepezil (5 mg/kg). Behavioural assessments were conducted using the Y-maze and Novel Object Recognition (NOR) tests to evaluate memory function. Biochemical analysis was performed to measure acetylcholinesterase (AChE) activity, oxidative stress markers such as malondialdehyde (MDA), superoxide dismutase (SOD), and catalase (CAT) activity. ELISA tests were used to measure the oxidative stress (NRF2 and HO-1), inflammatory cytokines, including NF-kB, TNF- α , IL-6, and IL-1 β , and apoptosis (Cytochrome C and caspase 9). H&E and Nissl staining were performed to assess the histopathological abnormalities. The results indicated that I3C administration significantly improved cognitive performance in the Y-maze and NOR tests, which is due to reduced AChE activity and elevation in ACh levels. Further, I3C significantly reduced the oxidative stress through enhancing the antioxidant enzymes such as NRF2 and HO-1. Furthermore, I3C mitigated inflammatory responses, as evidenced by decreased levels of NF-kB, TNF- α , IL-6, and IL-1 β . These findings suggest that I3C exerts neuroprotective effects through the inhibition of oxidative stress, inflammation, and cholinergic pathway abnormalities, potentially offering a therapeutic strategy for mitigating cognitive deficits.

Keywords: Indole 3-carbinol, Scopolamine, Memory deficits, Acetylcholinesterase, Oxidative stress, and Neuroinflammation

EXPLORING THE ROLE OF COMPUTATIONAL APPROACHES IN MODERN DRUG DISCOVERY: A CRITICAL REVIEW

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Abstract

Computer-Aided Drug Design (CADD) is a sophisticated and interdisciplinary area that plays an important role in modern drug discovery and development. It uses computational approaches and biological understanding to find and optimize prospective medication candidates. Computational techniques are important tools for interpreting and guiding trials to speed up the antibiotic medication research process. The two most common computer-aided drug design methodologies are structure-based drug design (SBDD) and ligand-based drug design (LBDD). Structure-based drug design is based on the three-dimensional structure of biological targets determined by experimental approaches. Ligand-based drug design makes use of data from active drugs to create quantitative structure-activity relationship (QSAR) models, pharmacophore mapping, and similarity-based virtual screening. Recent developments in computer-aided drug design have been driven by advancements in artificial intelligence, machine learning, molecular docking, and high-performance computers. These technologies have increased the accuracy of target prediction, binding affinity estimate, and pharmacokinetic profiling. High-performance and cloud computers have increased the speed and scalability of virtual screening and simulation experiments. The combination of computer-aided drug design, genomics, proteomics, and systems biology enables the production of individualized and precision medications. Computer-aided drug design has considerably lowered the time, cost, and failure rate associated with conventional drug development approaches.

Keywords: Computer-aided drug design, artificial intelligence, molecular docking, QSAR, machine learning, virtual screening.

DEVELOPMENT AND IN-VIVO/IN-VITRO EVALUATION OF VORICONAZOLE TOPICAL GEL FOR THE MANAGEMENT OF DERMATOPHYTOSIS

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Abstract

Dermatophytosis is a common superficial fungal infection caused by dermatophytes such as Trichophyton, Microsporum, and Epidermophyton species, affecting a large population worldwide. Conventional topical antifungal formulations often suffer from limitations such as inadequate skin penetration and reduced therapeutic efficacy. Voriconazole, a broad-spectrum triazole antifungal agent, exhibits potent activity against various fungal pathogens; however, its topical delivery has not been extensively explored. The present research work was undertaken to develop and evaluate a voriconazole-loaded topical gel for the effective management of dermatophytosis. The formulation was prepared using suitable gelling agents and excipients to achieve optimal physicochemical and drug release characteristics. The prepared gel formulations were evaluated for pH, viscosity, spreadability, drug content uniformity, and stability. In vitro drug release and ex vivo skin permeation studies were carried out to assess the release and permeation behavior of voriconazole from the gel. Antifungal activity studies were performed against selected dermatophyte strains to determine efficacy. In vivo evaluation was conducted using an appropriate animal model to assess therapeutic effectiveness and skin irritation potential. The optimized formulation demonstrated satisfactory physicochemical properties, enhanced drug permeation, sustained drug release, and significant antifungal activity without causing skin irritation. The study concludes that the developed voriconazole topical gel is a promising and effective topical antifungal formulation for the management of dermatophytosis, with potential for improved patient compliance and therapeutic outcomes.

Keywords: Dermatophytosis, Voriconazole, Topical gel, In-Vitro evaluation, In-Vivo evaluation, Antifungal activity

BRIDGING INNOVATION AND IMPLEMENTATION: ARTIFICIAL INTELLIGENCE AS A CATALYST IN MODERN PHARMACEUTICALS

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Abstract

Revolutionizing drug discovery, development, regulatory decision-making, and patient-centric care, artificial intelligence (AI) is drastically changing the pharmaceutical industry. High-throughput target identification, predictive toxicology, adaptive clinical trial designs, and the creation of real-world evidence with previously unheard-of speed and accuracy are all made possible by advanced AI approaches, such as machine learning, deep learning, natural language processing, and big language models. Despite these developments, the full potential of AI in pharmaceuticals is still limited by a persistent translational gap between academic research and industrial implementation. While the pharmaceutical business has the infrastructure, databases, regulatory know-how, and commercialization paths required for practical use, academic institutions excel in algorithm creation and mechanistic exploration. Therefore, closing this gap is essential rather than elective. In the field of AI-enabled pharmaceutical sciences, strategic collaboration between academia and industry can expedite model validation, improve data interoperability, guarantee ethical and regulatory compliance, and promote workforce preparedness. In order to balance innovation and application, a necessity of shared data ecosystems, co-development frameworks, interdisciplinary training, and policy-driven incentives. AI may go from being a promising tool to a disruptive force that enables quicker, safer, and more affordable therapeutic innovation by balancing academic inventiveness with industrial scalability. Whether AI is a disruptive innovation or a fundamental component of the future pharmaceutical ecosystem will ultimately depend on ongoing cooperation.

Keywords: artificial intelligence (AI), pharmaceutical sciences, drug discovery and development, academia–industry collaboration, machine learning and deep learning, clinical trial optimization

DESIGN AND CHARACTERIZATION OF A QUERCETIN–APIGENIN SOLID LIPID NANOPARTICLE HYDROGEL FOR ATOPIC DERMATITIS

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Abstract

Atopic dermatitis (AD) is a chronic inflammatory skin disorder associated with impaired skin barrier function, oxidative stress, and immune dysregulation. Prolonged use of topical corticosteroids is limited by safety concerns, creating a demand for effective non-steroidal topical therapies. This study aimed to develop and optimize a dual-flavonoid solid lipid nanoparticle (SLN)-based hydrogel containing quercetin and apigenin for the topical management of AD. Quercetin–apigenin–loaded SLNs were prepared using hot homogenization followed by ultrasonication and optimized through a three-factor, three-level Box–Behnken design. Particle size, polydispersity index, encapsulation efficiency, and zeta potential were selected as critical quality attributes. The optimized SLNs were incorporated into a Carbopol-940 hydrogel and evaluated for physicochemical characteristics, rheological behavior, drug content uniformity, and in vitro drug release kinetics. The optimized SLNs exhibited a mean particle size of approximately 102 nm, polydispersity index of 0.287, encapsulation efficiency of 78.81%, and zeta potential of -36.18 mV, indicating good colloidal stability. The SLN-loaded hydrogel showed skin-compatible pH, pseudoplastic flow behavior, uniform drug distribution ($>97\%$), and acceptable spreadability and extrudability. In vitro release studies demonstrated sustained and controlled release of both flavonoids (90–95%) over an extended period, following zero-order kinetics, in contrast to the concentration-dependent release observed with free drug suspensions. Incorporation of quercetin and apigenin into SLNs embedded within a hydrogel matrix enhanced drug stability and provided controlled topical delivery while maintaining suitable application properties. The optimized quercetin–apigenin SLN hydrogel represents a promising non-steroidal topical formulation for atopic dermatitis with potential to improve treatment safety and patient compliance.

Keywords: Atopic dermatitis; solid lipid nanoparticles; quercetin; apigenin; topical hydrogel; Box–Behnken design; controlled release.

FABRICATION AND CHARACTERIZATION OF FLOATING MICROSPHERES OF DEX RABEPRAZOLE SODIUM TO IMPROVE BIOAVAILABILITY

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Abstract

The present study aimed to develop a floating drug delivery system (FDDS) to prolong the residence time of the dosage form within the GI tract. Floating microspheres containing Dex rabeprazole Materials were prepared by the emulsion solvent diffusion technique using various proportions of drug and polymer, such as Ethyl cellulose and Hydroxypropyl methylcellulose (HPMC). The drug-to-polymer ratio used to prepare the different formulations. The prepared floating microspheres were characterized for shape and surface morphology, size, percentage of drug loading, and drug release. Formulation F1 showed good results in vitro. With respect to the various evaluation parameters among various batches (F1-F8). The particle size increased with an increase in polymer concentration. The drug entrapment efficiency was increased with an increase in the concentration of polymers. Buoyancy and the in vitro drug release decreased with respect to an increase in concentration of In-vitro polymers. The developed system has the dual advantages of being gastro-retentive, to increase oral bioavailability, and releasing the drug in a controlled manner.

Keywords: Floating drug delivery systems, gastric residence time, microsphere, Dex rabeprazole, formulation

TACKLING THE THICKEST: EXPECTATIONS FROM BIOLOGICALS AND BIOSIMILARS IN PSORIASIS

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Abstract

Psoriasis is a chronic autoimmune disease marked by keratinocyte hyperproliferation and cutaneous and visceral inflammation, frequently accompanied by comorbidities like psoriatic arthropathy, cardiovascular disease, and metabolic syndrome. Conventional systemic treatments, although highly effective, show several limitations, like broad immunosuppression and toxicities. The development of biological agents and biosimilars has significantly changed the landscape of psoriasis treatment as they selectively affect the immunologic pathways targeting TNF- α , IL-17, and IL-23, leading to higher efficacy, a favorable safety profile, and personalized treatments. Biosimilars, as cost-effective versions of the innovator biological agents, have increased accessibility, particularly in low- and middle-income countries, without compromising safety and efficacy profiles. In this review, we discuss the pathophysiology of psoriasis, mechanism, efficacy, safety profile, regulations, immunogenicity, and challenges in the use of biological agents and biosimilars for the treatment of psoriasis, suggesting their appropriate integration in the healthcare setting, along with assessments, teaching, and strict adherence to evidence-based recommendations for optimal long-term management.

Keywords: Psoriasis, Biologics, Biosimilars, TNF- α inhibitors, IL-17 inhibitors, IL

PROSPECTIVE OBSERVATIONAL STUDY ON INTRAVENOUS TO ORAL ANTIBIOTIC CONVERSION AND ITS IMPACT ON LENGTH OF HOSPITAL STAY

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Abstract

Background: IV to PO antibiotic conversion is an important antimicrobial stewardship tactic that improves patient outcomes. The UK National IVOS (Intravenous oral switch) guideline determines the appropriate time to switch. However, most hospitals lack a standard guideline, leading to inconsistency.

Objective: To evaluate the IV to PO antibiotic conversion in a hospital and assess its impact on the Length of hospital stay (LOS) among patients with non-severe infections.

Methodology: 300 patients, including adults and children, were selected in a prospective observational study starting with IV antibiotics and were categorised into converted and non-converted. Their LOHS differences were determined by the Mann-Whitney U Test.

Results: Among 300 patients, 155 were converted to oral therapy, with males having the highest conversion rate. Despite the majority of the non-converted group meeting the IVOS guideline, conversion was limited due to a lack of guidelines and reliance on physicians' judgment. LOHS was significantly reduced in the converted group ($U = 8359.5$, $Z = -3.865$, $p = 0.001$).

Conclusion: Lack of a conversion guideline promotes unnecessary prolonged IV antibiotics use, leading to longer LOHS. Implementing evidence-based criteria will enhance antimicrobial stewardship and improve outcomes.

Keywords: IV to PO, antimicrobial stewardship, IVOS, length of hospital stay

CARDIOPROTECTIVE POTENTIAL OF *LACTIPLANTIBACILLUS PLANTARUM* (LAB 39), A PROBIOTIC STRAIN, IN CARDIAC HYPERTROPHY IN RATS

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Abstract

Cardiovascular diseases (CVDs) are the leading cause of death among non-communicable diseases globally. Cardiac Hypertrophy (CH) is an underlying clinical manifestation for a plethora of cardiovascular diseases. The gut-heart axis has opened the doors for development and unfurling “cardiobiotics”. Therefore, in the present study, we have investigated the cardioprotective potential of *Lactiplantibacillus plantarum* lab 39 in an isoproterenol-induced CH model in male Wistar rats. An in-silico AI-based approach was also adopted to identify the targets. CH in rats was induced by administration of isoproterenol (5 mg/kg via subcutaneous route) for a period of 14 days. Probiotic strain was administered at 1×10^{10} cfu/ml for 14 days as a cotreatment in ISO-treated rats and also as a pretreatment for 28 days. During the treatment, physiological parameters were estimated. After the treatment, different parameters, such as morphological and hemodynamic parameters, such as ECG and arterial pressure functions, were measured using Power Lab software. The plasma and heart samples were used for biochemical assessment, such as plasma injury markers, oxidative stress, hypertrophic index parameters, inflammatory markers, and histopathological studies. ISO-induced CH was associated with ECG alterations (shortened RR interval, increased R amplitude, and ST segment depression), increased fibrosis, and increased hypertrophic index parameters. Furthermore, the administration of ISO leads to an increase in inflammatory markers and oxidative stress levels, which were alleviated by *lactiplantibacillus plantarum* treatment. Moreover, probiotic administration also ameliorated cardiac injury, inflammation, hypertrophic index parameters, ECG alteration, and cardiac fibrosis in ISO-induced CH. This study suggests that there is an interplay of gut microbiota in CVD's, and *Lactiplantibacillus plantarum* (lab 39) has a possible cardioprotective potential in the cardiac hypertrophy model.

Keywords: Cardiovascular diseases (CVDs), isoproterenol, Cardiac Hypertrophy (CH), *Lactiplantibacillus plantarum*

PHARMA 4.0 AND SMART MANUFACTURING: THE FUTURE OF THE PHARMACEUTICAL INDUSTRY

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Abstract

Pharma 4.0 represents a paradigm shift in the pharmaceutical industry through the integration of Industry 4.0 technologies into drug manufacturing and quality management systems. The objective of Pharma 4.0 is to establish smart, interconnected, and automated manufacturing environments that improve product quality, minimize human intervention, and ensure regulatory compliance. Key enabling technologies such as automation, robotics, the Internet of Things (IoT), artificial intelligence (AI), machine learning (ML), big data analytics, and cloud computing facilitate real-time data acquisition, predictive maintenance, and process optimization. A significant advancement within Pharma 4.0 is the implementation of digital twins, which allow virtual modeling and simulation of manufacturing processes to predict system behavior and identify potential failures prior to production. Furthermore, continuous manufacturing supported by Process Analytical Technology (PAT) enhances production efficiency and product consistency compared to conventional batch manufacturing. The use of smart sensors and automated analytical tools enables real-time release testing (RTRT), aligning with Quality by Design (QbD) and pharmaceutical quality system guidelines. In addition to manufacturing benefits, Pharma 4.0 strengthens patient safety through improved traceability, smart packaging, and optimized supply chain management. Overall, Pharma 4.0 accelerates the transition toward a data-driven, efficient, and resilient pharmaceutical ecosystem, supporting faster product development and the future of personalized medicine.

Keywords: Pharma 4.0, Industry 4.0, Smart Manufacturing, Digital Twins, Continuous Manufacturing, PAT

MICROGLIA–SYNAPSE INTERACTIONS IN NEURODEGENERATION: HOMEOSTATIC PRUNING TO PATHOLOGICAL SYNAPTIC LOSS

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Abstract

Neurodegenerative disorders such as Alzheimer's disease, Parkinson's disease, and frontotemporal dementia are increasingly recognized as synaptopathies, where early synaptic dysfunction precedes overt neuronal loss. Recent advances in neuroscience have highlighted microglia the resident immune cells of the central nervous system as key regulators of synaptic structure and function. Under physiological conditions, microglia actively participate in synaptic pruning, plasticity, and circuit refinement through activity-dependent signaling mechanisms involving complement proteins, fractalkine signaling, and purinergic receptors. However, emerging evidence suggests that during aging and disease, microglia undergo phenotypic and metabolic reprogramming that shifts their role from homeostatic maintenance to maladaptive synaptic elimination. In neurodegenerative states, aberrant activation of complement cascades (notably C1q and C3) leads to excessive tagging and removal of functional synapses, contributing to cognitive decline. Single-cell transcriptomics and in vivo imaging studies have revealed disease-associated microglial subtypes characterized by altered lipid metabolism, inflammatory signaling, and impaired phagocytic specificity. These changes are strongly influenced by genetic risk factors, including variants in TREM2, APOE, and CD33, linking innate immunity directly to synaptic vulnerability. Understanding microglia-synapse interactions provides a unifying framework connecting neuroinflammation, synaptic loss, and cognitive impairment. Targeting microglial signaling pathways to restore physiological synaptic pruning without compromising immune surveillance represents a promising therapeutic strategy. This emerging concept positions microglia not merely as bystanders but as central drivers of synaptic pathology, offering new avenues for early intervention in neurodegenerative diseases.

Keywords: Microglia, Synaptic pruning, Neurodegeneration, Complement system, Neuroinflammation, Synaptic dysfunction

NANOBOTS IN PHARMACEUTICAL SCIENCES: PIONEERING THE FUTURE OF PRECISION MEDICINE AND SMART THERAPEUTICS

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Abstract

The convergence of nanotechnology, artificial intelligence, and biomedical engineering has introduced a transformative paradigm in pharmaceutical sciences, positioning nanobots as a promising frontier in next-generation therapeutics. Nanobots are engineered nanoscale devices capable of autonomous or semi-autonomous functions, offering unprecedented opportunities in drug discovery, targeted drug delivery, diagnostics, and personalized medicine. Unlike conventional nanocarriers, nanobots can sense, navigate, and respond dynamically to specific biological microenvironments, enabling highly precise therapeutic interventions. Recent advancements highlight the feasibility of nanobots for site-specific drug delivery in oncology, cardiovascular diseases, neurodegenerative disorders, and infectious conditions. Through molecular recognition, magnetic guidance, and stimulus-responsive mechanisms, nanobots can overcome physiological barriers such as the blood–brain barrier, reduce off-target toxicity, and enhance therapeutic efficacy. In diagnostics, nanobots enable real-time disease monitoring, early molecular-level detection, and integration with biosensing platforms for feedback-controlled therapy. The future of nanobots in pharmaceutical applications is strongly linked with artificial intelligence and machine learning, facilitating intelligent navigation, adaptive decision-making, and patient-specific precision dosing. Additionally, their potential extends to regenerative medicine, minimally invasive interventions, and intracellular gene and protein modulation. Despite these advancements, challenges related to biocompatibility, scalable manufacturing, regulatory approval, ethical considerations, and long-term safety remain. Addressing these barriers is crucial for successful clinical translation and global adoption of nanobot-enabled smart therapeutics.

Keywords: Nanobots, Targeted Drug Delivery, Precision Medicine, Artificial Intelligence in Pharma, Smart Therapeutics

DEVELOPMENT OF A PHYTOCONSTITUENT-LOADED NANOEMULSION EMULGEL FOR ENHANCED TOPICAL DELIVERY IN PSORIASIS

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Abstract

Psoriasis is a chronic inflammatory skin disorder that requires prolonged topical therapy. Conventional corticosteroid-based treatments, although effective, are associated with adverse effects during long-term use, leading to poor patient compliance. Quercetin and hesperidin are bioactive flavonoids with established anti-inflammatory and antioxidant properties; however, their topical application is limited by poor aqueous solubility and inadequate skin permeation. This study aimed to develop a steroid-free nanoemulsion-based emulgel of quercetin and hesperidin to enhance their physicochemical stability and topical delivery. An oil-in-water nanoemulsion was optimized using a Box–Behnken design, with liquid paraffin, Span 80, and Tween 80 as independent variables. Particle size, encapsulation efficiency, and zeta potential were selected as responses. The optimized nanoemulsion was incorporated into a Carbopol-based hydrogel to form an emulgel. The formulation was characterized for particle size, polydispersity index, zeta potential, pH, viscosity, spreadability, Fourier-transform infrared spectroscopy, transmission electron microscopy, and in-vitro drug release. Cytocompatibility was evaluated using the MTT assay. The optimized nanoemulsion exhibited a mean particle size of 92.6 nm, high encapsulation efficiency (90–92%), and a stable zeta potential (–35 mV). The emulgel demonstrated skin-compatible pH (5.5 ± 0.03), suitable viscosity, good spreadability, and sustained drug release of approximately 80–82% over 12 h, following near-zero-order kinetics. Cytotoxicity studies confirmed excellent cell viability, indicating formulation safety. Nanoemulsion incorporation into a gel matrix successfully improved formulation stability, residence time, and controlled release, addressing the biopharmaceutical limitations of quercetin and hesperidin for topical use. The optimized quercetin–hesperidin nanoemulsion-based emulgel is a safe and promising steroid-free topical delivery system for psoriasis management.

Keywords: Psoriasis, quercetin, hesperidin, nanoemulsion emulgel, Box–Behnken design, topical drug delivery

NEUROPHARMACOLOGICAL EVALUATION OF A POLYHERBAL ANTICONVULSANT FORMULATION IN RODENT MODELS OF EPILEPSY

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Abstract

Epilepsy is a complex neurological disorder characterized by recurrent seizures. A prevail is a sudden, temporary disruption in brain electrical activity, accompanied by changes in behavior, sensation, consciousness, and cognitive functions. Seizures may be generalized or focal. Convulsions are seizures with motor symptoms, involving involuntary muscle contraction and relaxation, often resulting in shaking and trembling movements. Convulsions are a manifestation of seizure activity in the brain. These essential concepts help in the accurate diagnosis and effective management of epilepsy. The proposed mechanism of epilepsy involves abnormal neuronal excitability, which may be due to an imbalance between excitatory and inhibitory neurotransmitters, ion channel dysfunctions, and network abnormalities. For example, decreased gamma-aminobutyric acid (GABA; inhibitory) activity or increased glutamate (excitatory) activity can lead to excessive neuronal firing. There are many factors responsible for causing epilepsy, including genetic predisposition, head trauma, structural brain abnormalities, and others. Treatment of epilepsy may involve different systems of medicine, a combination of medications, and lifestyle modifications. In the present study, the dissertation is designed to utilize alcoholic extract of certain traditionally effective medicinal plants (*Argemone Maxicana*, *cestrnum noctnum*, *dhatura arandi*) in the form of a polyherbal formulation and to evaluate their effects on rodent models of epilepsy using pentylenetetrazole (PTZ) and maximal electroshock seizure (MES) models. The experimental results demonstrated significant antiepileptic and anticonvulsant effects of the polyherbal formulation, comparable to synthetic medicines. It was also observed that the toxicity profile of the polyherbal formulation was more favourable than that of conventional allopathic drugs.

Keywords: Epilepsy, Pentylenetetrazole, Convulsions, Seizures

RECENT ADVANCES IN SYNTHESIS AND BIOLOGICAL ACTIVITIES OF TRIAZINE DERIVATIVES

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Abstract

Triazine, a six-membered nitrogen-containing heterocycle, has emerged as a versatile scaffold in medicinal and synthetic chemistry. Its high stability, tunable electronic properties, and ease of functionalization make it valuable for designing bioactive molecules. Recent advances in green, one-pot, and microwave-assisted syntheses using cyanuric chloride have enabled efficient preparation of substituted triazine derivatives. These compounds display diverse biological activities, including anticancer, anti-inflammatory, antimicrobial, antiviral, and antioxidant effects. Structure–activity studies highlight that suitable substitutions at the triazine core enhance potency and selectivity. Moreover, hybrid triazine-based molecules show promising multi-target therapeutic potential. Overall, triazine chemistry continues to offer new opportunities for developing safe and effective drug candidates.

Keywords: Heterocyclic compounds, Cyanuric chloride, Structure-activity relationship, Anti-cancer activity, Anti-inflammatory activity, antimicrobial agents, Drug design.

INFLAMMATORY AND CARDIO-METABOLIC BIOMARKERS IN POLYCYSTIC OVARY SYNDROME: A CASE-CONTROL EVALUATION OF PAPP-A, HSCRP, LP(A), PAI-1, AND IL-18

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Abstract

Polycystic ovary syndrome (PCOS) is a multifactorial endocrine disorder in reproductive-age women characterized by reproductive, metabolic, and inflammatory abnormalities. Growing evidence highlights that systemic inflammation and early cardio-metabolic dysregulation contribute substantially to long-term health risks. This case-control study evaluated serum levels of pregnancy-associated plasma protein-A (PAPP-A), high-sensitivity C-reactive protein (hs-CRP), lipoprotein(a) [Lp(a)], interleukin-18 (IL-18), and plasminogen activator inhibitor-1 (PAI-1) in women with PCOS compared with healthy controls. A total of 400 women (200 PCOS, 200 age-matched controls) aged 18-45 years were enrolled. Biomarker levels were quantified using high-sensitivity immunoassay methods, and statistical analyses were conducted using Student's t-test and Pearson's correlation coefficient. All five biomarkers were significantly elevated in PCOS women ($p < 0.05$), indicating enhanced proteolytic activity, chronic low-grade inflammation, oxidative stress, impaired fibrinolysis, and increased atherogenic potential. Notably, PAI-1 elevation reflected reduced fibrinolytic capacity and a shift toward a pro-thrombotic profile. Correlation analysis revealed strong associations among inflammatory and cardio-metabolic markers, including PAPP-A with hs-CRP and IL-18, hs-CRP with IL-18 and Lp(a), and Lp(a) with PAI-1, demonstrating interconnected inflammatory, metabolic, and vascular pathways. These findings reinforce that PCOS is a systemic disorder with significant cardio-metabolic implications, underscoring the importance of early evaluation of inflammatory and vascular biomarkers for risk stratification and comprehensive management.

Keywords: Polycystic ovary syndrome (PCOS), systemic inflammation, C-reactive protein (hs-CRP), lipoprotein(a) [Lp(a)], interleukin-18 (IL-18), and plasminogen activator inhibitor-1 (PAI-1)

A REVIEW OF THE THERAPEUTIC PROSPECTS OF VANILLIN AND ITS DERIVATIVES

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Abstract

Background: Vanillin, a phenolic aldehyde, is the primary component of the vanilla bean's ethanolic extract. Synthetic vanillin is now more commonly used as a flavouring in foods, beverages, and pharmaceuticals. Natural vanilla extract consists of several hundred compounds, while artificial vanilla flavouring is often a synthetic ethanol solution of pure vanillin. The first commercial synthesis of vanillin began with eugenol, and today, it is made from guaiacol or lignin.

Methods: This review examines articles on vanillin and its chemical derivatives, focusing on biological evaluations and the mechanism of action, using databases like Science Direct, Scopus, PubMed, and Google Scholar.

Results: Vanillin, a plant with numerous medical benefits, is widely used in treating conditions like Alzheimer's disease, hypertension, upper respiratory tract infections, and venereal diseases. Its bioactive qualities are emphasized in this review due to its growing pharmacological importance, offering numerous benefits such as antioxidant, antitumor, anticancer, antiviral, antibacterial, antifungal, neuroprotective, and anti-quorum-sensing activity.

Conclusion: The present study represented different synthetic methods and biological activities of CA derivatives. Our goal was to help other researchers design and develop stable analogs of CA for the improvement of its metabolic stability and the promotion of its biological activity.

Keywords: Vanillin, Biological characteristics, antimicrobial activity, Antioxidant activity, analgesic activity, anti-inflammatory activity, anti-tubercular activity, Antidiabetic, Anticancer activity

PROSPECTIVE OBSERVATIONAL STUDY ON CLINICO-EPIDEMIOLOGICAL PROFILE AND MANAGEMENT OF TRAUMA AMONG TRAUMA PATIENTS

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Abstract

Background: Trauma is a global public health crisis, serving as the sixth leading cause of death and fifth leading cause of disability. Often termed a "neglected disease," it disproportionately affects males (68%) aged 15–45 years.

Aim: This study analyzed the clinico-epidemiological profile, causative factors, and management strategies for trauma patients at East Point Hospital.

Study Design: A prospective observational study was conducted, assessing patient demographics, injury mechanisms, and the application of trauma scoring systems like the Glasgow Coma Scale (GCS) and Injury Severity Score (ISS).

Conclusion: Findings reveal road traffic accidents and blunt trauma as primary injury drivers. Effective management relies on rapid emergency interventions, including airway stabilization and shock control. Utilizing standardized scoring scales is vital for prioritizing care in complex cases. Reducing the trauma burden requires stricter safety legislation, public awareness, and enhanced emergency management policies to minimize mortality and long-term disability.

Keywords: Trauma, Glasgow Coma Scale (GCS), Injury Severity Score (ISS).

NANOSTRUCTURED LIPID CARRIERS: A PROMISING DRUG CARRIER FOR TARGETING BRAIN TUMORS

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Abstract

Background: Recent advances in nanotechnology and nanomedicine have transformed drug delivery by overcoming limitations of conventional systems. Nanostructured lipid carriers (NLCs), or second-generation lipid nanocarriers, have gained attention due to their efficiency, targeted delivery, and versatile applications. Brain disorders, particularly brain tumors, remain challenging due to poor prognosis and difficulty in delivering drugs across the blood-brain barrier. This review focuses on the potential of NLCs for brain-specific delivery of chemotherapeutic agents.

Main Body: NLCs are lipid-based formulations with a solid matrix at room temperature, offering advantages such as enhanced stability, low toxicity, longer shelf life, improved drug loading, and biocompatibility compared to traditional lipid carriers like nanoemulsions and solid lipid nanoparticles. This review discusses NLC structure, classification, components, and preparation methods, highlighting relevant studies with their benefits and limitations. Concepts of drug loading, release, and strategies to enhance stability are explained. Moreover, various in vitro and in vivo studies on cytotoxic drug-loaded NLCs demonstrate their potential in brain-targeted therapy.

Conclusion: NLCs are increasingly used in pharmaceuticals, food, and cosmetics, and more recently in cancer therapy, gene delivery, and brain targeting. This review emphasizes their role in delivering chemotherapeutics to brain tumors and summarizes current clinical developments, highlighting NLCs as a promising platform for brain-specific drug delivery.

Keywords: Nanostructured lipid carriers, Nanomedicine, Lipid nanoparticles, Brain cancer, Glioma, Drug delivery system

FORMULATION AND DEVELOPMENT AND IN VIVO AND IN VITRO CHARACTERIZATION OF CLONIDINE HCL TRANSDERMAL DRUG DELIVERY SYSTEM

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Abstract

Clonidine hydrochloride is a centrally acting antihypertensive agent that undergoes extensive first-pass metabolism and requires frequent oral administration, leading to reduced patient compliance. The present study was undertaken to formulate, develop, and evaluate a transdermal drug delivery system (TDDS) of clonidine hydrochloride to achieve sustained drug release and improved therapeutic efficacy. Transdermal patches were prepared by the solvent evaporation method using various polymers such as hydroxypropyl methylcellulose and ethyl cellulose, along with suitable plasticizers and permeation enhancers. The prepared patches were evaluated for physicochemical parameters, including thickness, weight variation, folding endurance, tensile strength, moisture content, and drug content uniformity. In-vitro drug release studies were performed using Franz diffusion cells, and release kinetics were analyzed to understand the drug release mechanism. Ex-vivo permeation studies were conducted using excised animal skin to assess transdermal permeation. The optimized formulation demonstrated satisfactory physicochemical properties and sustained drug release over an extended period. In-vivo studies revealed prolonged antihypertensive activity and improved bioavailability compared to conventional oral formulations. Stability studies confirmed the formulation's stability under accelerated conditions. The study concludes that the developed clonidine hydrochloride transdermal patch is a promising alternative to oral dosage forms, offering sustained drug delivery, enhanced bioavailability, and improved patient compliance in the management of hypertension.

Keywords: Clonidine hydrochloride, antihypertensive agent, first-pass metabolism, transdermal drug delivery system (TDDS)

ADVANCES IN PARKINSON'S DISEASE MANAGEMENT: EMERGING THERAPEUTIC STRATEGIES BEYOND CONVENTIONAL DOPAMINERGIC THERAPY

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Abstract

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor impairments and a wide spectrum of non-motor symptoms, resulting primarily from the degeneration of dopaminergic neurons in the substantia nigra. Although conventional treatments such as levodopa provide symptomatic relief, they do not halt disease progression and are often associated with long-term complications. Recent advances in neuroscience and biotechnology have led to the development of innovative therapeutic approaches aimed at modifying disease pathology. These include gene therapy targeting α -synuclein aggregation, stem cell-based neuronal replacement strategies, and immunotherapies designed to reduce toxic protein accumulation. Additionally, neuromodulation techniques such as adaptive deep-brain stimulation and focused ultrasound are improving precision and clinical outcomes. Emerging pharmacological agents targeting mitochondrial dysfunction, neuroinflammation, and gut-brain axis dysregulation are also under investigation. Collectively, these novel techniques represent a paradigm shift from symptomatic management toward disease-modifying interventions. This poster highlights recent advances in PD treatment strategies, emphasizing their mechanisms, clinical relevance, and future potential to improve patient quality of life.

Keywords: Parkinson's disease, Emerging therapies, Neurodegeneration, Advanced neuromodulation

GINGER EXTRACT AND NAPROXEN: THERAPEUTIC ROLES, MECHANISMS, MIGRAINE APPLICATIONS: A MINI REVIEW

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Abstract

Ginger (*Zingiber officinale*) and naproxen are well recognized for their anti-inflammatory and analgesic properties. Naproxen, a commonly prescribed non-steroidal anti-inflammatory drug (NSAID), is widely used in the management of pain, inflammation, and headache disorders, particularly migraine. It exerts its therapeutic effect primarily by inhibiting cyclooxygenase (COX) enzymes, thereby reducing prostaglandin synthesis involved in pain and inflammation. Ginger, a traditional herbal medicine, possesses multiple pharmacological activities including mild anti-inflammatory, antioxidant, analgesic, anti-emetic, and gastroprotective effects, largely attributed to its bioactive constituents such as gingerols and shogaols. The combined use of ginger with conventional NSAIDs like naproxen may offer synergistic benefits by enhancing analgesic and anti-inflammatory efficacy while potentially minimizing gastrointestinal and systemic adverse effects associated with long-term NSAID therapy. This review discusses the mechanism of action, clinical applications, migraine-relieving properties, and safety profile of naproxen, along with the therapeutic potential of ginger in migraine management. In addition, possible drug–herbal interactions between ginger and naproxen are highlighted. Current literature suggests that ginger is effective in reducing migraine-associated pain and nausea, supporting its role as a complementary therapy alongside standard pharmacological treatment.

Keywords: Ginger extract, Naproxen, Migraine, NSAIDs, Analgesia

**PHARMACOGNOSTIC AND PHYSICOCHEMICAL CHARACTERIZATION OF
ARGYREIA NERVOSA (BURM. F.) BOJER'S ROOTS IN ESTABLISHING QUALITY
PARAMETERS FOR CRUDE DRUG AUTHENTICATION**

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Abstract

Quality evaluation of medicinal plants is a crucial step in developing standardized herbal formulations. The present study focuses on pharmacognostic and physicochemical assessment of the roots of *Argyreia nervosa* (Burm. f.) Bojer, traditionally known as Vṛddhadaru, family Convolvulaceae, to establish dependable parameters for crude drug evaluation. In Ayurveda, the plant is widely utilized for conditions associated with Kapha imbalance, inflammatory conditions, arthritis, synovitis, reproductive weakness, cardiac problems, psychological disturbances, abdominal ailments, tumors, and various other complaints. Considering its wide therapeutic applications and limited systematic data on its pharmacognostic and physicochemical characteristics, a detailed evaluation of the plant roots is necessary to ensure authenticity, purity, and consistency of the crude drug. A comprehensive Pharmacognostic examination (macroscopic and microscopic analyses), to record diagnostic morphological and histological characters and Physicochemical parameters, like ash value, extractive values, loss on drying, foaming index, etc. (using standard laboratory procedures), was evaluated to determine the identity, quality, and purity of the drug. Preliminary phytochemical screening of root extracts confirmed the presence of important secondary metabolites, indicating their therapeutic potential. These findings support the implementation of effective quality control measures for herbal formulations containing *A. nervosa* as an active component, ensuring therapeutic reliability and reproducibility in clinical use.

Keywords: *Argyreia nervosa*, Vṛddhadaru, pharmacognostic evaluation, physicochemical analysis, phytochemical profiling, quality standardization

MOLECULAR DOCKING STUDY OF SOME NEW BENZPYRAANONE DERIVATIVES AS A NEPHROPROTECTIVE ACTIVITY

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Abstract

Nephrotoxic agents are substances that can cause damage to the kidneys, particularly the nephrons, which are the functional units of the kidney. These agents can be drugs, toxins, or contrast media used in imaging studies. The molecular docking study is a predictive study they bind to the receptor and shows binding energy. Docking of the promising derivatives 5, 10, 15, 22, and the reference drug quercetin within the active site of NFκB was explored using Argus Lab 4.0 free software and visualization using PYMOL. The benzpyranone 50 derivatives are docked with PDB(1NFK) The docked compounds 5, 10, 15, 22 and quercetin afforded variable and high negative energy scores (-12.60, - 12.20, - 11.03 and - 11.30kcal/mol, respectively) indicating strong predicted binding affinity to NFκB All the screened compounds were fitted within the binding pocket via arene-arene interaction between the chromone moiety and the vital amino acid Tyr119 like the native ligand.

Keywords: NFκB (nuclear factor kappa beta), Try (tyrosine), PDB (protein data bank)

NATURAL COMPOUNDS TARGETING HEPATOCELLULAR CARCINOMA: PHARMACOLOGICAL PERSPECTIVES

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Abstract

Hepatocellular carcinoma (HCC) is the most prevalent primary liver malignancy and a leading cause of cancer-related mortality worldwide. The intricate molecular landscape of HCC, characterized by deregulated signaling pathways, persistent inflammation, oxidative stress, and resistance to apoptosis, poses major challenges to standard chemotherapy and targeted therapies. Despite recent advances, current treatment strategies are limited by systemic toxicity, drug resistance, and poor tumour selectivity, highlighting the need for safer and more effective approaches. Natural plant-derived bioactive compounds have emerged as promising candidates for HCC due to their multitargeted pharmacological activities, including antioxidant, anti-inflammatory, antiproliferative, and pro-apoptotic effects. Classes such as flavonoids, alkaloids, glycosides, and terpenoids modulate key molecular pathways (e.g., NF- κ B, PI3K/Akt, MAPK, and caspase signaling) and mitochondrial-mediated apoptosis, with favorable safety profiles and potential synergy with conventional anticancer agents. This review discusses HCC pathogenesis and highlights mechanistic, preclinical, and translational evidence supporting plant-derived compounds for prevention and therapy improved clinical relevance.

Keywords: Hepatocellular carcinoma, medicinal plants, bioactive compounds, anticancer activity, molecular mechanisms, apoptosis, oxidative stress, targeted therapy.

AQUASOME-MEDIATED DELIVERY OF AVOBENZONE FOR IMPROVED SUNSCREEN PERFORMANCE

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Abstract

Avobenzone is a widely used UVA filter in sunscreen formulations, but its clinical performance is limited by poor photostability, low aqueous solubility, and reduced skin retention. These drawbacks often lead to loss of efficacy and the need for higher concentrations, which may increase the risk of skin irritation. The present work focuses on the development of an aquasome-based nanocarrier system to enhance the stability and sunscreen performance of avobenzone. Aquasomes were prepared using a carbohydrate-coated ceramic core through a self-assembly technique, ensuring preservation of the drug's molecular integrity. The formulated avobenzone-loaded Aquasomes were evaluated for particle size, surface morphology, drug loading efficiency, and in vitro release behaviour. The optimized formulation showed nanosized particles with uniform distribution and satisfactory entrapment efficiency. In vitro release studies indicated a controlled release pattern compared to conventional avobenzone formulations. Photostability studies demonstrated a significant reduction in avobenzone degradation upon UV exposure when incorporated into Aquasomes. Ex vivo skin permeation and retention studies revealed enhanced drug deposition in the upper layers of the skin, indicating improved topical targeting with minimal systemic absorption. Overall, aquasome-mediated delivery of avobenzone offers a promising approach to overcome formulation challenges associated with conventional sunscreens. The developed system has the potential to improve sunscreen efficacy, reduce photodegradation, and enhance user safety, making it a suitable nanocarrier platform for advanced topical photoprotective formulations.

Keywords: Aquasomes, Avobenzone, Nanocarrier drug delivery, Sunscreen formulation, Photostability, Topical delivery

**APPLICATION OF THE QUALITY BY DESIGN APPROACH FOR THE
EXTRACTION OF COUMARIN FROM *CINNAMON CASSIA* USING DESIGN
EXPERT SOFTWARE**

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Abstract

A naturally occurring benzopyrone molecule found in many plants, Coumarin is well-known for its wide range of pharmacological properties, which include anti-inflammatory, antioxidant, anticoagulant, and antibacterial actions. One of the most abundant natural sources of coumarin, *Cinnamon cassia* [Lauraceae], is widely employed in flavouring, medicinal, and nutraceutical uses. This study investigates the use of Design-Expert® software version 13 [BBD-RSM] and the Quality by Design (QbD) strategy for the effective extraction of coumarin from *Cinnamon cassia*. With an emphasis on process consistency and product quality, QbD was used to create a methodical, scientific, and extraction process. Risk assessment was used to identify critical process parameters (CPPs), such as temperature, solvent concentration, extraction duration, and solid-to-solvent ratio. The adequacy and significance of the model were evaluated using statistical analysis, namely ANOVA. Investigation of the optimisation of the extraction of coumarin was carried out by statistical design expert software and by high content to be found 1:40 at 65°C for 2 hours in methanol using the reflux method extraction on the basis of the above findings. A detailed extraction method can be used in academia and industry for the maximum extraction of coumarin.

Keywords: Coumarin, *Cinnamomum cassia*, Quality by Design (QbD), Design-Expert® software, Response Surface Methodology

TAMARIND-BASED FLOATING MICROSPHERES OF METFORMIN

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

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

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

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Abstract

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

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

STUDY THE ROLE OF CREATINE MONOHYDRATE IN ARSONIC-INDUCED MEMORY IMPAIRMENT IN EXPERIMENTAL MICE MODELS

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Abstract

Arsenic is a common environmental toxin that induces neurotoxicity and cognitive deficits, particularly memory impairment, through oxidative stress and neuronal damage. Creatine monohydrate, an endogenous compound involved in cellular energy metabolism, has been reported to possess neuroprotective and antioxidant properties. The present study aimed to investigate the protective role of creatine monohydrate against arsenic-induced memory impairment in experimental mouse models. Adult mice were divided into control and treatment groups. Memory impairment was induced by arsenic administration, while creatine monohydrate was administered as an intervention for a defined period. Cognitive functions were evaluated using established behavioral tests such as the Morris water maze and passive avoidance test. Biochemical parameters, including oxidative stress markers and antioxidant enzyme activities, were analyzed in brain tissue. Arsenic exposure resulted in significant impairment of learning and memory, along with elevated oxidative stress. Treatment with creatine monohydrate significantly improved cognitive performance and restored antioxidant status compared to arsenic-treated mice. These findings indicate that creatine monohydrate mitigates arsenic-induced neurotoxicity and memory deficits. In conclusion, creatine monohydrate shows potential as a neuroprotective agent against arsenic-induced cognitive impairment, possibly through its antioxidant and energy-modulating effects.

Keywords: Arsenic toxicity, Creatine monohydrate, Memory impairment, Neuroprotection, Oxidative stress, Experimental mice

STATISTICAL APPROACH FOR OPTIMIZATION OF EXTRACTION OF TRIMYRISTIN FROM *MYRISTICA FRAGRANS*

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Abstract

The naturally occurring triglyceride trimyristin, which is mostly found in the seeds of *Myristica fragrans* (Myristicaceae), is well-known for its numerous industrial and pharmacological uses, especially in lipid-based formulations, drug delivery systems, and nutraceutical products. One of the best natural sources of trimyristin is *Myristica fragrans*, which is utilized extensively in the culinary, cosmetic, and traditional medical industries. The present study investigates a statistical approach for the optimization of trimyristin extraction from *Myristica fragrans*. Design-Expert® software version 13 was employed to enhance extraction efficiency while ensuring process reliability and reproducibility. Critical process parameters (CPPs) affecting trimyristin yield, such as solvent-to-drug ratio, extraction temperature, and extraction time, were identified. Analysis of variance (ANOVA) was used to statistically examine the experimental data in order to assess the generated mathematical model's adequacy, significance, and predictive power. Based on the above, it can be concluded that the maximum content of trimyristin-rich extract was found to be 21.5% using different parameters like solvent-to-drug ratio (1:40), temperature (60 °C) & time (1hour) using chloroform under the reflux extraction method. The optimized method is suitable for efficient trimyristin extraction in both academic and industrial applications.

Keywords: Trimyristin, Nutmeg, Quality by Design (QbD), Design-Expert® software, Response Surface Methodology.

COMPREHENSIVE PHYTOCHEMICAL AND ANALYTICAL ASSESSMENT OF CRASSULA OVATA WITH EMPHASIS ON ITS ANTIBACTERIAL POTENTIAL

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Abstract

The increasing prevalence of antimicrobial resistance has intensified the need for alternative antimicrobial agents from natural sources. Medicinal plants are rich in bioactive secondary metabolites that exhibit diverse pharmacological activities. *Crassula ovata* (family: Crassulaceae), commonly known as the Jade Plant or Money Plant, is traditionally used for the treatment of skin infections, wounds, and inflammatory conditions; however, its scientific validation remains limited. The present study aims to investigate the phytochemical composition, analytical profile, and antibacterial potential of *Crassula ovata*. Extracts prepared using solvents of different polarities will undergo qualitative and quantitative phytochemical screening. Analytical characterization will be performed using UV–Visible spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), High-Performance Liquid Chromatography (HPLC), and Gas Chromatography–Mass Spectrometry (GC–MS). Antibacterial activity will be evaluated against selected Gram-positive and Gram-negative bacterial strains using agar well diffusion, minimum inhibitory concentration (MIC), and minimum bactericidal concentration (MBC) assays. The findings are expected to provide scientific validation for the traditional medicinal uses of *Crassula ovata* and support its potential application as a natural antimicrobial agent.

Keywords: *Crassula ovata*, Phytochemical screening, Antibacterial activity, Analytical evaluation, Medicinal plants, Antimicrobial resistance

DESIGN, SYNTHESIS, AND ANTIDIABETIC ACTIVITY OF BENZOTRIAZOLE DERIVATIVES: AN IN-SILICO AND BIOLOGICAL APPROACH

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Abstract

This research aims to develop new benzotriazole-based compounds with potential antidiabetic activity through a combination of computational and laboratory-based approaches. Initially, computer-aided techniques such as molecular docking and virtual screening will be used to explore how the designed compounds interact with important biological targets involved in diabetes. Compounds showing promising interactions will then be synthesized using efficient and environmentally friendly methods, followed by detailed structural characterization. The synthesized derivatives will be evaluated for their antidiabetic activity using various in vitro assays. By integrating molecular modeling, organic synthesis, and biological evaluation, this study seeks to identify lead compounds with meaningful antidiabetic potential and suitable pharmacological properties. The findings from this work may contribute to the development of new therapeutic options for the management and treatment of diabetes mellitus.

Keywords: Antidiabetic Activity, Benzotriazole, In-silico, Molecular Docking, Synthesis, Drug design, etc.

ANTIMONY IN THE MODERN WORLD: SOURCES, HEALTH IMPACTS, AND PROTECTIVE STRATEGIES

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Abstract

Nowadays, modern humans are surrounded by several agents that promote oxidative stress, including air pollution, unhealthy food habits, psychological stress, radiation, pesticides, and chemical exposure. Among these factors, heavy metals play a major role in disturbing the body's redox balance. One such heavy metal is antimony, which has received comparatively less attention despite its potential health hazards. Antimony is widely used in industrial processes, plastics, flame retardants, electronics, and packaging materials, and is exposed to humans through air, water, food, and daily-use products such as plastic containers and polyethylene terephthalate (PET) bottles. Antimony induces oxidative stress by enhancing the production of reactive oxygen species and weakening the antioxidant defence system. This oxidative imbalance leads to lipid peroxidation, protein damage, DNA injury, inflammation, and cellular dysfunction, ultimately affecting vital organs. However, the harmful effects of antimony-induced oxidative stress can be reduced by adopting simple preventive measures such as avoiding prolonged and repeated use of PET bottles and minimizing contact with antimony-containing materials. In addition, regular intake of dietary antioxidants such as vitamin C, vitamin E, polyphenols, flavonoids, turmeric, green tea, and green leafy vegetables may strengthen the antioxidant defence system and protect against oxidative damage.

Keywords: Antimony, Heavy metals, Oxidative stress, Antioxidants.

AI-PHARMA FUSION: ACADEMIA MEETS INDUSTRY IMPERATIVES

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Artificial intelligence (AI) is rapidly changing the pharmaceutical industry by redefining how medications are found, created, and distributed. This poster discusses the expanding importance of AI in pharmaceuticals, emphasizing its ability to combine academic discovery with industrial translation. Core AI applications now include target identification, virtual screening, formulation optimization, and clinical decision support, allowing for more efficient, data-driven processes throughout the value chain. Strengthened academic-industry synergies, such as collaborative research networks, shared data infrastructures, and co-developed digital platforms, are important for using these capabilities at scale. However, considerable problems remain, including data quality and interoperability, legal ambiguity, algorithmic bias, and ethical concerns about patient privacy and accountability. New developments in multimodal learning, federated AI, and real-time analytics are enabling individualized medicines and adaptive trial designs. To effectively reap these benefits, future imperatives include developing strong governance frameworks, investing in transdisciplinary capacity building, and integrating policy, infrastructure, and finance mechanisms across industries. AI-driven methods aim to expedite innovation and close the gap between academic discovery and industrial implementation in pharmaceuticals.

Keywords: Artificial intelligence, pharmaceutical industry, partnership between academia and industry, core AI applications, obstacles and ethics, emerging breakthroughs, and future imperatives.

AMELIORATIVE EFFECT OF VERATRIC ACID AGAINST CYCLOPHOSPHAMIDE-INDUCED CARDIOTOXICITY

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Abstract

Background: Cyclophosphamide (CP), a cytotoxic alkylating agent, is known to cause cardiac toxicity due to oxidative damage, resulting in numerous side effects. Therefore, there is a requirement for a specific medication that can decrease the harmful side effects.

Objective: Veratric acid (VA) is a prominent benzoic acid that originates from plants, fruits, and medicinal mushrooms and has strong antioxidative and anti-inflammatory activities. This research aimed to investigate the cardioprotective effect of VA against CP-induced cardiotoxicity.

Methodology: The rats were administered VA at 80 and 160 mg/kg/day orally from the first day for 21 days. CP 200 mg/kg, i.p., was given once, on the 7th day. On the 22nd day, the rats were weighed, blood samples were taken, and they were sacrificed. The hearts were extracted to measure several biochemical estimations related to nitrative stress, oxidative stress, apoptosis, inflammation, and fibrosis.

Results: The results demonstrated that VA is protective in mitigating CP-induced cardiotoxicity by reducing inflammation, oxidative stress, apoptosis, heart injury, and histopathological damage.

Conclusion: Therefore, veratric acid has the potential to be employed alongside cyclophosphamide in cancer treatment.

Keywords: Cyclophosphamide, veratric acid, oxidative stress, cardiotoxicity

ARTIFICIAL INTELLIGENCE–DRIVEN COMPUTER-AIDED DRUG DESIGN AND PROTOX-BASED TOXICITY ASSESSMENT IN DRUG DISCOVERY

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Abstract

Artificial Intelligence (AI) has become an essential component of modern pharmaceutical research by enhancing the efficiency of drug discovery and development. Computer-Aided Drug Design (CADD) utilizes computational tools such as molecular modeling, virtual screening, and structure-based drug design to identify promising lead molecules with improved target specificity. Despite advancements in lead optimization, safety-related failures due to toxicity remain a significant challenge in later stages of drug development. To overcome this limitation, *In-silico* toxicity prediction platforms such as ProTox-II are increasingly employed during early screening. ProTox-II applies machine learning models to evaluate potential toxicological endpoints, including acute toxicity, organ toxicity, carcinogenicity, immunotoxicity, and cytotoxicity using molecular structure information. The integration of CADD with ProTox-based toxicity prediction enables early elimination of unsafe compounds, reduces dependence on animal experimentation, and shortens development timelines. This combined AI-based approach supports rational decision-making by prioritizing drug candidates with favourable safety and efficacy profiles. Overall, AI-driven CADD coupled with predictive toxicity assessment represents a reliable and sustainable strategy for accelerating drug discovery while aligning academic research with pharmaceutical industry demands.

Keywords: Computer-Aided Drug Design, Artificial Intelligence, ProTox-II, *In-silico* Toxicity, Drug Discovery, Drug Development.

ROLE OF ARTIFICIAL INTELLIGENCE IN ANIMAL MODEL REDUCTION AND ETHICAL DRUG DEVELOPMENT

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Abstract

The ethical use of animals in pharmaceutical research remains a critical concern, driving the need for innovative approaches that align scientific advancement with the principles of reduction, refinement and replacement. Artificial Intelligence (AI) has emerged as a powerful tool to minimize reliance on animal models while maintaining reliability and predictive accuracy in preclinical research. AI-driven computational models, machine learning algorithms and *In-silico* simulations enable early-stage prediction of drug efficacy, toxicity and pharmacokinetic behavior, thereby reducing the number of compounds requiring animal testing. In academic research, AI facilitates virtual screening, systems pharmacology modeling and toxicity prediction using large biological datasets. When translated into industrial workflows, these technologies can significantly reduce animal usage, shorten development timelines and lower research costs. AI also enhances study design by identifying optimal dosing strategies and predicting adverse outcomes before *In-vivo* experimentation, contributing to refined and ethically responsible experimentation when animal studies are unavoidable. Despite these advantages, challenges such as data standardization, model validation and regulatory acceptance limit widespread implementation. Strengthening academia-industry collaboration, developing explainable AI models and aligning computational outputs with regulatory expectations are essential for ethical integration. Overall, AI represents a transformative approach toward humane, efficient and responsible drug development.

Keywords: Artificial Intelligence, Drug Development, Ethical Research, Preclinical Models, Reduction of Animal Testing.

QUANTIFICATION OF BIOACTIVE MARKERS MYRICETIN AND QUERCETIN IN HYDROALCOHOLIC EXTRACT OF *MESUA FERRA L* STAMEN BY HPTLC TECHNIQUE

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Abstract

Mesua ferrea is a well-known medicinal plant widely used in traditional systems of medicine for its diverse therapeutic properties. The present study was aimed at the quantification of bioactive markers Quercetin and Myricetin in the hydroalcoholic extract of *Mesua ferrea* stamen using a validated High Performance Thin Layer Chromatography (HPTLC) technique. The stamen of *Mesua ferrea* was subjected to hydroalcoholic extraction using ethanol:water::70:30 solvent system to obtain a concentrated extract. Standard solutions of markers Quercetin and Myricetin and the test extract were applied on silica gel 60 F₂₅₄ HPTLC plates using a CAMAG applicator. Chromatographic development was carried out in a pre-saturated twin trough chamber with an optimized mobile phase to achieve good resolution. Densitometric scanning was performed at an appropriate wavelength 190-450 nm, and quantification was achieved by comparing peak areas of the sample with those of the standards. The method showed good linearity, precision, accuracy, and reproducibility within the selected concentration range. The amounts of markers Quercetin is 0.78% w/w and Myricetin 0.64% w/w present in the hydroalcoholic extract were successfully quantified, demonstrating the suitability of the HPTLC method for routine quality control and standardization of *Mesua ferrea* stamen extract. This study provides a reliable analytical approach for ensuring consistency, purity, and efficacy of herbal formulations containing *Mesua ferrea*.

Keywords: *Mesua ferrea*, Quality control, HPTLC.

AI-BASED MOLECULAR DOCKING AND VIRTUAL SCREENING: ACADEMIC INNOVATION VS INDUSTRIAL VALIDATION

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Abstract

Artificial Intelligence (AI)-based molecular docking and virtual screening represent transformative tools in drug discovery, yet stark contrasts persist between academic innovation and industrial validation. In academia, AI algorithms excel at high-throughput screening of vast chemical libraries, predicting binding affinities for novel scaffolds like furan and phenyl derivatives with unprecedented speed and diversity. These approaches leverage machine learning models, such as graph neural networks and generative AI, to explore uncharted chemical spaces and prioritize hits for experimental synthesis, fostering breakthrough hypotheses in medicinal chemistry. However, academic efforts often grapple with limited datasets, model generalizability, and validation against real-world pharmacokinetics. Industrially, rigorous validation frameworks dominate, integrating AI predictions with proprietary biophysical assays, ADMET profiling, and large-scale clinical data to ensure scalability and regulatory compliance. While academia drives creative exploration, industry demands reproducible outcomes under GMP standards, bridging the gap through collaborative platforms that refine AI models with empirical feedback loops. This synergy promises accelerated pipelines from virtual hits to market-ready candidates, exemplified by recent successes in targeted therapies. Ultimately, harmonizing academic ingenuity with industrial pragmatism will unlock AI's full potential, revolutionizing precision medicine and sustainable pharma innovation.

Keywords: AI molecular docking, virtual screening, drug discovery, academia-industry gap, binding affinity prediction, medicinal chemistry, validation pipelines

ANTIBIOTIC RESISTANCE: A GLOBAL THREAT

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Abstract

Antibiotic resistance has emerged as one of the most serious global public health threats of the 21st century. It occurs when bacteria evolve mechanisms to withstand the effects of antibiotics, rendering standard treatments ineffective and allowing infections to persist and spread. The rapid rise of resistant strains is driven by the overuse and misuse of antibiotics in human medicine, veterinary practice, agriculture, and poor infection control measures. As a result, common infections such as pneumonia, tuberculosis, urinary tract infections, and sepsis are becoming increasingly difficult to treat. The consequences of antibiotic resistance are profound, leading to prolonged illness, increased mortality, extended hospital stays, and higher healthcare costs. Moreover, it threatens the success of modern medical procedures such as surgery, chemotherapy, and organ transplantation, which rely heavily on effective antimicrobial therapy. Low- and middle-income countries are particularly vulnerable due to limited access to diagnostics, surveillance systems, and newer antibiotics. Combating this global crisis requires a coordinated, multidisciplinary approach involving rational antibiotic use, public awareness, robust surveillance, infection prevention strategies, and accelerated research for novel antimicrobial agents. Strengthening antimicrobial stewardship programs and promoting responsible prescribing practices are essential steps. Addressing antibiotic resistance is not only a medical necessity but also a global responsibility to safeguard future generations from a post-antibiotic era.

Keywords: Antibiotic resistance, antimicrobial stewardship, Multidrug-resistant bacteria, Global health threat, Rational drug use, public health.

LIPOSOMAL GELS: AN INNOVATIVE PLATFORM FOR SUSTAINED AND TARGETED DRUG DELIVERY

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Abstract

Combining the benefits of hydrogels and liposomes, liposomal gels have become a viable drug delivery method that can improve therapeutic efficacy. Phospholipid bilayers form the spherical vesicles known as liposomes, which have the capacity to encapsulate both hydrophilic and lipophilic medications and provide biocompatibility and controlled release. However, their clinical applicability is limited due to their fast elimination and low stability. By offering a stable, viscous medium that increases drug retention, prolongs release, and improves patient compliance, liposome incorporation into a gel matrix gets around these problems. With better permeability and tailored drug deposition than traditional formulations, liposomal gels have been thoroughly studied for topical, transdermal, ocular, and mucosal delivery. Furthermore, there has been a lot of interest in their ability to treat cancer therapy, infections, inflammation, and chronic skin conditions. The formulation methods, characterisation approaches, and therapeutic uses of liposomal gels are the primary subject matter of this review. It also discusses current developments, difficulties with large-scale manufacturing, and prospects for creating patient-friendly, optimal dose forms in the future. All things considered, liposomal gels are a flexible and cutting-edge platform that could completely transform contemporary medication delivery.

Keywords: Liposomal gel, Controlled release, Transdermal delivery, Nanocarriers.

TRANSLATING A-QBD PRINCIPLES INTO PRACTICE: A STEP-BY-STEP IMPLEMENTATION STRATEGY FOR ROBUST RP-HPLC ANALYSIS OF DRUG COMBINATION

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Abstract

This work highlights the transition from empirical to QbD-based method development for anti-hypertensive fixed-dose combinations. By focusing on the interplay between AZT and CIL Combinations, we provide a step-by-step roadmap that yields a significantly more stable and reproducible RP-HPLC method than traditional development strategies. Moving beyond empirical scouting, this study leveraged a Box-Behnken Design under the QbD paradigm to optimize the RP-HPLC analysis of the AZT and CIL combination. This systematic transition from traditional screening to statistical optimization resulted in a highly robust method, which was subsequently validated to guarantee its accuracy, precision, and reliability for routine pharmaceutical analysis. On the Basis of the traditional method development, Methanol and 0.1% v/v OPA were selected as a mobile phase in an 82:18 ratio, the flow rate was selected as 1 ml/min, and the column temperature was selected at 40°C. Based on these factors, 17 HPLC runs were performed as per the Box Behnken design protocol. The P-values for the quadratic model for all factors were found to be less than 0.0500, which shows the quadratic model is best for the proposed study, by which method gets optimized, and the validation was carried out on the most appropriate optimized solution. Selected validation parameters were found in the specified range, which suggests that the developed method was reliable, suitable, and better in comparison with the traditional method development approach. Implementation of a QbD-driven approach resulted in a highly reliable RP-HPLC method that demonstrates exceptional analytical performance. The reproducibility of the data confirms that this optimized protocol is not only cost-effective but also ready for industrial scale-up. Its validated robustness makes it an ideal candidate for high-throughput screening and routine quality assessment of fixed-dose combinations in pharmaceutical laboratories.

Keywords: Quality by Design, DoE, Method Development, Validation, Simultaneous Estimation

ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING PHARMACEUTICAL SCIENCES

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Abstract

Artificial Intelligence (AI) focuses on the development of intelligent models capable of acquiring knowledge, solving complex problems, and supporting decision-making processes. In recent years, AI has emerged as a transformative technology in various domains of pharmacy, including drug discovery, drug delivery and formulation development, polypharmacology, and hospital pharmacy services. In drug discovery and formulation development, advanced Artificial Neural Networks (ANNs), such as Deep Neural Networks (DNNs) and Recurrent Neural Networks (RNNs), are increasingly employed to analyze complex datasets and predict drug behavior. Several AI-based implementations in drug discovery have demonstrated the effectiveness of these techniques in quantitative structure–property relationship (QSPR) and quantitative structure–activity relationship (QSAR) studies. Furthermore, AI-driven *de novo* drug design has facilitated the generation of novel drug molecules with optimized physicochemical and pharmacological properties. Beyond drug discovery, AI plays a significant role in polypharmacology by predicting multi-target drug interactions and enhancing hospital pharmacy practice through improved medication management, clinical decision support systems, and patient safety measures. This review highlights the current applications and future potential of artificial intelligence in pharmacy, with particular emphasis on drug discovery, drug delivery formulation development, polypharmacology, and hospital pharmacy practice.

Keywords: Artificial Intelligence, Pharmacy, Drug Discovery, Drug Delivery Systems, QSAR, QSPR, Polypharmacology, Hospital Pharmacy

**RECENT ADVANCEMENT AND STRUCTURE ACTIVITY PARADIGM OF
BENZOTHAZOLE: A CLASSICAL REVIEW FOR BIOLOGICAL SCREENING OF
DIFFERENT DISEASES**

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Abstract

Several attempts were made to synthesize various heterocycle compounds, and their analogues have been shown to possess antimicrobial, anti-malarial, anti-inflammatory, anti-tuberculosis, anti-diabetic, and anti-neoplastic properties. The chemistry and structure of the benzothiazole moiety are very small, but they have a variety of biological properties. In addition to benzothiazoles, the various substituted analogues also have a variety of biological activities. Significant modification of structure and clinical studies have shown the outstanding power of benzothiazoles against a variety of microorganism strains. Benzothiazole component and its many analogues that have various biological activities were the main focus of this summary.

Keywords: Benzothiazole, antimicrobial, anticancer, SAR.

CBD (CANNABIDIOL)-BASED HERBAL PAIN RELIEVER LOTION FOR NEUROPATHIC PAIN

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Abstract

Neuropathic pain is a chronic and debilitating condition arising from damage or dysfunction of the nervous system, often associated with diabetes, post-herpetic neuralgia, chemotherapy, or nerve injury. Conventional pharmacological treatments frequently provide incomplete relief and may cause significant adverse effects with long-term use. Cannabidiol (CBD), a non-psychoactive phytocannabinoid derived from *Cannabis sativa*, has gained increasing attention due to its analgesic, anti-inflammatory, and neuroprotective properties. This poster presents the concept and therapeutic potential of a CBD-based herbal pain reliever lotion formulated for topical application in neuropathic pain. The lotion combines CBD with selected herbal actives known for their anti-inflammatory, analgesic, and nerve-soothing properties. Topical delivery allows localized action at the site of pain, minimizes systemic exposure, and improves patient compliance. The formulation aims to provide safe, effective, and non-addictive pain relief, positioning it as a promising complementary or alternative approach for neuropathic pain management.

Keywords: Cannabidiol, CBD lotion, Neuropathic pain, Herbal topical formulation, Pain management, Endocannabinoid system

ARTIFICIAL INTELLIGENCE IN PHARMACOVIGILANCE AND ADVERSE DRUG REACTION PREDICTION

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Abstract

Introduction: The pharmaceutical industry continually seeks innovative methodologies to enhance drug safety monitoring and proactively identify potential adverse drug reactions. The traditional pharmacovigilance framework, largely reliant on spontaneous reporting systems and extensive manual review, often struggles with the volume and complexity of data generated during post-market surveillance.

Objective: Incorporating artificial intelligence and machine learning into pharmacovigilance offers a revolutionary approach to address these challenges, improving the precision and speed of systems for identifying and forecasting adverse drug reactions. By leveraging AI's advanced capabilities such as data analysis, automated signal detection, case processing, and continuous surveillance shifts from reactive to proactive drug safety oversight.

Methodology: The inherent limitations of traditional pharmacovigilance underscore the need for advanced analytical tools capable of processing vast, heterogeneous datasets efficiently and accurately. This study follows a descriptive and analytical approach, reviewing recent literature and data sources to assess how AI technologies enhance pharmacovigilance systems.

AI, equipped with advanced capabilities like data analytics, automated signal detection, case processing, and ongoing surveillance, stands as a potent solution to overcome these limitations. This incorporation drives a transition from reactive to proactive pharmacovigilance, transforming drug safety through greater efficiency and precision in detecting, evaluating, and preventing adverse drug reactions.

Conclusion: The findings suggest the methods used to integrate AI, evaluate their effectiveness in real-world applications, and highlight their potential to transform modern pharmacovigilance. This enables earlier detection of safety issues, more accurate risk assessment, and improved patient outcomes.

Keywords: Artificial Intelligence, Machine learning, Adverse drug reactions, Data analytics, Pharmacovigilance, Drug safety, Signal detection

COMPUTATIONAL MODELLING AND NETWORK TOXICOLOGY ANALYSIS OF THE SYNERGISTIC ANTIARTHRITIC EFFECTS OF COMMIPHORA WIGHTII AND CURCUMA AMADA FORMULATION

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Abstract

The purpose of the study is to promote a strong antiarthritic herbal formulation over the conventional antiarthritic drug. With the help of an in-silico study, we know the interaction potential of the constituents and their synergistic effect of herbal formulation. For the selection of the protein database, protein data bank (PDB) is used. For the in-silico study, online tools Auto Dock, Chemdraw, PubChem, and ProTox-3.0 are used. According to docking with the help of Auto Dock 4.2 (Release 4.2.6) the Vina score with the cox-2 receptor of guggulsterone E (Eg) is -9.41 kcal/mol and for guggulsterone Z (Zg) -9.97 kcal/mol, and for curcumin (C) it is -9.25. The binding energy for guggul and Haldi is more than that of the conventional drug diclofenac, which has -7.7861 kcal/mol binding energy for the COX-2 receptor. According to in-silico study, guggul and amba Haldi also gives good binding energy for other binding sites, like for TN- α binding energies are -11.24 for Eg, -7.13 for Zg and -5.2 for C, for IKK kinase are -10.17, -7.37, -5.97 for Eg, Zg and C, for NF- κ B (p50/p65 heterodimer) binding energies are -9.21, -6.73, -6.07 (Eg, Zg, C respectively), for Ikk kinase binding energies -10.17, -7.37, -5.97 (Eg, Zg, C respectively), for activation of the NFE2L2 (Nrf2) transcription factor binding energies are -9.6, -9.92, -7.78 (Eg, Zg, C respectively). These other binding sites are also responsible for the management of arthritis as COX-2 receptors, according to previous studies. Guggul and amba Haldi act as antiarthritic moiety with multiple mechanism of actions like selective COX-2 inhibitor, also inhibit NF-Kb, suppress cytokines like IL, TN- α and inhibit JAK-STAT signalling pathways, also involve in activation of the NFE2L2 transcription factor etc. these mechanism collective make guggul and amba Haldi a potent antarthritic formulation with synergistic effects, which may be good candidates for clinical trials in future.

Keywords: In silico docking, COX-2, herbal formulation, ligand, vina score, IKK kinase, TN- α

INVASOMES: A PROMISING VESICULAR PLATFORM FOR TARGETED TREATMENT OF DERMATOLOGICAL INFECTIONS

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Abstract

Invasomes are advanced elastic vesicular drug delivery systems developed to overcome the limitations associated with conventional topical formulations in the treatment of dermatological infections. These vesicular carriers are primarily composed of phospholipids, ethanol, and terpenes, which synergistically enhance vesicle deformability, skin penetration, and drug permeation across the stratum corneum. Ethanol acts by fluidizing both the vesicular bilayer and skin lipids, leading to reduced vesicle size and improved permeability, whereas terpenes function as effective penetration enhancers by disrupting the ordered lipid structure of the skin. Owing to these unique compositional attributes, invasomes exhibit high drug encapsulation efficiency, nanoscale particle size, prolonged and controlled drug release, and enhanced stability. The exceptional penetration ability of invasomes facilitates efficient drug delivery to deeper skin layers, ensuring higher drug concentration at the site of infection while minimizing systemic exposure and associated adverse effects. This targeted delivery approach is particularly advantageous for the management of dermatological infections such as fungal, bacterial, and inflammatory skin disorders, where localized and sustained drug action is required. Invasome-based formulations have demonstrated improved skin retention, enhanced therapeutic efficacy, and better patient compliance compared to conventional gels, creams, and ointments. Furthermore, invasomes offer a biocompatible, non-invasive, and versatile drug delivery platform suitable for a wide range of antimicrobial and antifungal agents. Their potential to enhance drug bioavailability, reduce dosing frequency, and improve clinical outcomes makes invasomes a promising vesicular platform for the targeted treatment of dermatological infections and an emerging strategy in advanced topical drug delivery research.

Keywords: Invasomes, Vesicular Drug Delivery System, Dermatological Infections, Transdermal Drug Delivery, Topical Drug Delivery, Skin Permeation Enhancement, Antifungal Therapy, Elastic Vesicles

DESIGN, SYNTHESIS, AND BIOLOGICAL EVALUATION OF OXADIAZOLE DERIVATIVES AS AN ANTI-OXIDANT

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Abstract

Objectives: The primary objectives of the project are: To synthesize novel oxadiazole derivatives. To characterize and evaluate synthesized molecules. To determine the melting point, a solubility study, and thin-layer chromatography.

Introduction: Antimicrobial resistance (AMR) is one of the main problems of modern medicine. Poor treatment of infections, over-prescription of antibiotics, and their inappropriate use by patients have made some of the microorganisms insensitive to currently used drugs.

Methodology: A series of 2,5-substituted oxadiazole were synthesised. The series comprises 7 compounds. The entire procedure to synthesise the compounds is following: In a round-bottom flask, 0.025 mol of 2-(4-chloro-3-nitro benzoyl) benzoic acid, 10 ml of methanol, and 0.5g of p-Toluenesulfonic acid were added. The resulting mixture was placed on a water bath for 4 hrs. After the completion of the reaction, this mixture was poured into ice for the formation of methyl (2-(4-chloro-3-nitro benzoyl)) benzoate.

Results & Discussion: All the compounds that were synthesised, their physical properties, chemical properties, and analytical observations are mentioned in this chapter. The data in the table exhibits various properties of the compounds as examined.

Keywords: Oxadiazole, Antioxidant activity of compound DPPH assay, Anti-microbial activity.

REVOLUTIONIZING RHEUMATOID ARTHRITIS TREATMENT: A NANOMEDICINE-BASED PERSPECTIVE ON TARGETED THERAPIES

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Abstract

Rheumatoid arthritis (RA) is a systemic inflammatory condition, with progressive damage to the bones and cartilage surrounding the joints which can have detrimental effects on structure and function. Current therapies using anti-inflammatory and biologic medications can alleviate symptomology; however, clinical effectiveness is waning as a result of often short half-lives of medications, poor penetrance into tissues, and systemic, non-specific distribution of medications used. This limits the overall effectiveness of these treatments and requires patients to use higher dosages, increasing costs and also increasing the potential of adverse effects. Recent advances in nanomedicine have paved the path for the use of drugs in the form of liposomes, micelles, and other nanocarrier systems (as well as several forgotten methods) that can increase bioavailability and selectively target the inflamed joint. This targeted delivery will improve efficacy for drugs and potentially mitigate systemic toxicity. This review summarizes an overview of the pathophysiology and means of diagnosis of RA and current and emerging nano-targeting methods of drug delivery. By specifically targeting therapeutic agents to diseased tissues in patients with RA, these novel technologies may overcome the existing barriers to treatment. The promise of nanomedicine in the management of RA focuses on the ability to deliver safer, more effective, localized therapies for patients. These new methods not only provide better patient outcomes but also potentially lessen the long-term burden of medication in an individual experiencing rheumatic disease.

Keywords: Rheumatoid arthritis, Cartilage degeneration, nanotargeting techniques, nanogel, Localized treatment, Joint inflammation, Treatment efficiency

EVALUATION AND DOSAGE FORM DESIGN FOR WOUND HEALING AND ANTI-INFLAMMATORY ACTIVITIES OF *ADENIUM OBESUM* EXTRACT

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Abstract

Medicinal plants have long been used in traditional medicine for the management of wounds and inflammatory conditions. The present study aims to evaluate the wound healing and anti-inflammatory activities of *Adenium obesum* extract and to design a suitable topical dosage form for enhanced therapeutic efficacy. The plant extract was prepared using a suitable solvent system and subjected to preliminary phytochemical screening to identify bioactive constituents responsible for pharmacological activity. Wound healing activity was assessed using standard experimental models by evaluating parameters such as percentage wound contraction and epithelialization time, while anti-inflammatory activity was determined using established inflammation models. Based on the pharmacological evaluation, a topical dosage form was formulated using appropriate excipients to ensure stability, patient acceptability, and effective drug release. The formulated dosage form was evaluated for physicochemical parameters, including pH, viscosity, spreadability, homogeneity, and stability. The results demonstrated that *Adenium obesum* extract showed significant wound healing and anti-inflammatory activities, which may be attributed to the presence of phytoconstituents such as flavonoids, alkaloids, and phenolic compounds. The formulated dosage form exhibited satisfactory physicochemical characteristics and enhanced therapeutic potential. This study supports the traditional use of *Adenium obesum* in wound management and inflammation and suggests its potential as a natural, effective, and safe therapeutic agent. Further clinical studies are recommended to confirm its efficacy and safety in human subjects.

Keywords: *Adenium obesum*, wound healing activity, anti-inflammatory activity, herbal formulation, topical dosage form

PLGA (POLY LACTIC CO-GLYCOLIC ACID) MICROPARTICLES IN ANTI-DIABETIC FORMULATION: FUTURE TREND IN CONTROLLED RELEASE SOLID ORAL DELIVERY

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Abstract

Use of (PLGA) Poly lactic co-glycolic acid microparticles incorporated with a solid dosage form of Metformin HCL. The research will include a review of formulation techniques, e.g. solvent evaporation, spray drying, and analysis of the reported release profile. Use of the PLGA microparticle solid dosage form of Metformin HCL will be associated with higher patient adherence due to reduced dosing frequency and better tolerability. The research will include both convergence and divergence in formulation outcomes, thereby guiding evidence-based optimization of PLGA-based controlled release systems for an anti-diabetic study. The research will help identify emerging trends in the application of PLGA microparticles for oral antidiabetic use.

Keywords: PLGA, Controlled release formulation, Anti-diabetic, Metformin HCL

EXPLORING THERAPEUTIC AND CHEMICALLY HERBAL DRUGS FOR THE PREVENTION OF MENSTRUAL DISORDERS

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Abstract

Menstrual disorders are physical or emotional problems that affect the normal menstrual cycle and bring about pain, unusually heavy or light bleeding, and missed periods. They are one of the most common gynecologic issues that affect women of childbearing age, with a global prevalence of 30- 70% and one of the most frequent reasons women consult physicians worldwide. Background menstrual problems affect as high as 90% of adolescent females and are the main reason for gynecology visits. Dysmenorrhea was the most frequent menstrual disorder for which adolescents and their parents were referred to a physician. This study aimed to determine the prevalence of menstrual disorders and to determine the effect of menstrual disorders on quality of life (QOL) of female undergraduate students. Menstrual disorders are highly prevalent among young females of child bearing age in our environment; the role of mass media and interpersonal relationships in health education is very acknowledgeable and should be harnessed to improve young females knowledge of positive health seeking behaviors about menstrual disorders. In this study, we screened many literatures on the topic of MD, among which a review has been noticed on “Medicinal plants used for menstrual disorders in Latin America, the Caribbean, sub-Saharan Africa, South and Southeast Asia and their uterine properties: A review” is similar on this theme, it mainly focuses on MDs and pay more attention on adverse reactions of related herbs. In our study, we systematically analyzed the herbal medicines used in countries and regions in treating different MD, compared the common characters and differences, and analyzed the compatibility law of classical prescriptions.

Keywords: Menstrual Disorders, Dysmenorrhea, Amenorrhoea, Irregular Periods.

COMPUTATIONAL ELUCIDATION OF MECHANISMS AND TARGET INTERACTIONS OF BIOACTIVE PHYTOCHEMICALS

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Abstract

The need for safer, multi-targeted, mechanism-based treatment approaches has been highlighted by the rising prevalence of chronic and complex diseases. Although the wide pharmacological potential of bioactive phytochemicals derived from medicinal plants has long been acknowledged, their precise molecular mechanisms and therapeutic targets are frequently still poorly understood. By facilitating the methodical investigation of phytochemical–target interactions at the molecular level, computational approaches have emerged as potent tools to close this gap. This study emphasizes how computational techniques can be used to clarify the mechanisms of action and identify possible molecular targets of bioactive phytochemicals in a variety of disease conditions. Plant-derived compounds' binding affinities, target specificity, pathway modulation, and drug-likeness characteristics can all be better understood using in silico methods like molecular docking and network pharmacology predictions. These methods make it easier to comprehend how phytochemicals affect multiple targets, control important signaling pathways, and alter biological networks that contribute to the development of disease. This method supports rational drug discovery, lowers experimental costs, and speeds up the identification of promising lead compounds by combining computational biology with phytochemistry and systems pharmacology. All things considered, computational research provides a strong foundation for forecasting therapeutic potential, comprehending intricate disease mechanisms, and promoting phytochemicals as promising options for the creation of new, secure, and efficient treatments.

Keywords: Molecular docking, network pharmacology, bioactive phytochemicals, computational biology, and silico drug discovery

EFFICIENT AND ENVIRONMENTALLY BENIGN ONE-POT MULTICOMPONENT SYNTHESIS OF PYRANOPYRAZOLE DERIVATIVES USING THEOPHYLLINE AS A RECYCLABLE CATALYST

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Abstract

An eco-friendly and efficient protocol for the synthesis of pyranopyrazole derivatives is reported using theophylline as a green catalyst under solvent-free conditions at room temperature. The method employs a one-pot multicomponent reaction involving aromatic or heteroaromatic aldehydes, ethyl acetoacetate, malononitrile, and hydrazine hydrate, affording the desired products in excellent yields. This strategy offers several advantages, including mild reaction conditions, short reaction times, a clean reaction profile, and a straightforward workup procedure. Moreover, the protocol exhibits high atom economy, resulting in minimal waste generation and enhanced sustainability, making it a valuable green alternative for the synthesis of pyranopyrazole scaffolds.

Keywords: Pyranopyrazole, Theophylline, Multicomponent reaction, Solvent-free, Greener.

ARTIFICIAL INTELLIGENCE DRIVEN GABA MICROBIOME PROFILING FOR PERSONALISED SLEEP AND STRESS MANAGEMENT

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Abstract

Objective: A potential artificial intelligence (AI)- driven framework is presented here that can integrate stool metagenomics and salivary/plasma GABA quantification to reveal GABA deficiency states and subsequently personalize an approach with GABA-producing probiotics for patients suffering from sleep and stress-related disorders.

Methods: Theoretically, AI helped metagenomic tools analyse stool samples to identify GABA-producing microbial taxa and glutamate decarboxylase (GAD) gene abundance, whereas salivary GABA concentrations are determined by a confirmed, inexpensive ELISA test. AI algorithms incorporate microbial gene signatures, GABA levels from biofluids, and clinical phenotypes (i.e. sleep quality, stress and anxiety scores) into decision rules that categorize patients as: (i) healthy profile normal stool/plasma GABA pattern, only monitoring is necessary; and (ii) disorder profile on the one hand low microbial GABA production capacity and on the other low plasma/salivary GABA, thereby customised GABA producing probiotic or synbiotic therapies are indicated along with biochemical retesting at certain intervals.

Results: The AI-driven approach integrated stool metagenomic analysis of GABA-related genes with salivary GABA levels to differentiate gut–brain GABA homeostasis. Normal microbial GABA gene abundance and plasma GABA levels indicated physiological balance requiring monitoring. In contrast, reduced microbial GABA genes and low plasma GABA were associated with poor sleep and elevated stress and anxiety. Using these profiles, AI enables the customisation of GABA-producing probiotic or synbiotic interventions to restore GABA homeostasis and support personalised management.

Keywords: GABA, Gut–brain axis, Saliva, ELISA, Artificial intelligence, Microbiome

THERAPEUTIC POTENTIAL OF NOVEL DERIVATIVES OF INDOLE-3-ACETIC ACID IN MANAGING DIABETIC-INDUCED NEUROPATHIC PAIN

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Abstract

Diabetic neuropathy is nerve damage that is caused by diabetes. Nerves are bundles of special tissues that carry signals between your brain and other parts of your body. It is characterized by nerve damage resulting from prolonged exposure to high blood glucose levels. Diabetic neuropathy may cause a range of symptoms, including pain, numbness, muscle weakness, autonomic dysfunction, and foot ulcers, potentially causing significant impairment to the quality of life for those affected. The pooled prevalence of DPN among patients with type 2 diabetes mellitus was higher than that of patients with type 1 diabetes mellitus. Limited options are available for the treatment of diabetic neuropathy pain, which are FDA-approved drugs like duloxetine, pregabalin, tapentadol extended release, and the capsaicin 8% topical system. Hence, indole-3-acetic acid derivatives may have therapeutic potential against the aldose reductase enzyme. Aldose reductase inhibition in the rate-determining step of the polyol pathway is a useful method of planning for the prevention and treatment of complications arising due to chronic diabetes. In this project, I will synthesize, characterize, and evaluate in-silico, in-vitro, and in-vivo activity on STZ induced albino rats for managing diabetic induced neuropathic pain.

Keywords: Diabetes neuropathy pain, aldose reductase inhibitors, indole-3-acetic acid derivatives.

AI-GUIDED DESIGN AND SYNTHESIS OF NOVEL HETEROCYCLIC DERIVATIVES AS DUAL DNA GYRASE/TOPO IV INHIBITORS TO COMBAT ANTIMICROBIAL RESISTANCE

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Abstract

The escalation of multidrug-resistant bacterial strains necessitates the development of novel therapeutics with dual-targeting mechanisms. This study presents the rational design, synthesis, and computational validation of novel heterocyclic derivatives as inhibitors of bacterial DNA Gyrase and Topoisomerase IV. Utilising an AI-integrated workflow, a library of oxadiazole scaffolds was screened for binding affinity within the conserved ATP-binding pockets of both enzymes. Lead candidates were identified based on superior docking scores and favourable machine learning-predicted ADMET profiles. The identified leads were successfully synthesized via [Esterification, Cyclization, and SN2 reactions], and their structures were characterized using spectral techniques. To evaluate the stability of the leads, 100-ns Molecular Dynamics (MD) simulations were performed, confirming consistent binding trajectories (RMSD <0.7 nm). This research demonstrates a successful "Academia-Industry" bridge by combining high-level computational predictive modeling with benchtop synthetic chemistry to develop potent antibacterial scaffolds.

Keywords: AI-Guided Design, computational validation, ADMET, docking, Molecular Dynamics (MD) simulations

PHARMACOLOGICAL EFFICACY OF TURMERIC EXTRACTION

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Abstract

Numerous research has been conducted on the various phytochemicals found in turmeric, including polysaccharides, essential oils, and curcuminoids. This study's primary goal was to extract, identify, and analyze the important phytochemicals found in turmeric while taking into account the effectiveness of several extraction techniques to optimize the yield and preservation of bioactive compounds. To determine the most effective technique for extracting curcumin and other advantageous compounds, extraction methods including maceration, Soxhlet extraction, ultrasound-assisted extraction (UAE), and supercritical fluid extraction (SFE) were evaluated. Using chromatographic and spectroscopic investigations, including Thin Layer Chromatography (TLC), High Performance Liquid Chromatography (HPLC), and UV/Visible Spectrophotometry techniques, the phytochemical screening of turmeric extracts was carried out. Details on the different amounts of antioxidants, anti-inflammatory, anti-infective, and anticancer properties linked to turmeric use include flavonoids, alkaloids, tannins, terpenoids, and curcuminoids. Ultrasound-assisted extraction (UAE), a promising, environmentally friendly substitute for traditional methods, outperformed the other extraction procedures examined in terms of curcuminoid production, solvent use, and extraction time. It also examined how temperature, extraction time, and solvent polarity affected the yield and purity of turmeric bioactives. The optimum solvents for curcuminoid extraction, according to the research, are ethanol and methanol. Moderate temperatures are ideal for the extraction procedure since they prevent chemical degradation. The primary bioactive ingredient, curcumin, was the subject of stability and solubility tests at different pH levels to show if it may be used in pharmaceutical and nutraceutical applications. In order to maximize the recovery of bioactive components, this study provides a comprehensive phytochemical analysis of turmeric extraction, with a focus on choosing the best extraction circumstances and technique. In order to ensure the efficient utilization of curcumin's medicinal advantages, the research aids in standardizing the extraction technique in the food, cosmetic, and pharmaceutical industries. For effective use in clinical applications, future research should focus on enhancing curcumin's stability and bioavailability.

Keywords: Curcuminoid extraction, Soxhlet extraction, ultrasound-assisted extraction (UAE), supercritical fluid extraction (SFE)

AI-DRIVEN TRANSFORMATION IN PHARMACY: CONNECTING ACADEMIC INNOVATION WITH INDUSTRY PRACTICE

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Abstract

Artificial intelligence (AI) and machine learning (ML) are reshaping the pharmaceutical sector by bridging academic research with industry and clinical practice. This presentation highlights the translational role of AI across the pharmaceutical value chain. In drug discovery, AI accelerates target identification, lead optimization, and prediction of protein–drug interactions, significantly reducing development time and cost. Academic innovations are increasingly translated into scalable industrial solutions through AI-driven platforms. AI and ML also improve clinical development by enabling optimized trial design, intelligent patient recruitment, real-time safety monitoring, and virtual clinical trials. In pharmacy practice, AI-powered clinical decision support systems enhance medication safety by detecting adverse drug reactions using electronic health records and real-world data. Automation, robotics, and predictive analytics improve operational efficiency in community and hospital pharmacies, reducing dispensing errors and improving medication adherence. AI-based educational platforms further support personalized learning and simulation-based training, preparing future pharmacists for evolving roles. Despite challenges related to ethics, data privacy, regulatory uncertainty, and implementation costs, emerging approaches such as federated learning and hybrid human–AI models support responsible adoption. Overall, AI and ML are key enablers in advancing safer, smarter, and patient-centered pharmaceutical care while aligning academic innovation with industry imperatives.

Keywords: Artificial intelligence, Machine learning, pharmaceutical innovation, Academia–industry collaboration, Patient-centered care

ESTIMATION OF DIOSGENIN IN *TRILLIUM GOVANIANUM* BY TLC DENSITOMETRY

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Abstract

Trillium govanianum, commonly called Nag Chatri, belongs to the Trilliaceae family. Rhizomes of *T. govanianum* are key material for trade and contain trillarin, which, upon hydrolysis, yields diosgenin. Plants containing ecdysteroids possess noticeable pharmacological properties as anabolic, antidiabetic, analgesic, anti-inflammatory, and anthelmintic activities. This study aims to develop an analytical method for the quantitative estimation of diosgenin in *T. govanianum*. Quantitative analysis by TLC-densitometry was carried out using CAMAG TLC scanner 4 and WINCATS software version 1.4.2. Silica gel 60 F 254 aluminium-based plates, 20x20 cm, having 2 mm thickness were used. The sample volume used was 10 μ L. The mobile phase used was Toluene: Ethyl acetate (7:3), and the plate was allowed to run upto 8 cm. Post-derivatization of plates was done by anisaldehyde reagent, followed by heating at 110° C for 5 minutes. The plates were scanned at 433 nm. The method was validated as per ICH guidelines. The diosgenin content in the roots of the plant was found to be 0.49 mg/g.

Keywords: Diosgenin, *Trillium govanianum*, Densitometry, Nag Chatri

INULIN: A NATURAL PREBIOTIC APPROACH TOWARD COLORECTAL CANCER PREVENTION

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Abstract

Inulin, a plant-derived soluble dietary fibre, has gained increasing attention for its potential role in preventing cancer through modulation of gut microbiota. Acting as a natural prebiotic, inulin promotes the growth of beneficial intestinal bacteria that produce bioactive metabolites such as short-chain fatty acids (SCFAs), notably butyrate. These metabolites help regulate immune responses, suppress inflammation, and induce apoptosis in malignant cells. Moreover, inulin contributes to detoxification processes and enhances the gut barrier function, thereby reducing the systemic absorption of carcinogenic compounds. Scientific evidence suggests that regular dietary intake of inulin may lower the incidence of colorectal and other gastrointestinal cancers by maintaining microbial balance and inhibiting tumour-promoting pathways. Hence, inulin represents a promising, safe, and natural dietary intervention for cancer prevention and overall gut health improvement.

Keywords: Inulin, Prebiotic, Gut Health, Cancer Prevention, Short-Chain Fatty Acids, Microbiota Modulation.

MOLECULAR TARGETS AND REDOX-SENSITIVE SIGNALING PATHWAYS OF PIPERLONGUMINE

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Abstract

Piperlongumine is a naturally occurring bioactive alkaloid isolated from *Piper longum* that has gained considerable scientific interest due to its potent pharmacological activities and selective cytotoxicity toward diseased cells. The compound is primarily recognized for its ability to disrupt redox homeostasis by modulating intracellular reactive oxygen species (ROS) levels. Piperlongumine selectively elevates oxidative stress in pathological cells by inhibiting antioxidant defense mechanisms such as glutathione and thioredoxin systems, leading to redox imbalance and subsequent cellular damage. In addition to its redox-modulating properties, piperlongumine influences multiple cell signaling pathways involved in cell survival, proliferation, inflammation, and apoptosis. It has been reported to regulate key molecular pathways, including NF- κ B, MAPK, PI3K/Akt, STAT3, and Nrf2, thereby contributing to its anti-inflammatory, antiproliferative, and pro-apoptotic effects. Furthermore, piperlongumine demonstrates potential in overcoming drug resistance and enhancing the efficacy of conventional therapies through synergistic mechanisms. Preclinical studies suggest its promising role in the management of oxidative stress-related disorders, including cancer, inflammatory diseases, and metabolic dysfunctions. Despite encouraging experimental evidence, further studies focusing on pharmacokinetics, safety, and clinical validation are essential to translate piperlongumine into a viable therapeutic agent.

Keywords: Piperlongumine, Redox homeostasis, Reactive oxygen species, Cell signaling pathways, Oxidative stress, Bioactive alkaloid

THE EMERGING ROLE OF ARTIFICIAL INTELLIGENCE IN OPTIMIZING TREATMENT OUTCOMES AND ECONOMIC EFFICIENCY IN COPD PHARMACOTHERAPY

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Abstract

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory condition that requires long-term pharmacological therapy to manage symptoms and prevent disease exacerbations. Despite the availability of multiple therapeutic options, treatment outcomes often vary due to differences in patient characteristics, disease severity, and medication adherence, while healthcare costs continue to rise. Advances in artificial intelligence (AI) present new opportunities to support more effective and efficient COPD pharmacotherapy. The application of AI in COPD management demonstrates considerable potential to enhance treatment outcomes while improving economic efficiency. AI-based tools, including predictive analytics and data-driven decision-support systems, enable improved identification of patient-specific treatment needs and facilitate more informed medication selection. By analyzing real-world clinical data, AI can assist in anticipating disease progression, optimizing therapy adjustments, and supporting adherence monitoring. These applications have the potential to reduce avoidable hospitalizations and minimize unnecessary healthcare expenditure. The integration of AI into COPD pharmacotherapy highlights a practical pathway for translating academic research into industry-relevant solutions, supporting value-driven healthcare delivery. Overall, AI-driven strategies represent a promising approach for advancing effective, affordable, and sustainable pharmacological care for patients with COPD.

Keywords: Chronic Obstructive Pulmonary Disease, Artificial Intelligence, Pharmacotherapy, Treatment Outcomes, Economic Efficiency, Healthcare Optimization

ARTIFICIAL INTELLIGENCE IN NANO-DRUG DELIVERY SYSTEMS: ACADEMIC RESEARCH TO INDUSTRIAL TRANSLATION

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Abstract

Artificial intelligence (AI) is revolutionizing pharmaceutical research by accelerating drug development and reducing costs. AI is particularly prominent in the academic design and optimization of nano-drug delivery systems (NDDS), which include nanoparticles and nanogels that improve drug solubility, enable targeted release, and control drug delivery. However, translating these academic advancements into industrial-scale drug formulations presents challenges. AI-based tools such as machine learning algorithms, predictive modeling, and data analytics are now bridging the gap between academia and industry. In academia, AI assists in optimizing formulations, predicting particle size, and identifying critical parameters. Industrially, AI supports scale-up, quality control, process optimization, and regulatory reporting through data-driven decisions, minimizing experimental trial and error and enhancing efficiency and repeatability across the product development lifecycle.

Keywords: Artificial Intelligence (AI), nano-drug delivery Systems (NDDS), machine learning

MICROPLASTIC CONTAMINATION AND HEALTH

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Abstract

Microplastics are ubiquitous in the global environment. As a typical emerging pollutant, its potential health hazards have been widely concerning. In this brief paper, we introduce the source, identification, toxicity, and health hazards of microplastics in the human. The literature review shows that microplastics are frequently detected in environmental and human samples. Humans are potentially exposed to microplastics through oral intake, inhalation, and skin contact. We summarize the toxic effects of microplastics in experimental models like cells, organoids, and animals. These effects consist of oxidative stress, DNA damage, organ dysfunction, metabolic disorder, immune response, neurotoxicity, as well as reproductive and developmental toxicity. In addition, the epidemiological evidence suggests that a variety of chronic diseases may be related to microplastic exposure. Finally, we put forward the gaps in toxicity research of microplastics and their future development directions. This review will help understand the exposure risk and potential health hazards of microplastics. Exposure to microplastics presents a major emerging threat to ecosystems due to their potential adverse effects. Herein, we reviewed the literature to provide an up-to-date synopsis of the current understanding of the sources, compositions, and adverse effects of microplastics in humans and the environment. Most studies on microplastics have focused on developing standardized methods for monitoring the occurrence, distribution, and movement of microplastics in the environment, as well as developing microplastic substitutes; however, although humans are exposed to microplastics via various routes, research on the adverse effects of microplastics in humans remains limited.

Keywords: Microplastic, environmental pollutants, human exposure, multipathway, health effect, waste management

DEVELOPMENT AND IN-VITRO CHARACTERIZATION OF ETHOSOMAL GEL FOR DIABETIC NEUROPATHY

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Abstract

Diabetic neuropathy is a severe nerve damage caused by high blood sugar levels. Currently, many therapies provide symptomatic relief but show many harmful side effects, so these side effects are overcome via the use of phytoconstituent-based formulation. The Selected Phytoconstituent belongs to the BCS class 2 drug, which means have low aqueous solubility, absorption, and bioavailability issues. These issues can be overcome via the use of Nanotechnology. So, develop a phytochemical-based Ethosomal formulation via cold method, enhanced solubility, absorption and bioavailability, and provides strong antioxidant, anti-inflammatory, wound healing, promising and targeted drug delivery in the prevention and management of diabetic neuropathy. The Ethosomal formulation was evaluated for its vesicle size (nm), polydispersity index (PDI), Zeta potential (mV), Encapsulation Efficiency (%), Drug loading (%), and (%) drug release profile. The ethosomal formulation exhibited a vesicle size of 215 ± 1.5 nm, PDI value of 0.32, and a Zeta potential of -29.16 ± 1.2 mV showed good uniformity & colloidal stability. The % entrapment efficiency was found to be $58 \pm 1.5\%$ and drug loading ($42 \pm 1.5\%$). Furthermore *In-vitro* drug release profile showed 90.23% for 24 hours. As per the data report, the present study concluded that phytoconstituent loaded Ethosomal formulation is safe and efficient for diabetic neuropathy.

Keywords: Diabetic neuropathy, Ethosomes, phytoconstituent (5,7, dihydroxy-3-(4-hydroxyphenyl) chromen-4-one), targeted drug delivery.

FORMULATION AND IN-VITRO CHARACTERIZATION OF TRANSETHOSOMAL GEL FOR ALZHEIMER'S DISEASE

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Abstract

Alzheimer's disease causes memory loss and cognitive decline, oxidative stress, amyloid aggregation, and neuroinflammation. In this study, Phytoconstituent belongs BCS Class-II was selected, which has poor solubility, absorption, and bioavailability. Phytoconstituent has several effective properties, such as reducing oxidative stress, preventing neuronal apoptosis, and enhancing memory with minimal or no side effects. While phytoconstituent has some issues like poor solubility, permeability, and bioavailability, these issues can be overcome via effective Nanotechnology. So, prepare a chitosan-coated phytoconstituent-loaded transethosomes by a simple cold method. The chitosan-coated transethosomes showed effective and targeted drug delivery and these are characterized by vesicle size (nm), polydispersity index (PDI), Zeta potential (mV), Encapsulation Efficiency (%), Drug loading (%) and (%) drug release profile. The chitosan-coated phytoconstituent-loaded transethosomes drug exhibited a vesicle size of 208 nm, a PDI of 0.34, indicating uniformity, and a zeta potential of + 32mV, suggesting good colloidal stability. The entrapment efficiency (%) was found to be 48%, and the drug loading (45%). The *in-vitro* release studies showed (85.23%). From this study, it can be concluded that the chitosan-coated phytoconstituent-loaded transethosomes are safe and efficacious in the prevention and management of Alzheimer's disease.

Keywords: Alzheimer's disease, Transethosomal gel, phytoconstituent {3, 5, 7, trihydroxy-2(4-hydroxyphenyl)-4H-chromen-4-one}

SELF-LEARNING AI SYSTEMS FOR REAL-TIME DRUG OPTIMIZATION

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Optimizing a drug during development usually needs many repeated experiments and takes a lot of time. Self-learning artificial intelligence (AI) systems offer a flexible solution by learning from new data as the research progresses. These systems improve their performance by using results from experiments, computer studies, and updated biological information, which helps in making faster and better decisions during drug development. Self-learning AI can help improve drug properties such as effectiveness, stability, and safety while the drug is being developed. By using feedback from previous results, AI systems can suggest changes in drug structure and help select better drug candidates in a short time. The importance of this approach in pharmaceutical research is discussed, along with challenges such as data quality, system accuracy, and use in regulated settings. Overall, self-learning AI supports more efficient and flexible decision-making in modern drug optimization.

Keywords: Self-learning artificial intelligence, Drug optimization, pharmaceutical research, Molecular improvement, Real-time decision making, Drug development, Computational approaches

***IN SILICO* IDENTIFICATION OF NOVEL QUINOLINE- PIPERAZINE INHIBITORS
TARGETING KRAS G12D IN PANCREATIC DUCTAL ADENOCARCINOMA**

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Corresponding author: v1sapanavishwakarma@gmail.com**Abstract**

Pancreatic ductal adenocarcinoma (PDAC) is primarily driven by KRAS mutations, making the KRAS G12D variant a critical therapeutic target. This study utilized a multi-step computational approach to identify novel inhibitors from a D-series of compounds (D1-D5). A molecular docking against the 9C3R crystal structure comparing the novel compounds to the standard drug Daraxonrasib and applied Density Functional Theory (DFT) to analyse the electronic properties of the ligands. Pharmacokinetic parameters were predicted using the Mcule property calculator, while toxicity assessments were performed through STOPTOX 1.0. Results showed that D5 (2,4-dichloro-N-(3-((4-cyclohexylpiperazin-1-yl) methoxy)-2-methoxyquinolin-8-yl) benzamide) achieved the strongest binding affinity with a docking score of -8.2, outperforming Sotorasib (-7.7) and Irinotecan (-8.0). DFT analysis confirmed its stability with an energy gap of 0.14460 eV and a dipole moment of 4.93 Debye. Most notably, STOPTOX 1.0 results categorized the D-series compounds as non-toxic (-) across acute oral, dermal, and inhalation models, whereas established inhibitors exhibited oral toxicity. These findings, supported by Mcule and STOPTOX 1.0 data, suggest that D5 (2,4-Cl) is a potent and safer lead molecule for suppressing KRAS G12D oncogenicity.

Keywords: Pancreatic ductal adenocarcinoma (PDAC), KRAS G12D, Daraxonrasib, STOPTOX 1.0, DFT

SYNTHESIS AND BIOLOGICAL EVALUATION OF SUBSTITUTED BENZOXAZOLE DERIVATIVES AS ANTI-MICROBIAL AGENTS

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Abstract

A series of twelve 2-[(E)-2-substituted-ethenyl]-1,3-benzoxazole derivatives (1–12) were evaluated for their ability to inhibit photosynthetic electron transport (PET) in isolated spinach chloroplasts and for their antimycobacterial activity. Among the tested compounds, derivatives 2, 8, and 4 exhibited the strongest inhibitory activity against *Mycobacterium tuberculosis*, *Mycobacterium kansasii*, and *Mycobacterium avium*, respectively. Notably, compound 4 demonstrated significantly higher activity against *M. avium* compared with isoniazid. The most potent ortho-substituted derivative, 2-[(E)-2-(2-methoxyphenyl) ethenyl]-1,3-benzoxazole, effectively inhibited PET, requiring a concentration of $76.3 \mu\text{mol L}^{-1}$ to achieve inhibition, whereas para-substituted analogues showed PET inhibition at much lower concentrations. Mechanistic studies indicated that the inhibitory site of these compounds is located on the donor side of photosystem II (PS II). Structure–activity relationship analysis revealed that substitution pattern and electronic properties play a crucial role in both antimycobacterial and PET inhibitory activities. Benzoxazoles, as nucleotide bioisosteres, exhibit enhanced interactions with biological targets and are known to inhibit key bacterial enzymes and regulatory systems. The observed correlation between herbicidal PET inhibition and antibacterial activity highlights the potential of 2-styrylbenzoxazole derivatives as promising leads for the development of novel antimycobacterial agents.

Keywords: Antibacterial, bacterial, Photosynthesis inhibition, benzoxazole.

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

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Abstract

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

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

NETWORK PHARMACOLOGY–BASED ELUCIDATION OF IMMUNOMODULATORY MECHANISMS OF *WITHANIA SOMNIFERA*

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Abstract

Objective: This study aims to elucidate the immunomodulatory mechanisms of *Withania somnifera* using an integrative network pharmacology approach.

Methods: Reported bioactive phytoconstituents of *Withania somnifera*, primarily withanolides and sitoindosides, were subjected to oral bioavailability and drug-likeness screening using ADME parameters. Potential human protein targets were predicted and validated through curated databases. Protein–protein interaction (PPI) networks were constructed and analyzed to identify key hub targets. Gene Ontology and KEGG pathway enrichment analyses were performed to delineate immune-related biological processes. Disease association and combination synergy networks were developed to assess coordinated immune regulation.

Results: Network analysis revealed that key phytoconstituents interact with multiple immune-relevant targets involved in cytokine signaling, oxidative stress regulation, apoptosis, and inflammatory responses. Hub proteins and functional modules were enriched in pathways including NF- κ B, MAPK, PI3K-Akt, and cytokine–cytokine receptor interactions, indicating broad immunoregulatory potential.

Conclusion: The findings demonstrate that *Withania somnifera* modulates immune function through a multi-target, multi-pathway mechanism, providing a systems-level scientific rationale for its traditional immunomodulatory use and supporting its potential in immune-related therapeutic interventions.

Keywords: *Withania somnifera*, Immunomodulation, Network Pharmacology, In-silico, Withanolides

PREPARATION AND EVALUATION OF SOLID LIPID NANOPARTICLES CONTAINING NATEGLINIDE

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Abstract

This research centers on the formulation and characterization of solid lipid nanoparticles (SLNs) containing Nateglinide, an anti-diabetic medicine with poor oral bioavailability (70%) attributable to considerable first-pass metabolism. The process of high-pressure homogenization was used to create SLNs. Mannitol served as the cryoprotectant, Phospholipid 90G served as the lipid core, and Tween 80 and oleic acid served as the surfactants involved in the process. With a particle size ranging from 81.14 to 146.0 nm, a polydispersity index ranging from 0.34 to 0.471, a zeta potential ranging from -20.7 to -32.1 mV, and a high entrapment efficiency of $91.8 \pm 1.7\%$, the enhanced formulation, denoted as F3, exhibited a range of properties. X-ray diffraction and scanning electron microscopy tests corroborated the amorphous properties and spherical form of the SLNs, while in vitro release assays demonstrated a biphasic and sustained drug release profile. When the formulation was subjected to stability trials, it was observed that it maintained its stability even when the temperature was maintained at $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and the relative humidity was maintained at $60\% \text{ RH} \pm 5\% \text{ RH}$. A promising strategy for improved diabetes therapy is presented by the findings, which show that SLNs have the potential to increase the oral bioavailability of nateglinide by improving solubilization, assuring extended release, and protecting against stomach degradation.

Keywords: Diabetes Therapy, High-Pressure Homogenization, Nateglinide, Oral Bioavailability, Phospholipid 90G

DIGITAL TWINS IN MEDICATION ERROR PREVENTION

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Abstract

The trend of medication errors in clinical pharmacy practice, including prescribing, dispensing, and administration, contributes to risks to safe healthcare and escalates healthcare costs globally. The use of digital twins, AI-driven virtual twins of patients, medication, or systems, provides an innovation breakthrough in simulating real-time pharmacokinetic/pharmacodynamic processes based on data from EHRs, IoT sensors, and ML algorithms. The abstract will explore their use in error prevention in predictive modeling, virtual prescription validation, and process streamlining, adapted to be relevant to the International Conference on AI in the Future of Pharma. The literature analysis of published work from 2022 to 2026 emphasizes their use in precision pharmacology in achieving error prevention gains of between 30% to 50% in medication dosing, drug interactions, and reconciliation, mainly in population groups with polypharmacy scenarios. The use of digital twins in predicting adverse medication reactions, inventory alert systems, and personalized medication dosing improves healthcare quality while reducing costs and promoting ethical healthcare practices in pharmacy. The use of digital twins in pharmacy implementation signals a new healthcare breakthrough towards zero-error pharmacy collaboration between AI innovation and clinical practice in healthcare settings worldwide.

Keywords: Digital twins, Medication errors, Clinical Pharmacy, Artificial Intelligence, Patient safety.

MACHINE LEARNING IN PHARMACOKINETICS AND PHARMACODYNAMICS

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Machine Learning (ML) has emerged as a powerful tool in the field of pharmacokinetics (PK) and pharmacodynamics (PD), enabling improved prediction, optimization, and personalization of drug therapy. Traditional PK–PD modelling relies on predefined mathematical equations, which may not fully capture the complexity of biological systems. Machine learning algorithms, such as decision trees, support vector machines, neural networks, and deep learning models, can analyse large and complex datasets to identify hidden patterns and nonlinear relationships between drug dose, concentration, and therapeutic response. In pharmacokinetics, ML is used to predict absorption, distribution, metabolism, and excretion (ADME) parameters, bioavailability, and clearance. In pharmacodynamics, ML helps in predicting dose–response relationships, therapeutic efficacy, and adverse drug reactions. These techniques are particularly useful in population PK–PD modelling, drug discovery, and precision medicine, where patient-specific factors such as genetics, age, and disease condition play a significant role. Overall, machine learning enhances decision-making in drug development and clinical practice by improving accuracy, reducing time and cost, and supporting personalized treatment strategies. However, challenges such as data quality, model interpretability, and regulatory acceptance still need to be addressed for widespread implementation.

Keywords: Machine Learning, Pharmacokinetics, Pharmacodynamics, PK–PD Modeling, Drug Development, Precision Medicine

HARNESSING ARTIFICIAL INTELLIGENCE TO ENHANCE MEDICATION ADHERENCE IN HEMODIALYSIS: BRIDGING ACADEMIA AND INDUSTRY

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Abstract

Hemodialysis patients still struggle with medication adherence because of complex treatment plans, a high pill load, psychological stressors, and limitations in the healthcare system. This review emphasizes the need for increased cooperation between academics and the pharmaceutical sector while highlighting the expanding importance of artificial intelligence (AI) in tackling these multifactorial adherence hurdles. Research from 2020 to 2025 shows that AI-driven strategies, like digital adherence monitoring systems, machine learning-based risk prediction, and customized patient engagement platforms, can successfully identify patients who are at high risk of non-adherence and facilitate prompt, focused interventions. AI makes it possible to integrate real-world data from pharmaceutical databases, electronic health records, and patient-reported outcomes to find unseen clinical and behavioral patterns that affect hemodialysis patients' adherence. While industry offers technological scalability, regulatory knowledge, and implementation channels, academic research contributes methodological rigor and clinical insights. Translating AI advances into practical pharmacological and clinical practice requires bridging these disciplines. Notwithstanding its potential, issues with bias, data privacy, ethical governance, and system interoperability continue to be crucial factors. Hemodialysis patients still struggle with medication adherence because of complex treatment plans, a high pill load, psychological stressors, and limitations in the healthcare system. These challenges must be overcome by transparent, interdisciplinary collaboration in order to promote equitable and patient-centered AI adoption. In conclusion, AI is a ground-breaking instrument for enhancing hemodialysis research and medication adherence practices. Academic institutions and the pharmaceutical industry must establish strategic partnerships in order to fully exploit AI's potential and provide customized adherence solutions, improved treatment outcomes, and sustainable healthcare innovation.

Keywords: Artificial Intelligence, Medication Adherence, Hemodialysis Patients, Pharmaceutical Industry, Academia–Industry Collaboration, Machine Learning, Digital Health, Personalized Medicine, Chronic Kidney Disease, Healthcare Innovation

ROLE OF PHYTOMEDICINES IN THE MANAGEMENT OF MYCETOMA: A REVIEW

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Abstract

Mycetoma is a long-term infectious disease caused by fungi or bacteria and is recognized by the World Health Organization as a neglected tropical disease. It mainly affects people living in poor rural areas of tropical and subtropical regions, where access to healthcare is often limited. The disease causes painless swelling, sinus tracts, and discharge, and if not treated early, it can spread to bones and muscles and lead to serious disability. Treatment usually involves long-term antifungal or antibacterial medicines and sometimes surgery. However, diagnosis is often delayed because of low awareness and difficulty in identifying the causative organism. Due to high treatment costs, long duration of therapy, and drug-related side effects, many patients depend on traditional herbal medicines. In this review, available studies were examined to understand the role of medicinal plants such as *Boswellia papyrifera*, *Santalum album*, *Acacia leiocarpus*, and *Melaleuca alternifolia*, which have shown antifungal or anti-inflammatory activity in laboratory studies. In future research, artificial intelligence may help in screening plant compounds and predicting their antifungal activity, which can save time and resources. This review suggests that phytomedicines may support standard treatment but should not replace modern medical therapy.

Keywords: Mycetoma, Neglected tropical disease, Antifungal therapy, Phytomedicine. Traditional medicine, Anti-inflammatory activity, Artificial intelligence

AI-BASED DRUG DISCOVERY: BRIDGING ACADEMIC RESEARCH AND INDUSTRY NEED

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Abstract

Artificial Intelligence (AI) is transforming drug discovery by enabling faster, cost-effective, and data-driven decision-making. Traditional drug discovery is time-consuming and associated with high failure rates, creating a gap between academic research and industrial requirements. AI-based approaches, including machine learning and deep learning, facilitate efficient target identification, virtual screening, lead optimization, and toxicity prediction by analyzing large biological and chemical datasets. Academic institutions contribute novel algorithms and mechanistic insights, while the pharmaceutical industry focuses on scalability, regulatory compliance, and translational outcomes. Bridging these complementary strengths through collaborative frameworks enhances the successful translation of AI innovations into viable drug candidates. This poster highlights key AI tools used in drug discovery, the roles of academia and industry, and the challenges in data sharing, validation, and regulatory acceptance. Integrating academic innovation with industrial priorities can significantly accelerate drug development and improve success rates.

Keywords: Artificial Intelligence, Drug Discovery, Machine Learning, Academic Research, Pharmaceutical Industry, Translational Research, Lead Optimization, Virtual Screening.

ADVANCING PHARMACOLOGY RESEARCH AND DEVELOPMENT THROUGH ARTIFICIAL INTELLIGENCE

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Abstract

Artificial Intelligence (AI) is rapidly transforming pharmacology research and development (R&D) by improving the efficiency, accuracy, and success rate of drug discovery and development processes. Traditional pharmacological R&D is time-consuming, costly, and associated with a high risk of failure. The integration of AI technologies, including machine learning and deep learning, offers advanced solutions to overcome these limitations. In the early stages of drug discovery, AI enables high-throughput screening of large chemical libraries and accurate prediction of drug–target interactions, leading to faster identification and optimization of lead compounds. AI also supports target identification and validation through the analysis of complex biological datasets such as genomics, proteomics, and disease-related pathways. In addition, AI models play a crucial role in predicting pharmacokinetic and toxicity profiles, including absorption, distribution, metabolism, excretion, and toxicity (ADMET), thereby reducing late-stage drug attrition and improving safety. Furthermore, AI enhances clinical development by optimizing trial design, improving patient selection, and enabling real-time data analysis for better decision-making. Overall, the application of AI in pharmacology R&D accelerates drug development, reduces costs, and promotes the development of safer and more effective therapeutics. AI-driven pharmacology is expected to play a vital role in advancing precision medicine and future pharmaceutical innovation.

Keywords: Artificial Intelligence, Pharmacology, Drug Discovery, Research and Development, Machine Learning, ADMET, Precision Medicine

CRYPTOTANSHINONE ATTENUATES PARKINSONIAN SYMPTOMS BY RESTORING NEUROTRANSMITTER BALANCE AND ENHANCING NRF2 EXPRESSION IN ROTENONE-TREATED ZEBRAFISH

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Abstract

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor and non-motor symptoms, including bradykinesia, tremor, anxiety, and selective loss of dopaminergic neurons in the substantia nigra. The present study investigated the neuroprotective potential of cryptotanshinone (CT) against rotenone-induced PD-like pathology in adult zebrafish. PD was induced using rotenone, and the effects of CT (10 and 20 mg/kg) were evaluated through behavioral, biochemical, neuroinflammatory, neurotransmitter, histopathological, and immunohistochemical analyses. Behavioral assessments, including the open field test, novel tank diving test, and T-maze, revealed significant locomotor deficits, anxiety-like behavior, and cognitive impairment following rotenone exposure, which were markedly improved by CT treatment. Rotenone significantly elevated pro-inflammatory cytokines (TNF- α and interleukins) while reducing the anti-inflammatory cytokine IL-10; these alterations were effectively normalized by CT. Neurotransmitter analysis demonstrated decreased dopamine and GABA levels and increased glutamate levels in rotenone-treated zebrafish, indicating neurotransmitter imbalance, which was restored by CT administration. Histopathological evaluation revealed pronounced neurodegeneration and apoptosis in rotenone-exposed brains, whereas CT preserved neuronal architecture. Furthermore, rotenone downregulated Nrf2 expression, while CT significantly upregulated Nrf2, suggesting activation of antioxidant defence mechanisms. Overall, CT exhibits significant neuroprotective effects against rotenone-induced PD through anti-inflammatory, neurotransmitter-modulating, and Nrf2-mediated antioxidant pathways.

Keywords: Parkinson's disease, Rotenone, Cryptotanshinone, Neuroprotection

MECHANISMS OF ALUMINIUM NEUROTOXICITY: CURRENT INFORMATION ON SIDE EFFECTS AND TREATMENT APPROACHES

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Abstract

According to recent research, the brain may be a well-considered target for aluminium (Al) toxicity, leading to the development of neurodevelopmental problems and neurodegenerative diseases like Alzheimer's disease. However, there is ongoing debate over the precise mechanisms of Al neurotoxicity and their significance in Al-associated neurological diseases. Al exposure's widespread unpleasant characteristics, such as oxidation, inflammation, and apoptotic activity, which have been documented for a range of cell lines and tissues, as well as more focused "neurotropic" effects, such as interference with neurotransmitter metabolism, mediate the neurotoxic effect. Although specific treatment of Al toxicity is not established, Al chelation as well as compounds targeting molecular mechanisms of Al neurotoxicity (trace elements, polyphenols, phytoextracts, etc.) may be considered as therapeutic strategies to respond Al neurotoxicity. However, further studies are required to unknot the particular role of Al in neurological diseases and precise treatment agents.

Keywords: Aluminium, Oxidative stress, Neuroinflammation, amyloid, Neurotransmission.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN MODERN DRUG DISCOVERY AND DEVELOPMENT

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Abstract

Artificial intelligence (AI) has become a powerful tool in drug discovery and development by addressing challenges such as high costs, long development timelines, and low success rates. Using machine learning (ML) and deep learning (DL), AI enables rapid analysis of large biological and chemical datasets, facilitating efficient target identification, prediction of drug efficacy, and optimization of lead compounds. AI-based models support early-stage decision-making by predicting pharmacokinetic properties, toxicity risks, and potential adverse effects, thereby reducing late-stage failures. In clinical development, AI improves trial design through better patient selection, data monitoring, and outcome prediction. These advancements enhance efficiency, accuracy, and risk management throughout the drug development pipeline. However, challenges such as poor data quality, limited model interpretability, and regulatory uncertainties remain. Future progress will depend on improved data standardization, transparent AI models, and stronger collaboration between AI researchers and pharmaceutical scientists to enable the development of safer, effective, and affordable medicines.

Keywords: Artificial intelligence, Drug discovery, Machine learning, Deep learning, Clinical trials.

PHYTOCHEMICAL PROFILING OF TAGETES PATULA STEM FOR ANTIOXIDANT POTENTIAL

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Abstract

Tagetes patula (French marigold) is traditionally valued for its medicinal and ornamental importance, yet its stem remains underexplored compared to flowers and leaves. The present study aimed to evaluate the phytochemical composition and antioxidant potential of *Tagetes patula* stem extracts. Dried stem material was subjected to solvent extraction using ethanol, followed by qualitative phytochemical screening and in vitro antioxidant assays. Phytochemical profiling revealed the presence of bioactive secondary metabolites such as phenolics, flavonoids, tannins, alkaloids, saponins, and terpenoids, which are known to contribute to antioxidant activity. Total phenolic content (TPC) and total flavonoid content (TFC) were determined using Folin–Ciocalteu and aluminum chloride methods, respectively. Antioxidant activity was assessed through free radical scavenging assays including DPPH, ABTS, and ferric reducing antioxidant power (FRAP). The stem extract exhibited notable free radical scavenging and reducing capacity, indicating a strong correlation between phenolic/flavonoid content and antioxidant activity. These findings suggest that *T. patula* stem, often considered an agricultural waste, is a promising source of natural antioxidants. The study highlights its potential application in pharmaceutical, nutraceutical, and functional food formulations, promoting value addition and sustainable utilization of plant resources.

Keywords: *Tagetes patula*, stem extracts, phytochemical profiling, phenolic and flavonoids, antioxidant activity, natural antioxidant.

PHYTOCHEMICAL SCREENING AND HISTAMINE INHIBITORY ACTIVITY OF PUMPKIN SEED EXTRACTS

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Abstract

Pumpkin seeds (*Cucurbita pepo*) are rich in bioactive compounds that contribute to their medicinal and nutritional value. This study investigated the phytochemical composition and histamine inhibitory activity of pumpkin seed extracts to evaluate their potential anti-allergic properties. Dried pumpkin seeds were pulverized and extracted using ethanol and aqueous solvents by maceration. Preliminary phytochemical screening was conducted using standard qualitative tests to detect the presence of alkaloids, flavonoids, tannins, saponins, phenolic compounds, steroids, and glycosides. The histamine inhibitory activity of the extracts was evaluated *in vitro* using a histamine-induced contraction model, with diphenhydramine serving as the reference antihistamine drug. The results of phytochemical analysis revealed a high abundance of flavonoids, phenolics, and tannins, while moderate amounts of saponins and alkaloids were also detected. The ethanolic extract exhibited significantly higher histamine inhibition compared to the aqueous extract in a concentration-dependent manner. The observed antihistaminic activity may be attributed to the presence of polyphenolic compounds known for their mast cell-stabilizing and anti-inflammatory effects. These findings suggest that pumpkin seed extracts possess promising histamine-inhibitory activity and could serve as a natural alternative for the management of allergic reactions. Further studies are warranted to isolate the active constituents and elucidate their molecular mechanisms of action.

Keywords: Pumpkin seeds, *Cucurbita pepo*, phytochemical screening, histamine inhibition, antihistaminic activity, flavonoids, phenolic compounds

THERAPEUTIC POTENTIAL OF HERBAL MEDICINES IN THE MANAGEMENT OF ARTHRITIS: A NATURAL APPROACH TO INFLAMMATION AND JOINT DEGENERATION

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Abstract

Arthritis, a chronic inflammatory disorder affecting the joints, remains one of the leading causes of disability worldwide. Conventional treatments such as non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids provide symptomatic relief but are often associated with adverse effects upon prolonged use. In recent years, increasing scientific attention has been directed toward herbal medicines as safer and more sustainable therapeutic alternatives. This study explores the efficacy of selected medicinal plants—such as *Boswellia serrata* (Indian frankincense), *Withania somnifera* (Ashwagandha), *Curcuma longa* (Turmeric), and *Zingiber officinale* (Ginger)—in alleviating arthritic symptoms and modulating inflammatory pathways. The bioactive constituents, including boswellic acids, withanolides, curcuminoids, and gingerols, have demonstrated potent anti-inflammatory, antioxidant, and immunomodulatory properties in both in vitro and in vivo studies. These phytochemicals inhibit key mediators such as cyclooxygenase (COX), lipoxygenase (LOX), and nuclear factor-kappa B (NF- κ B), thereby reducing joint pain, stiffness, and cartilage degradation. Additionally, the synergistic use of herbal extracts has shown enhanced therapeutic potential with minimal toxicity. The integration of phytotherapy with conventional medicine could provide a complementary and holistic strategy for managing arthritis, improving patient quality of life while minimizing drug dependence. Future research should emphasize clinical trials, standardization of herbal formulations, and elucidation of molecular mechanisms to validate and optimize their therapeutic applications.

Keywords: Arthritis, Herbal medicine, Anti-inflammatory, *Curcuma longa*, *Boswellia serrata*, Phytotherapy

DRUG REPURPOSING: USING ARTIFICIAL INTELLIGENCE TO UNLOCK NEW CURES IN OLD MEDICINE

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Abstract

Drug repurposing involves identifying new therapeutic applications for existing drugs, offering a faster and more economical alternative to traditional drug discovery. The integration of Artificial Intelligence (AI) has significantly enhanced this approach by analysing large and complex biomedical datasets to reveal hidden drug–disease associations. AI techniques such as machine learning and deep learning enable rapid drug screening, prediction of efficacy, safety profiling, and mechanism-of-action analysis. This reduces development time, cost, and clinical failure rates. Recent successes, including the use of AI-guided drug repurposing during global health emergencies, demonstrate its practical value. This presentation highlights key AI methodologies used in drug repurposing, selected case studies, and the challenges in clinical and regulatory implementation. AI-driven drug repurposing bridges Academic research and industrial application, accelerating the development of safe, effective, and affordable therapies.

Keywords: Drug Repurposing, Artificial Intelligence, Machine Learning, Drug Existing Translational Medicine.

IN SILICO MOLECULAR DOCKING INVESTIGATION OF LEVODROPROPIZINE WITH COUGH-RELATED MOLECULAR TARGETS

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Abstract

Levodropropizine is a peripherally acting antitussive agent widely used in the management of non-productive cough with minimal central nervous system side effects. In order to gain molecular-level insight into its mechanism of action, an in silico molecular docking study was performed against key cough-related molecular targets, including TRPV1, P2X3, and NK1 receptors. The ligand structure was drawn using ChemDraw, and protein structures were prepared using Chimera and PyMOL. Docking simulations were carried out using AutoDock Tools and AutoDock Vina. Post-docking interaction analysis and visualization were performed using Discovery Studio Visualizer and PyMOL. The docking results indicated favorable binding of levodropropizine within the active sites of the selected targets, stabilized mainly by hydrogen bonding and hydrophobic interactions. The piperazine moiety and hydroxyl-containing side chain were found to play an important role in anchoring the ligand in the binding pockets. This study provides a rational molecular basis for the peripheral antitussive activity of levodropropizine and supports the utility of structure-based approaches in understanding and optimizing antitussive agents.

Keywords: Levodropropizine, molecular docking, TRPV1, P2X3 receptor, NK1 receptor, antitussive

AN OVERVIEW OF PATENTS FILED FOR PYRAZOLINE

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Abstract

Pyrazoline, a five-membered heterocyclic compound containing two adjacent nitrogen atoms, has garnered significant attention due to its broad spectrum of pharmacological activities, including anti-inflammatory, antimicrobial, anticancer, and anticonvulsant properties. This overview analyzes patents filed globally related to pyrazoline and its derivatives, with a focus on trends in chemical modifications, therapeutic applications, and industrial interest over the past two decades. The review categorizes patents based on their functional substitutions, synthetic routes, and targeted diseases, revealing a strong inclination toward oncology and central nervous system disorders. Additionally, this study highlights key assignees, patent filing regions, and technological advancements driving innovation in pyrazoline-based drug development. The overview provides insights into the evolving intellectual property landscape and identifies future directions for research and commercialization in this promising class of heterocycles.

Keywords: Pyrazoline, Synthesis, Patent, Novel, Intellectual property.

A PILOT PRESCRIPTION ERROR PATTERN ANALYSIS AND THE ROLE OF DIGITAL TOOLS IN MEDICATION SAFETY

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Abstract

Medication errors at the prescribing stage remain a major and preventable threat to patient safety, particularly in busy outpatient settings where handwritten prescriptions and time constraints increase the risk of omissions. This pilot study aimed to identify common prescription error patterns through manual audit and to highlight the potential role of digital and AI-based tools in improving medication safety. A prospective prescription audit was conducted over a short duration using prescriptions collected during Drug Information Centre duties. Each prescription was manually reviewed using a structured audit tool divided into basic prescription details and error-focused parameters. Errors assessed included missing or unclear dose, frequency, and duration, presence of high-risk medications, duplicate therapy, and potential drug–drug interactions (DDIs). Manual clinical judgement and standard drug information resources were used for evaluation. The audit revealed that prescribing errors were common, with frequency omission and incomplete duration being the most frequently observed issues. High-risk drugs and potential DDIs were identified in a subset of prescriptions, particularly in polypharmacy cases. Although these errors were detectable through careful manual review, the process was time-consuming and dependent on individual expertise. This study demonstrates that structured prescription audits can effectively identify prescribing errors; however, integration of AI-based digital tools, such as clinical decision support systems, can enable early, consistent, and scalable detection of errors. Combining clinical expertise with digital tools may significantly reduce preventable medication errors and enhance overall patient safety.

Keywords: Prescription audit, Medication errors, Prescribing errors, Drug–drug interactions, Digital health tools, Patient safety, Clinical decision support, Artificial intelligence in healthcare

OPTIMIZING ANTIBIOTIC STEWARDSHIP USING MACHINE LEARNING

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Antibiotic resistance is a major global health challenge mainly caused by the inappropriate and excessive use of antibiotics. Antibiotic stewardship programs aim to promote the rational use of antibiotics; however, their effectiveness is often limited by delayed laboratory results, increasing clinical data complexity, and uncertainty in early decision-making. Machine learning (ML), a key application of artificial intelligence, provides a data-driven approach to optimize antibiotic stewardship practices. ML systems can analyze large volumes of healthcare data, including patient demographics, clinical symptoms, laboratory investigations, culture and sensitivity reports, and local antimicrobial resistance patterns. Based on this analysis, ML models assist healthcare professionals in selecting appropriate antibiotics, optimizing dosage, and determining the correct duration of therapy. In real-life hospital settings, particularly in intensive care units, ML-based tools have been used to predict bacterial infections at an early stage, enabling timely initiation of targeted therapy and reducing unnecessary use of broad-spectrum antibiotics. These applications contribute to reduced antimicrobial resistance, improved patient outcomes, and decreased healthcare costs. The integration of machine learning into antibiotic stewardship programs represents a promising advancement in clinical pharmacy practice and supports safer and more effective antibiotic use.

Keywords: Machine Learning, Antibiotic Stewardship, Antimicrobial Resistance, Artificial Intelligence, Clinical Pharmacy.

ROLE OF THE CLINICAL PHARMACIST IN THERAPEUTIC DECISION-MAKINGBhumika Debnath*¹, Dr. Jagriti Kumawat²¹PharmD 2nd Year, SGT College of Pharmacy, SGT University, Gurugram, Haryana²Assistant Professor, SGT College of Pharmacy, SGT University, Gurugram, Haryana**Corresponding author: debbhumi3@gmail.com****Abstract**

Therapeutic decision-making in clinical practice is a complex process that requires careful evaluation of patient-specific factors, drug efficacy, safety, and evidence-based guidelines. Clinical pharmacists play a critical role in supporting this process by identifying drug-related problems, optimizing pharmacotherapy, and collaborating with physicians to ensure rational and individualized treatment. This review aimed to evaluate the role of clinical pharmacists in therapeutic decision-making and their impact on patient care outcomes. A literature-based review was conducted using published research and review articles obtained from databases such as PubMed and Google Scholar. Studies focusing on clinical pharmacist interventions in hospital and clinical settings were analyzed, with emphasis on medication review, dose adjustment, therapeutic drug monitoring, management of adverse drug reactions, drug–drug interaction prevention, and participation in multidisciplinary healthcare teams. The reviewed literature demonstrated that active involvement of clinical pharmacists in therapeutic decision-making significantly reduced medication errors, improved adherence to treatment guidelines, enhanced medication safety, and contributed to better clinical outcomes, particularly in patients with chronic diseases and polypharmacy. Clinical pharmacist interventions were also associated with improved patient education and optimized therapeutic regimens. This review highlights that integration of clinical pharmacists into healthcare teams strengthens therapeutic decision-making, promotes rational drug use, and improves overall patient safety. Expanding the role of clinical pharmacists is essential for achieving effective and patient-centered pharmacotherapy.

Keywords: Clinical pharmacist, Therapeutic decision-making, Pharmacotherapy, Drug-related problems, Patient safety, Rational drug use, Clinical pharmacy services

COMPARATIVE COST ANALYSIS OF BRANDED ANTIDEPRESSANT FORMULATIONS AVAILABLE IN THE INDIAN PHARMACEUTICAL MARKET

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Abstract

Background: Depression is a typical psychiatric disease that is represented by constant sadness, mood disorders, social withdrawal, loss of interest, and poor academic and social functioning. Stress in academia may increase the effects of depression and cause suicidal tendencies. In addition to emotional distress, branded antidepressants are both expensive and a source of financial strain, adds to adherence and treatment failures. The purpose of this study is to assess the price difference of antidepressants that are commonly prescribed in the Indian market.

Sources: Indian Drug Index was used to get the prices of various antidepressant formulations. The prices of ten tablets (INR) of different brands of each drug were documented. The most and least expensive brands were compared using the percentage variation of costs and ratio of costs.

Findings: There was a significant inter-brand price difference. Amitriptyline 25mg (195), fluoxetine 50mg (95) and sertraline 50 mg (83) exhibited the greatest variation and variation in fluvoxamine 20mg (13.8%), duloxetine 20mg (16%), and escitalopram 10mg (38) was lower.

Conclusion: The prices of antidepressant brands in India are highly varied, makes financial load and adherence lower. Prescribing and price control should be based on rationality to enhance access and affordability.

Keywords: Antidepressants, Amitriptyline, Fluoxetine, Cost variation.

NATURAL LANGUAGE PROCESSING IN EARLY DETECTION OF ADVERSE DRUG REACTIONS

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Abstract

Adverse drug reactions have been a significant challenge to the safety of patients and remain one of the leading causes of morbidity and health burden globally. Classic pharmacovigilance systems largely depend on spontaneous reporting, which is generally confined by low reporting rates, time delays, and superficial clinical information. Meanwhile, a vast amount of drug safety-related information is available in unstructured textual data such as electronic health records, clinical notes, discharge summaries, patient narratives, and social media platforms. NLP, a key area within artificial intelligence itself, supports the computerized extraction and analysis of useful information from unstructured text. NLP-based models can identify drug names, adverse events, symptom patterns, and temporal relationships, allowing early detection of potential ADR signals before formal reporting occurs. Integration of NLP with machine learning algorithms improves signal detection accuracy, supports real-time surveillance, and enhances regulatory decision-making. The applications of NLP in pharmacovigilance bridge the gap between academic research and the needs of the pharmaceutical industry by providing active monitoring of drug safety. With continuous improvement in AI, NLP-driven ADR detection may revolutionize the field of pharmacovigilance, improve patient outcomes, and support safer use and better effectiveness of medicines in the future.

Keywords: Natural Language Processing, Adverse Drug Reactions, Pharmacovigilance, Artificial Intelligence, Machine Learning.

IN SILICO INVESTIGATION OF *SWERTIA CHIRAYITA* TARGETING BACTERIAL DNA GYRASE: A NATURAL LEAD FOR ANTIBACTERIAL DRUG DISCOVERY

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Swertia chirayita is a medicinal herb traditionally recognized for its antimicrobial and therapeutic properties, positioning it as a valuable source for natural drug discovery. In the present in silico study, bioactive constituents of *S. chirayita* were evaluated against DNA Gyrase, an essential bacterial enzyme involved in DNA supercoiling and replication. Molecular docking was performed using the crystal structure of DNA Gyrase (PDB ID: 5L3J), with ciprofloxacin serving as the standard reference drug. Among the screened phytochemicals, Norswertianin exhibited the strongest binding affinity (-7.9 kcal/mol), surpassing ciprofloxacin (-6.6 kcal/mol). Molecular dynamics simulation through the iMODS online server further validated the stability of the Norswertianin - DNA Gyrase complex by analyzing deformability, B-factors, eigenvalues, and covariance maps, indicating favorable structural stability and flexibility. ADME profiling revealed that Norswertianin complies with Lipinski's Rule of Five without major violations, supporting suitable drug-likeness and predicted oral bioavailability. Overall, the findings suggest that Norswertianin is a promising lead molecule from *Swertia chirayita* for future antibacterial drug development targeting DNA Gyrase.

Keywords: *Swertia chirayita*, Antimicrobial, DNA Gyrase, Molecular docking, ADME.

ARTIFICIAL INTELLIGENCE-DRIVEN APPROACH FOR SELECTION AND OPTIMIZATION OF MEDICINAL PLANT COLORANTS

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Abstract

Replacement of synthetic hair dye with herbal alternatives is promoted by the increase demand of plant based, safe and sustainable cosmetic products. Natural pigmented medicinal plants are good source of eco-friendly hair colorants but due to change in performance and phytochemical composition, selection and optimization of correct plant combination is remains challenging. This study investigates a technique that is based on artificial intelligence (AI) for the selection and optimization of medicinal plants that can be used to formulate black herbal hair dye. First of all, we have to collect literature based data of selected medicinal plants which include their traditional use, color intensity, pigment content, and safety profile and analyzed by using data-driven decision support principles. By using tools that are AI-assisted and predictive modeling concept, we should prioritize plant extracts and optimize their proportions to improve formulation stability and color strength of product. Further then, optimized formulation should be evaluated for physiochemical parameters like color uniformity, hair compatibility, pH and stability. This AI-guided approach then improved formulation efficacy, allow systemic selection of medicinal plants and reduce trial and error experimentation. This study brings out the possibility of artificial intelligence in connecting traditional herbal knowledge with modern pharmaceutical formulation practices.

Keywords: artificial intelligence, herbal hair dye, medicinal plant, synthetic hair dye

ARTIFICIAL INTELLIGENCE AND THE FUTURE OF MECHANISM-BASED PHARMACOLOGICAL PREDICTION OF HEPATOTOXICITY: BRIDGING ACADEMIA AND INDUSTRY

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Abstract

By enabling accurate, mechanism-based prediction of drug-induced hepatotoxicity, artificial intelligence (AI) is revolutionizing pharmacology. Conventional approaches to assessing liver toxicity mainly depend on lengthy in vitro and in vivo experiments, which are costly, time-consuming, and frequently offer little understanding of underlying mechanisms. In order to forecast hepatotoxic reactions, AI-driven techniques, such as machine learning and deep learning, combine chemical structure descriptors, molecular fingerprints, omics datasets, and pathway-level data. These models support early-stage screening, lead optimization, and rational dose selection while minimizing off-target toxicity and lowering attrition in drug development by clarifying important mechanisms like oxidative stress, mitochondrial dysfunction, apoptosis, cell-cycle disruption, and cytochrome P450-mediated metabolism. Additionally, explainable AI facilitates the transfer from academic research to industrial applications by improving model interpretability and regulatory confidence. The systematic assessment of natural products and flavonoids, emphasizing both hepatoprotective and hepatotoxic effects, is also made possible by the integration of AI with mechanistic pharmacology. AI speeds up preclinical drug discovery, improves liver safety evaluation, and aids in the creation of safer, more potent treatments by fusing predictive modelling with experimental validation. This mechanism-driven, forward-thinking approach is a revolutionary way to connect the demands of industry and academia in hepatotoxicity research.

Keywords: Artificial Intelligence (AI), Drug-Induced Hepatotoxicity, Mechanism-Based Toxicity Prediction, Machine Learning, Explainable AI, Preclinical Drug Discovery.

ARTIFICIAL INTELLIGENCE FOR PREDICTING MECHANISM-BASED CYTOTOXICITY OF ANTICANCER DRUGS

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Abstract

Research on anticancer drugs is being revolutionized by artificial intelligence (AI), which makes it possible to forecast cytotoxicity using mechanisms more accurately and effectively. Conventional cytotoxicity evaluation techniques require a lot of resources and can offer little mechanistic understanding, especially for complex bioactive substances like flavonoids. In order to forecast cytotoxic effects and their underlying processes, recent AI-driven techniques, such as machine learning and deep learning models, integrate chemical structure descriptors, molecular fingerprints, omics data, and pathway-level information.

AI makes it easier to identify important mechanisms in flavonoid-based anticancer research, including cell cycle arrest, apoptosis induction, oxidative stress modulation, mitochondrial malfunction, and control of oncogenic signalling pathways, including PI3K/Akt and MAPK. Early screening, lead optimization, and sensible dose selection are all supported by mechanism-oriented prediction, which also reduces off-target toxicity. Furthermore, explainable AI frameworks improve biological relevance and regulatory trust by boosting model interpretability. AI's integration with flavonoid research provides a strong translational platform that connects experimental validation with computational prediction. This strategy has the potential to significantly lower attrition rates, speed up preclinical research, and progress the creation of safer and more potent anticancer treatments derived from flavonoids for clinical use.

Keywords: Artificial intelligence, Cytotoxicity prediction, Mechanism-based toxicity, Flavonoids, Anticancer drug discovery, Machine learning, Deep learning, Apoptosis, Oxidative stress, Pathway analysis, Explainable AI.

AI-ENABLED DRUG REPURPOSINGAkash Shaw*¹, Himadri Mandal²¹Freyr Solutions, Hyderabad²M. Pharm, Adamas University, Kolkata**Corresponding author: Akash.shaw@freyrsolutions.com****Abstract**

Drug repurposing represents a powerful strategy to accelerate therapeutic development by identifying novel indications for approved or investigational drugs, thereby reducing cost, development time, and attrition rates. Traditional repurposing approaches, however, are largely opportunistic and limited in scalability. Recent advances in artificial intelligence (AI) have enabled a paradigm shift toward systematic, data-driven drug repurposing. This work summarizes key AI technologies, including machine learning, deep learning, knowledge graphs, natural language processing, and electronic health record mining, that facilitate the integration and analysis of large-scale biomedical, chemical, and clinical data. An AI-driven workflow encompassing data integration, feature extraction, predictive modeling, candidate prioritization, and experimental validation is presented. Representative case studies, such as baricitinib for COVID-19, ketamine for cocaine use disorder, efavirenz for Parkinson's disease, and the combination of vandetanib and everolimus for diffuse intrinsic pontine glioma, illustrate the translational potential of AI-enabled repurposing. Despite challenges related to data quality, model interpretability, and regulatory considerations, AI-driven drug repurposing holds significant promise to enhance precision medicine and accelerate the delivery of effective therapies when coupled with robust clinical validation.

Keywords: Artificial intelligence, Drug repurposing, Machine learning, Deep learning, Precision medicine, Biomedical data integration, Clinical translation

ARTIFICIAL INTELLIGENCE AND THE FUTURE OF PHARMA: BRIDGING ACADEMIA AND INDUSTRY IMPERATIVES

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Abstract

Through improving research efficiency in the fields of pharmacology and toxicology, artificial intelligence (AI) is progressively changing the pharmaceutical industry's future. AI-driven models make it possible to quickly analyze complicated biological data in pharmacological research, which enhances lead optimization, drug target identification, and pharmacokinetic and pharmacodynamic behavior prediction. By anticipating possible medication toxicity, adverse drug reactions, and off-target effects early on, AI also significantly contributes to toxicology research by lowering late-stage drug failures. AI integration improves experimental design, data interpretation, and translational accuracy in both in vitro and in vivo research. AI-assisted analysis of biomarker data, animal models, and cell-based assays promotes a deeper comprehension of drug safety, efficacy, and dose-response interactions. Additionally, AI algorithms contribute to better patient safety and individualized therapeutic methods by identifying drug-induced adverse effects and helping to design ways for their prevention and treatment. AI makes it easier to translate basic pharmacological and toxicological discoveries into clinically feasible and legally compliant medication candidates by linking academic research and pharmaceutical industry demands. AI use in pharmacology, toxicology, and preclinical research improves teamwork, shortens development times, and facilitates the production of safer, more efficient, and future-ready pharmaceutical treatments.

Keywords: Pharmacology, Toxicology, Research, Drug Safety, Adverse Effects

AI IN PHARMACOVIGILANCE PROGRAMME OF INDIA - A NEW ERA OF AUTOMATED DRUG SAFETY SURVEILLANCE

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Abstract

The Pharmacovigilance Programme of India (PvPI) is an important program that ensures drug safety by monitoring Adverse Drug Reactions (ADRs) and assessing the risk of medicinal products. However, traditional pharmacovigilance methods often struggle with high data volume, delayed signal detection, and inefficient manual reporting. The adoption of Artificial Intelligence (AI) is revolutionizing PvPI by automating adverse event detection, optimizing data analysis, and improving the decision-making process. AI-powered algorithms, such as natural language processing and machine learning, enable real-time monitoring of ADRs from various sources, e.g., electronic health records, social media, and medical literature. Signal detection and risk assessment are made more automated, resulting in increased accuracy and efficiency in pharmacovigilance, and reducing the burden on healthcare professionals and regulatory bodies. Predictive analytics also supports proactive risk management through timely interventions. In this paper, we outline where AI has been integrated into PVPI and to what extent it is transforming drug safety surveillance in India. The implementation of AI-driven tools is advancing pharmacovigilance toward patient safety while speeding up regulatory decision-making. However, the successful adoption of AI within pharmacovigilance faces challenges, such as data privacy and regulatory acceptance.

Keywords: PvPI, Adverse drug reactions, Artificial intelligence, Natural language processing, and Machine learning.

ROLE OF ARTIFICIAL INTELLIGENCE IN CANCER DIAGNOSIS AND TREATMENT

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Abstract

Cancer continues to be a major source of morbidity and mortality worldwide, requiring creative methods for early detection and successful treatment. With its cutting-edge computational techniques to enhance cancer diagnosis, characterisation, and treatment decision-making, artificial intelligence (AI) has become a game-changing tool in oncology. The effective analysis of high-dimensional biomedical data, including digital pathology, radiological imaging, genomic sequencing data, and electronic health records, is made possible by AI-based methods, such as machine learning and deep learning algorithms. AI systems show high proficiency in tumor detection, classification, grading, and staging in cancer diagnosis, enhancing diagnostic precision and minimizing inter-observer variability among physicians. These tools support prompt clinical action and early assessment. By facilitating customized treatment planning and outcome prediction, AI greatly advances precision oncology in the context of cancer therapy. Artificial Intelligence models support the selection of targeted medicines and immunotherapies, optimize the distribution of radiation doses, and anticipate therapeutic responses. Additionally, by finding new therapeutic targets and refining lead compounds, AI speeds up the development of anticancer drugs. AI-powered prediction analytics and ongoing monitoring also help evaluate therapy effectiveness and identify disease recurrence. Artificial intelligence has the ability to improve patient outcomes, boost clinical efficiency, and encourage personalised cancer care when it comes to cancer diagnosis and treatment. However, ethical governance, data harmonization, and strong validation are crucial to successful clinical implementation.

Keywords: Artificial Intelligence, Cancer Diagnosis, Cancer Treatment, Machine Learning, Deep Learning, Oncology, Medical Imaging, Personalized Therapy

PHARMACOLOGICAL EVALUATION OF THE ANTI-ASTHMATIC AND ANTIOXIDANT POTENTIAL OF *DATURA* SPECIES

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Abstract

Asthma is a chronic respiratory disorder characterized by airway inflammation, bronchoconstriction, and significant oxidative stress. Traditional herbal medicines offer a vast repository of therapeutic leads for chronic respiratory disorders. This study provides a comprehensive pharmacological evaluation of *Datura* extracts to establish their efficacy in managing asthmatic conditions. The research focuses on two primary therapeutic pathways: bronchodilation and oxidative stress reduction. Using standardized experimental models of airway hyperresponsiveness, the extract was tested for its ability to modulate respiratory distress and inflammatory cell infiltration. Our findings demonstrate that *Datura* possesses significant antiasthmatic properties, effectively reducing airway constriction and promoting easier respiration. Additionally, the extract exhibited potent antioxidant activity, providing a protective shield against cellular damage caused by reactive oxygen species in lung tissue. The results suggest that the therapeutic benefits of *Datura* are derived from its multi-targeted action on the respiratory system. This study supports the broader application of plant-derived compounds in modern pharmacology and highlights *Datura* as a promising candidate for the development of standardized, cost-effective asthma therapies.

Keywords: Asthma, *Datura* extracts, antiasthmatic, chronic respiratory disorder

ROLE OF AI AND TECHNOLOGY IN MODERN PHARMACY

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Abstract

Artificial Intelligence (AI) and modern technology are transforming the pharmaceutical industry by making drug discovery, development, and production faster, safer, and more efficient. This presentation explores the role of AI, machine learning, data analytics, and digital tools in various stages of the pharmaceutical process. AI helps identify potential drug candidates, predict their effectiveness, and optimize clinical trial design, reducing time and costs. Advanced technologies like automation, robotics, and blockchain improve manufacturing quality, supply chain management, and regulatory compliance. Furthermore, by predicting patient reactions and tracking side effects, AI-powered data analysis allows personalised medication. The presentation also discusses practical uses, difficulties, and moral issues related to using AI in pharmaceuticals. Healthcare practitioners, researchers, and regulators can use AI and technology to improve innovation, patient safety, and medication accessibility by studying their effects. The growing significance of technology in influencing the pharmaceutical industry's future is highlighted in the presentation.

Keywords: Artificial Intelligence, personalised medication. accessibility, effectiveness, and clinical trial design.

THE ROLE OF AI IN DETECTING ADVERSE EVENTS OF MEDICAL DEVICES

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Abstract

Medical devices are pivotal in contemporary healthcare, necessitating rigorous post-market surveillance to detect adverse events and avert patient harm. Traditional manual reporting systems are plagued by incompleteness, underreporting, and delays, impeding timely risk mitigation. Materiovigilance is a standardized framework for identifying, reporting, and analyzing device-related incidents that bolsters device efficacy, forestalls failures, and flags substandard or counterfeit products, thereby safeguarding patient health. Recent advancements in artificial intelligence (AI), particularly machine learning (ML) and natural language processing (NLP), have revolutionized this domain by enabling automated, real-time AE detection across heterogeneous data sources, including electronic health records (EHRs), social media, clinical narratives, and patient feedback. AI excels in dissecting vast datasets to unearth safety signals, discern emergent patterns, and prognosticate risks with superior precision and velocity compared to conventional approaches, which squander resources and retard regulatory responses. Predictive analytics further empowers proactive malfunction anticipation, fostering pre-emptive interventions. This synthesis elucidates AI's transformative potential in Materiovigilance for expeditious AE signal discernment. Nonetheless, deployment hurdles persist, encompassing data fidelity, regulatory adherence, and algorithmic bias, alongside imperatives for enhanced accuracy, rapidity, cost-efficiency, and scalability in evolving AI paradigms.

Keywords: Materiovigilance, Artificial intelligence, Adverse events, Machine learning, and Natural language processing.

MACHINE LEARNING BASED PREDICTION OF NITROSAMINE RISK IN HERBAL DRUGS

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Abstract

Nitrosamine impurities have become a major pharmaceutical safety issue of concern. Recent studies have shown that even the use of herbal pharmaceuticals can be susceptible to issues due to the presence of natural amines, alkaloids, nitrate-accumulating flora, and processing conditions that are prone to nitrosation reactions. It requires effective, predictive, and cost-effective methods that can screen large phytochemical libraries to provide sufficient assurance of the safety and regulatory compliance of herbal products. The review is a synthesis of the current developments in quantum chemistry and machine learning that can be used in the in-silico prediction of the risk of nitrosamine formation in herbal drugs. Density Functional Theory (DFT) offers a mechanistic approach to the formation of electronic reactivity, like the HOMO-LUMO energy gap, the electrophilicity, and Fukui index, through which nitrosation-prone functional groups in complex natural products can be identified. Complementarily, machine learning classifications via molecular fingerprints and classic structural descriptors coupled with quantum-instigated characteristics can be used to conduct high-throughput classification and prioritization of possibly high-risk phytochemicals. By combining these computational strategies, hybrid pipelines can be developed employing computational methods, which are potent on the one hand, in enhancing the profiling of impurities, allowing regulatory toxicology analyses, and driving the manufacturing controls in the development of herbal drugs. This review analyses the advantages, weaknesses, and practice of the existing in-silico tools, presents available evidence on the topic of nitrosamine contamination in herb products, as well as the future research opportunities with regard to the pharmacy field. It focuses on the fact that predictive modelling is capable of assisting pharmacists, formulators, and regulatory agencies in enhancing the risk-management, quality, and safety framework of herbal pharmaceuticals.

Keywords: Nitrosamines, Herbal drugs, Quantum chemistry, Density Functional Theory (DFT), Machine learning, In-silico toxicology, pharmaceutical quality, Impurity prediction.

TRANSDERMAL DRUG DELIVERY SYSTEM

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Abstract

The Transdermal Drug Delivery System (TDDS) is a modern method of administering a drug through the skin into the systemic circulation. It offers an effective alternative to oral and injectable routes of drug administration. In this system, the drug is incorporated into a patch or formulation that is applied to the skin, allowing controlled and continuous drug release over a prolonged period. TDDS helps to avoid problems associated with oral drug delivery such as gastrointestinal irritation, first-pass metabolism, and fluctuating drug levels in the blood. It improves patient compliance due to its painless, non-invasive nature and ease of use. This system is especially beneficial for drugs with short half-lives and those requiring sustained therapeutic action. A transdermal patch consists of several components, including a drug reservoir, adhesive layer, rate-controlling membrane, and backing layer. When applied to the skin, the drug diffuses across the stratum corneum and enters the bloodstream. The skin acts as a natural barrier; therefore, various techniques such as chemical permeation enhancers, microneedles, iontophoresis, and nanocarriers are used to improve drug penetration. Transdermal patches are widely used in the treatment of pain, hormonal therapy, cardiovascular diseases, and smoking cessation. Overall, the transdermal drug delivery system provides controlled drug release, enhanced safety, and improved therapeutic efficacy, making it a promising approach in modern pharmaceutical drug delivery.

Keywords: Transdermal patch, Controlled drug release, Skin Permeation, Penetration Enhancers, Patient Compliance, Polymer Matrix, Bioavailability.

AI-ASSISTED PRECLINICAL PHARMACOLOGY: ADVANCING ETHICAL DRUG DEVELOPMENT

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Abstract

Preclinical pharmacology plays an essential role in drug development by assessing safety, pharmacokinetics, and pharmacodynamic properties before clinical evaluation. Traditionally, these investigations have relied extensively on animal experimentation; however, such approaches are associated with ethical concerns, high financial burden, prolonged timelines, and limited predictive accuracy for human outcomes. Recent advances in artificial intelligence (AI) offer promising alternatives that can significantly reduce the reliance on animal models in preclinical research. AI-driven methods utilize large-scale pharmacological, biological, and chemical datasets to predict drug–target interactions, toxicity risks, and pharmacokinetic behavior at early stages of development. Machine learning and deep learning algorithms enable efficient *in silico* screening, facilitating early identification of unsuitable drug candidates and minimizing unnecessary *in vivo* testing. Additionally, AI enhances the analysis and integration of data generated from alternative experimental systems, including organ-on-chip technologies, three-dimensional cell cultures, and other non-animal models. By supporting the principles of Replacement, Reduction, and Refinement (3Rs), AI contributes to more ethical, cost-effective, and sustainable preclinical pharmacology practices. Although animal studies remain necessary in certain contexts, the integration of AI-based strategies substantially reduces animal use while improving translational relevance. This poster highlights recent applications, benefits, and prospects of AI-assisted approaches aimed at minimizing animal experimentation in drug development.

Keywords: Preclinical Pharmacology, Artificial Intelligence, Animal Experimentation, *In Silico* Modeling, Drug Development, 3Rs Principle.

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL FORMULATION DEVELOPMENT

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Abstract

Artificial Intelligence (AI) is rapidly influencing pharmaceutical sciences by offering smarter alternatives to conventional formulation development and dosage calculation methods. Traditional approaches largely depend on repeated experimental trials, which are often time-consuming and resource-intensive. The integration of AI technologies such as machine learning, deep learning, and language-based models now allows complex pharmaceutical data to be analyzed more effectively, supporting rational and evidence-based decision-making.

Applications of AI includes prediction of drug physicochemical properties, optimizing excipient combinations, and designing robust pharmaceutical formulations. The role of AI in pharmacokinetic and pharmacodynamic modeling is also examined, particularly its potential to support individualized dose adjustment and improve therapeutic precision. In addition, AI-driven tools are being adopted in manufacturing environments for automated quality evaluation, process optimization, and regulatory documentation support.

Although AI offers substantial advantages, its implementation is still limited by challenges related to data integrity, model transparency, regulatory acceptance, and ethical responsibility. Emerging innovations, including AI-assisted three-dimensional printing of dosage forms and the integration of digital health technologies, further highlight the growing impact of AI. Overall, AI represents a powerful enabler for advancing intelligent pharmaceutical product development and personalized therapeutics.

Keywords: Artificial intelligence, Machine learning, Deep learning, Pharmaceuticals

NATURAL PRODUCTS IN THE ERA OF COMPUTER-AIDED DRUG DESIGN

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Abstract

Natural products have historically served as a rich source of therapeutic agents, contributing significantly to modern drug discovery. However, conventional natural product-based drug development is often time-consuming, resource-intensive, and associated with high attrition rates. The advancement of Computer-Aided Drug Design (CADD) has transformed this landscape by enabling rapid, cost-effective, and target-oriented identification of bioactive compounds. Molecular docking, virtual screening, pharmacophore modelling, quantitative structure-activity relationship (QSAR) analysis, molecular dynamics simulations, and ADMET prediction are some examples of theoretical techniques in drug discovery of natural origin. All of this is largely due to the availability of workstations capable of handling high-quality computer graphics. CADD not only accelerates the identification and optimization of bioactive natural compounds but also bridges the gap between traditional medicine and contemporary pharmaceutical research. Continued advancements in computational tools and collaborative research efforts are expected to unlock the full potential of natural products in the era of digital drug discovery.

Keywords: Natural products, Computer-aided drug design, Molecular docking, Virtual screening, ADMET, In silico drug discovery

**QUALITY BY DESIGN ASSISTED HIGH-PERFORMANCE LIQUID
CHROMATOGRAPHY PARAMETERS FOR SIMULTANEOUS ESTIMATION OF
SIMVASTATIN AND FENOFIBRATE**

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Abstract

In a present study, quality by design was used to develop a reliable high-performance liquid chromatography method for the simultaneous estimation of simvastatin and fenofibrate. A robust chromatographic setting for quality peaks and appropriate component separation within a reasonable run duration was generated. Furthermore, to determine critical quality attributes (CQA), a quantitative relationship between critical material attributes and CQA was established using a Box-Behnken design to produce an analytical design space and develop a control approach. The mathematical models used three independent characteristics: acetonitrile volume, buffer molarity, and flow rate. The optimum and expected conditions were acetonitrile and potassium dihydrogen orthophosphate buffer (pH 2.9 adjusted, with orthophosphoric acid) (80.65:19.35 v/v) as an optimized mobile phase at a flow rate of 0.99 ml/min. We achieved adequate baseline separation of both drugs in just 10 min with these optimum parameters. The amount of acetonitrile was revealed to be the most important factor determining the perturbation plot responses. The %recoveries for both medicines were 99.15% 101.86% at all three levels. Both drugs showed relative standard deviations for repeatability and intermediate precision of less than 2%. As a result, a simple, accurate, and repeatable high-performance liquid chromatography approach for routine quality control testing was developed.

Keywords: Box-Behnken design, fenofibrate, HPLC, simvastatin, Quality by design

GASTRORETENTIVE DRUG DELIVERY SYSTEMS: A NOVEL APPROACH FOR ENHANCING ORAL BIOAVAILABILITY

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Abstract

Gastroretentive Drug Delivery Systems (GRDDS) are designed to prolong the gastric residence time of dosage forms, thereby enhancing drug absorption and therapeutic efficacy. These systems are especially useful for drugs that are absorbed predominantly in the upper gastrointestinal tract, exhibit poor solubility, or require controlled drug release. By maintaining the dosage form in the stomach for an extended duration, GRDDS help improve oral bioavailability and therapeutic outcomes. Several gastroretentive approaches have been developed to achieve prolonged gastric retention, including floating, swelling, mucoadhesive, and high-density systems. The selection of an appropriate approach depends on the physicochemical properties of the drug and the desired release profile. Conventional oral drug delivery systems often suffer from limitations such as rapid gastric emptying, variable absorption, and reduced bioavailability, which can negatively impact drug performance. GRDDS provides an effective strategy to overcome these challenges by optimizing drug release in the gastric region and enhancing absorption. The formulation of gastroretentive systems involves the careful selection of polymers and excipients that influence gastric retention behavior and drug release characteristics. Evaluation parameters such as gastric retention time, in vitro drug release, swelling behavior, and drug release kinetics are essential for assessing system performance. Overall, gastroretentive drug delivery systems represent a promising and innovative approach for improving oral bioavailability and optimizing drug therapy, with significant potential in the development of advanced oral drug delivery systems.

Keywords: Gastroretentive drug delivery systems, Gastric residence time, Oral bioavailability, Controlled drug release, Novel drug delivery systems

AI IN HEALTHCARE: OPPORTUNITIES AND CHALLENGES IN CLINICAL DECISION SUPPORT

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Abstract

Clinical Decision Support Systems (CDSS) with AI capabilities are transforming healthcare. They're improving daily operations in clinics, improving diagnostics, and personalizing treatments. This presentation delves into the specifics of these AI tools, including as deep learning, machine learning, and natural language processing, and demonstrates how they are revolutionizing risk assessment, diagnostics, and even clinical documentation. However, things aren't always easy. The poster also discusses the challenging aspects, such as ensuring that these models are comprehensible, addressing prejudice, and determining how to truly integrate them into the day-to-day grind of clinical work. It emphasizes the importance of user-centered design and the necessity of ethics and trust. Explainability also comes up as a major concern. The poster explores how AI-CDSS's lucid explanations genuinely support clinicians' trust in the system and their ability to make their own decisions. Ultimately, it does more than merely highlight the issues. It outlines practical tactics, such as collaborating across disciplines, emphasizing education, and continuously enhancing these systems, to truly unleash the potential of AI-CDSS and provide patients with improved care.

Keywords: Artificial Intelligence (AI), Clinical Decision Support Systems (CDSS), Machine Learning, Deep Learning, Natural Language Processing (NLP), Explainable AI (XAI)

ENHANCING ORAL BIOAVAILABILITY OF POORLY SOLUBLE DRUG THROUGH SOLID SELF-NANOEMULSIFYING DRUG DELIVERY SYSTEMS: A REVIEW OF CURRENT TRENDS AND FUTURE PERSPECTIVES

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Abstract

Self-Nanoemulsifying Drug Delivery Systems (SNEDDS) have emerged as a promising lipid-based platform to enhance the oral bioavailability of poorly water-soluble drugs, primarily by forming fine oil-in-water nanoemulsions with droplet sizes below 100 nm upon contact with gastrointestinal fluids. These systems improve drug solubilization, dissolution, lymphatic transport, and reduce first-pass metabolism. However, liquid SNEDDS face challenges such as stability issues, leakage, and patient compliance, which have driven the development of Solid SNEDDS (S-SNEDDS). By adsorbing or encapsulating liquid SNEDDS onto solid carriers, S-SNEDDS combine the advantages of nanoemulsification with the stability and convenience of solid dosage forms. Various preparation methods, including spontaneous emulsification, high-energy emulsification and phase inversion, are employed to tailor droplet size and stability. Solidification techniques such as capsule filling, adsorption onto carriers, spray drying, melt granulation, and extrusion enable conversion of liquid SNEDDS into user-friendly solid forms. Recent research trends emphasize nanotechnology integration, novel carriers, continuous manufacturing, and personalized dosage forms. Marketed products like Neoral® exemplify successful SNEDDS applications. Future perspectives focus on stimuli-responsive formulations, hybrid delivery systems, improved lymphatic targeting, and regulatory standardization. Overall, S-SNEDDS represent a versatile and evolving strategy to overcome solubility and bioavailability limitations, offering improved therapeutic efficacy and patient compliance in oral drug delivery.

Keywords: SNEDDS, Solid SNEDDS (S-SNEDDS), Oral bioavailability, Lipid-based drug delivery, Nanoemulsion formulation

AI IN PHARMACOVIGILANCE IMPACT ON ADVERSE DRUG REACTION DETECTION AND RISK MANAGEMENT

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Abstract

Pharmacovigilance remains essential for safeguarding drug safety by identifying, evaluating, and mitigating adverse drug reactions (ADRs). Traditional approaches, however, face constraints like incomplete reporting, slow identification of safety signals, and struggles with handling vast, intricate data volumes. Artificial intelligence (AI) has recently surfaced as a game-changing technology poised to revolutionize these processes. This study investigates how AI influences ADR identification and risk mitigation in pharmacovigilance frameworks. It delves into core AI methods—such as machine learning, natural language processing, and deep learning—and their roles in streamlining case handling, accelerating signal discovery, scanning scientific literature, and gauging causal links. Drawing on practical data from electronic health records, voluntary reporting systems, and patient databases, AI models boost the accuracy and speed of detecting safety issues. AI also advances forward-looking risk strategies through forecasting tools, patient risk grouping, and ongoing assessments of benefits versus risks. Incorporating AI into pharmacovigilance boosts workflow efficiency, minimizes manual mistakes, and supports better-informed choices by regulators and clinicians. While hurdles persist in areas like data reliability, model interpretability, and regulatory approval, AI-enhanced systems offer substantial promise for contemporary drug monitoring. Employing reliable, transparent AI alongside human supervision could markedly elevate patient protection and fortify worldwide pharmacovigilance infrastructures.

Keywords: Pharmacovigilance, Adverse Drug Reactions, Artificial Intelligence, Machine Learning, Deep Learning, Signal Detection, Risk Management, Drug Safety, Predictive Analytics.

FORMULATION AND EVALUATION OF SILVER NANOPARTICLES LOADED WITH CHAMAECOSTUS CUSPIDATUS EXTRACT FOR ITS ANTI-DIABETIC ACTIVITY

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Abstract

Diabetes mellitus remains a major global health concern, necessitating the development of safer and more effective therapeutic strategies. Medicinal plants with antidiabetic potential offer a promising alternative; however, their clinical utility is often limited by poor stability and bioavailability. The present study focuses on the formulation and evaluation of silver nanoparticles (AgNPs) loaded with *Chamaecostus cuspidatus* leaf extract to enhance its antidiabetic efficacy. Silver nanoparticles were synthesized using a green, plant-mediated approach, where phytoconstituents of *C. cuspidatus* served as both reducing and stabilizing agents. The prepared nanoparticles were characterized for particle size, shape, and surface morphology using transmission electron microscopy (TEM), which confirmed the formation of predominantly spherical nanoparticles with nanoscale dimensions and uniform distribution. Additional physicochemical properties, including stability and dispersion characteristics, were assessed to ensure suitability of the formulation for drug delivery applications. The in vitro release profile of the bioactive constituents from the silver nanoparticles was investigated using Franz diffusion cells, employing an appropriate membrane system. The release studies demonstrated a controlled and sustained diffusion pattern compared to the plain extract, indicating effective incorporation of the extract within the nanoparticle matrix. Biological evaluation involved in vitro antioxidant activity and carbohydrate-hydrolyzing enzyme inhibition studies, followed by in vivo assessment in diabetic animal models. Overall, the study demonstrates that silver nanoparticle-based delivery of *Chamaecostus cuspidatus* extract may represent an effective nanoherbal approach for diabetes management, offering improved therapeutic performance and potential for future pharmaceutical development.

Keywords: Diabetes mellitus, Silver nanoparticles, *Chamaecostus cuspidatus*, Antidiabetic, Antihyperglycemic, Nanotechnology

ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PHARMACOVIGILANCE FOR DETECTION OF ADVERSE DRUG REACTIONS IN ASTHMA AND COPD PATIENTS

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Abstract

Asthma and chronic obstructive pulmonary disease (COPD) are chronic respiratory disorders that demand ongoing pharmacological treatment, typically with inhaled corticosteroids, bronchodilators, systemic corticosteroids, and biologics. The prolonged therapy and polypharmacy heighten the risk of adverse drug reactions (ADRs), which conventional pharmacovigilance often under-reports or detects late. Artificial intelligence (AI)-powered pharmacovigilance offers a promising solution by enabling earlier detection, assessment, and mitigation of ADRs in these patients. This review examines core AI tools—machine learning, natural language processing, and deep learning—in pharmacovigilance for asthma and COPD. Machine learning excels in predictive risk modeling and signal detection through analysis of vast real-world datasets from electronic health records, reporting systems, and registries. Natural language processing streamlines the extraction and classification of ADR signals from unstructured notes and literature, boosting case identification and accuracy. Deep learning advances pattern recognition, such as spotting drug-related pulmonary toxicity and serious respiratory events.

Keywords: Artificial Intelligence, Pharmacovigilance, Adverse Drug Reactions, Asthma, Chronic Obstructive Pulmonary Disease (COPD), Machine Learning

AI IN PHARMACY: OPPORTUNITIES AND CHALLENGES ACROSS PRACTICE AND INDUSTRY

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Abstract

The pharmaceutical industry and the pharmacy profession are undergoing significant change due to artificial intelligence (AI), which is changing how medications are manufactured, identified, dispensed, and monitored. An overview of the main uses, advantages, and significant difficulties of AI in pharmacy practice and commercial settings is intended to be provided via this review-based poster. To map existing and developing AI technologies in drug discovery and development, clinical decision support, dispensing and inventory management, pharmacovigilance, and regulatory activities, literature from recent publications, guidelines, and reports is examined. AI has many advantages, such as quicker and more economical drug development, improved medication safety through better adverse event and drug interaction detection, optimization of dosage and therapy customization, and increased operational efficiency in hospital and community pharmacies. However, significant obstacles include data security and privacy difficulties, algorithmic bias and lack of transparency, regulatory and validation gaps, ethical concerns, and the requirement for digital infrastructure and labor upskilling, which are limiting the use of AI. These elements are combined in this poster to show how AI may complement, not replace, the function of the pharmacist while highlighting the precautions needed for its responsible application in pharmacies and the larger pharmaceutical industry.

Keywords: Artificial intelligence, Machine learning, Pharmacy practice, Pharmaceutical industry, Data Privacy, Algorithm Bias

EMERGING ROLE OF EXOSOMES IN BREAST CANCER MANAGEMENT

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Breast cancer represents the most frequently diagnosed type of cancer and is also the leading cause of mortality in women globally. Traditional treatment modalities such as chemotherapeutic agents, hormonal and targeted drugs continue to serve as the first-line treatment. Additionally, remarkable results have been demonstrated by immunotherapeutic agents in clinical trials. Nonetheless, these conventional therapies often result in serious challenges and thus the development of a novel effective treatment method is urgently needed. Exosomes exhibiting 40-160 nm size range are the extracellular vesicles (EVs) that are secreted by the eukaryotic cells and are recently gaining attention worldwide owing to their growing role in managing several disease conditions. A plethora of studies have indicated significant potential of these natural EVs in treating cancer wherein these can suppress the tumor cells proliferation more effectively when combined with other therapeutic approaches. These have diverse applications as prognostic, biomarker for tumor diagnosis and as drug delivery systems specifically for breast cancer. Due to the various unique features namely biocompatibility, ease of modification, nanosize range and tumor targeting capability these serve as effective drug delivery systems in cancer treatments. However, extensive research is needed for addressing several critical issues for fully harnessing the potential of exosomes and their clinical translation in breast cancer.

Keywords: Breast cancer, exosomes, tumor cells, drug delivery, extracellular vesicles

AI-ENABLED DRUG REPURPOSING: TRANSLATING ACADEMIC INTELLIGENCE INTO INDUSTRY-READY THERAPIES

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Abstract

Drug discovery remains an expensive and lengthy process, often associated with a high rate of failure due to limitations in safety and therapeutic efficacy. Drug repurposing has emerged as an effective alternative approach by exploring new clinical applications for existing drugs, thereby reducing development timelines, costs, and associated risks. The integration of artificial intelligence (AI) has significantly enhanced drug repurposing efforts by enabling rapid and comprehensive analysis of complex biomedical data, including genomic, proteomic, clinical, and chemical information. Advanced AI methodologies such as machine learning, deep learning, and network-based analyses support efficient identification of drug–target interactions, disease associations, and therapeutic potential. This presentation emphasizes the role of AI-enabled drug repurposing as a critical link between academic research and industrial drug development. Notable examples of AI-guided repurposing in conditions such as COVID-19, cancer, and central nervous system disorders highlight its strong translational relevance. The alignment of academic AI innovations with pharmaceutical development pipelines has the potential to improve clinical translation while reducing preclinical failures. Although challenges related to data reliability, regulatory frameworks, and model validation remain, AI-assisted drug repurposing represents a promising strategy for advancing safe, economical, and patient-focused therapeutic solutions.

Keywords: Drug discovery, artificial intelligence (AI), Drug repurposing

ROLE OF PHYTOCONSTITUENTS IN DRUG-INDUCED DEPRESSION

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Depression is a mood disorder characterized by persistent feelings of sadness, hopelessness, and loss of interest and it is a major health concern. According to WHO 2025 report depression is a leading cause of global disability, affecting an estimated 330 million) 4% population worldwide, with higher prevalence in women (6.9%) than men (5.7%). There are many drug which causes depression like β -blockers, benzodiazepines, corticosteroid (prednisolone) opioids (morphine, codeine) anticonvulsant (phenytoin). β -blockers are widely used as anti-hypertensive and cardio protective drug which leads depression in long term use. β -blockers blocked β -adrenergic receptors via peripherally and centrally then depletion of nor-adrenaline which disrupts mood-regulating biogenic amines and reduce serotonergic and dopaminergic neurons which dysregulate the HPA-Axis and leads into depression. There are many herbal/natural phytoconstituents like berberine, d-berberine, jatrorhizine, palmatine, protopine and magnoflorine which can be used as an adjunct with the drugs causing depression. These phytoconstituents have potent anti-depressant activity proved in pre-clinical studies. However the dose and dose regimen needs to be standardized with a planned pre-clinical & clinical study to utilize them as a protective agent in drug induced depression.

Keywords: Depression, β -blockers. mood disorder, drug induced depression

SPATIALLY TARGETED CUBOSOMAL DELIVERY OF CELASTROL ENHANCES ANTITUMOR EFFICACY IN A 4T1 XENOGRFT MODEL

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Abstract

Celastrol is a powerful anticancer phytochemical, but its clinical use is limited due to inadequate water solubility, low bioavailability, and dose-dependent systemic toxicity. To overcome these pharmaceutical constraints, celastrol-loaded cubosomes utilizing monoolein or phytantriol were engineered as spatially tailored lipid nanocarriers to improve tumor-specific delivery and therapeutic effectiveness. Cubosomes were created with monoolein or phytantriol and stabilized with appropriate surfactants, thereafter undergoing optimization and characterization for particle size, polydispersity index, drug loading, encapsulation efficiency, internal nanostructure, and in vitro release behavior. The optimized cubosomal formulations demonstrated homogeneous nanoscale dimensions (<150 nm), elevated encapsulation efficiency, and prolonged, diffusion-controlled drug release attributed to the stable bicontinuous cubic phase. These characteristics promote passive tumor targeting through the increased permeability and retention (EPR) effect. The in vivo anticancer effectiveness was assessed using a 4T1-bearing xenograft mouse model. Celastrol-loaded cubosomes exhibited markedly superior tumor growth inhibition relative to free celastrol and control groups ($p < 0.05$), as well as improved tumor accumulation and intratumoral retention. Cubosome-treated mice had decreased systemic toxicity, as indicated by negligible body weight loss and the lack of substantial histological changes in primary organs ($p > 0.05$). Monoolein- and phytantriol- based cubosomes constitute a viable pharmaceutical approach for enhancing the therapeutic index of hydrophobic anticancer drugs like celastrol.

Keywords: Celastrol, cubosomes, monoolein, phytantriol, lipid nanocarriers, 4T1 xenograft

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL SCIENCES: BRIDGING ACADEMIA AND INDUSTRY FOR FUTURE HEALTHCARE

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Abstract

Artificial Intelligence (AI) is rapidly emerging as a powerful tool in pharmaceutical sciences, offering new ways to improve drug discovery, development, and healthcare delivery. Traditional pharmaceutical research often requires significant time, cost, and resources, with a high risk of failure. AI technologies, including machine learning and data analytics, are helping researchers analyze large datasets more efficiently and make better-informed decisions. This review-based study aims to explore how artificial intelligence is shaping the future of pharmaceutical sciences and how it helps connect academic research with industrial practices. The paper discusses key applications of AI in areas such as drug discovery, clinical trials, pharmacovigilance, personalized medicine, and pharmaceutical manufacturing. It also highlights the growing importance of collaboration between academic institutions and the pharmaceutical industry in transforming innovative research ideas into practical healthcare solutions. Although AI offers many advantages, challenges related to data quality, ethical concerns, and regulatory approval still need to be addressed. Overall, artificial intelligence has the potential to strengthen academia–industry partnerships and contribute to a more efficient, innovative, and patient-focused pharmaceutical sector.

Keywords: Artificial Intelligence, Pharmaceutical Sciences, Drug Discovery, Academia–Industry Collaboration, Healthcare Innovation

UNLOCKING BIOMARKERS: AI-POWERED DISCOVERY FOR PHARMACEUTICAL BREAKTHROUGH

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Abstract

Biomarkers are important in disease diagnosis, prognosis, or decision-making in therapeutic strategies. It provides a more comprehensive understanding of disease progression and response to therapy compared to traditional indicators. Recent advances in Artificial Intelligence (AI) and Machine Learning (ML) have transformed Biomarker discovery by enabling the analysis of high-dimensional biomedical data and uncovering complex patterns. This has immense implications for neurodegenerative disorders like Amyotrophic Lateral Sclerosis (ALS), which faces great challenges in being incurable and having great patient variability. AI-driven approaches integrating omics, proteomics and neuroimaging data are enhancing early detection, improving diagnostic accuracy and supporting therapeutic development, offering new prospects for disease research and treatment.

Keywords: AI, biomarkers, amyotrophic lateral sclerosis (ALS)

AI-DRIVEN INNOVATIONS IN PHARMACEUTICAL FORMULATION AND DEVELOPMENT

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Abstract

Artificial Intelligence (AI) has become a game-changing technology in pharmaceutical development and formulation, providing creative ways to get around the drawbacks of traditional trial-and-error methods. Formulation development has historically been largely dependent on Design of Experiments (DoE), which is frequently expensive, time-consuming, and resource-intensive. Data-driven, predictive, and logical formulation design has been made possible by the integration of AI-driven tools like machine learning, deep learning, Bayesian optimization, and generative algorithms. AI makes it easier to virtually screen combinations of active pharmaceutical ingredients (APIs) and excipients, predict compatibility, optimize formulation parameters, and improve product quality before laboratory testing. These methods drastically cut production costs, development time, and experimental workload. AI also helps with in silico-DoE, excipient selection, process optimization, and drug release kinetics, encapsulation efficiency, and stability prediction in sophisticated drug delivery systems, such as liposomes, lipid nanoparticles, and controlled-release formulations. Formulation is further improved by combining AI with Process Analytical Technology (PAT) and Quality by Design (QbD). Resilience, repeatability, and adherence to regulations. All things considered, AI-assisted formulation development is a future-ready strategy that improves decision-making, speeds up innovation, and aids in the creation of superior, customized, and effective pharmaceutical products.

Keywords: Artificial Intelligence, formulation development, optimization, process analytical technology, quality by design

AI IN 3D PRINTING

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Artificial Intelligence (AI) has emerged as a transformative force in the field of three-dimensional (3D) printing, enabling smarter, faster, and more efficient additive manufacturing processes. The integration of AI algorithms with 3D printing systems enhances design optimization, material selection, process control, and quality assurance. Machine learning models analyze large datasets to predict printing errors, optimize printing parameters, and reduce material waste while improving product accuracy and consistency. AI-driven generative design allows the creation of complex geometries that are lightweight, cost-effective, and structurally superior compared to traditional designs. In addition, real-time monitoring using AI-based vision systems ensures early defect detection and adaptive process correction during fabrication. The convergence of AI and 3D printing has significant applications across healthcare, pharmaceuticals, aerospace, automotive, and manufacturing industries, including personalized medical devices, drug delivery systems, and rapid prototyping. Despite its advantages, challenges such as high computational requirements, data dependency, and integration complexity remain. AI-enabled 3D printing represents a promising advancement toward intelligent manufacturing, offering improved precision, customization, and sustainability in next-generation production technologies.

Keywords: Artificial Intelligence, 3D printing, machine learning, design optimization

ARTIFICIAL INTELLIGENCE-DRIVEN PERSONALIZED DRUG THERAPY

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Artificial Intelligence (AI) is playing a crucial role in advancing personalized drug therapy by enabling patient-specific treatment strategies. Conventional drug therapy often follows a uniform approach, which may result in variable drug responses and adverse effects due to individual differences in genetics, clinical conditions, and disease characteristics. AI techniques such as machine learning and deep learning can efficiently analyze large and complex datasets, including genomic information, electronic health records, and therapeutic response data, to support personalized drug selection and dose optimization. In personalized drug therapy, AI assists healthcare professionals by predicting patient-specific drug responses, optimizing treatment regimens, and improving clinical decision-making. This approach is particularly beneficial in chronic diseases and oncology, where personalized treatment has shown improved therapeutic outcomes. Despite its significant potential, challenges such as data privacy, algorithm transparency, and the requirement for high-quality patient data remain important considerations. AI-driven personalized drug therapy represents a promising advancement towards precision medicine, supporting patient-centric pharmaceutical care and bridging the gap between academic research and clinical practice.

Keywords: Artificial intelligence, personalized drug therapy, precision medicine

REVOLUTIONIZING HEALTHCARE: AI-POWERED PATIENT COUNSELLING

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Abstract

Artificial Intelligence in Patient Counselling examines the transformative role of AI in enhancing patient education, communication, and personalized care. It explores how AI-driven technologies such as personalized treatment planning, predictive analytics, virtual health assistants, empathetic chatbots, and AI-enhanced medical imaging, are reshaping healthcare and dentistry by improving patient understanding, engagement, and outcomes. AI enables consistent, accurate information delivery across practices through personalized educational resources, virtual consultations, and language translation tools, fostering trust and meaningful provider–patient interactions. Special emphasis is placed on dental patient counselling, highlighting AI’s potential to address diverse learning needs, language barriers, and access inequalities. Ethical considerations, including data accuracy, privacy, and accessibility, are critically discussed alongside real-world applications. By integrating expert insights and practical examples, it underscores how responsible AI adoption can modernize patient counselling, promote equitable access to knowledge, and support compassionate, effective patient-centered care.

Keywords: AI, patient counselling, chatbots, dentistry, AI-chats, machine learning

CALOTROPIS GIGANTEA: A MEDICINAL PLANT WITH DIVERSE PHARMACOLOGICAL ACTIVITIES

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Abstract

Calotropis gigantea, a valuable medicinal plant, has been widely used traditionally in various systems of medicine for the management of pain, inflammation, skin disorders and infections. Belonging to the Apocynaceae family, the plant is commonly found in tropical and subtropical regions, particularly in India. This review critically summarises the published scientific evidence on the phytochemical and pharmacological activities of *Calotropis gigantea*. Literature reports indicate that the various parts of the plant, including leaves, flowers, roots, bark and latex, contain a wide array of bioactive constituents such as cardiac glycosides, flavonoids, alkaloids, terpenoids, tannins, steroids and resins. Experimental studies using in-vitro and in-vivo models have demonstrated several pharmacological activities, including anti-inflammatory, analgesic, antimicrobial, antioxidant, antidiarrheal, wound-healing, cytotoxic and anti-fertility effects. Among these, anti-inflammatory and analgesic activities have been consistently reported, justifying its traditional use in pain-related and joint disorders. Toxicological studies have shown that while the plant has great therapeutic potential, improper dosage may result in adverse effects, thus demanding standardisation and controlled use. Despite promising preclinical studies, clinical studies and formulation-based research are limited. This review highlights the importance of *Calotropis gigantea* as a useful medicinal plant.

Keywords: *Calotropis gigantea*, inflammation, pain, skin disorder, anti-inflammatory, analgesic, antimicrobial, antioxidant, antidiarrheal, wound-healing

ARTIFICIAL INTELLIGENCE-DRIVEN NANO-THERANOSTICS FOR TUBERCULOSIS: A PRECISION MEDICINE APPROACH

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Abstract

Tuberculosis (TB) is a significant health hazard affecting the world not only because it is pathogenic but also because of late diagnostics, prolonged treatment, drug toxicity, and improper patient compliance. Standard interventions are often not sufficient to provide focused and personalized care. Recent studies have shown that the combination of artificial intelligence (AI) and nano-theranostics can change this paradigm by offering a more advanced and accurate methodology in the detection and treatment of TB. Nano-theranostic platforms which are AI-enhanced can design nanoparticles that can selectively target therapeutics to diseased cellular compartments and at the same time support real-time monitoring of disease dynamics. AI can help to increase the safety of treatment regimens, their speed, and effectiveness by simulating interfaces between nanoparticles and biology, optimizing the release kinetics, and personalizing dosage regimens. This is a review of recent developments in AI-based nano-theranostics to TB, highlighting how they could address the limitations of traditional therapeutics. Through the ability to bridge innovations in the laboratory to the industrial realm, these technologies promise to transform the future of the management of TB and pharmaceutical technology into a patient-centred, scalable and precision-based strategy.

Keywords: Tuberculosis, artificial intelligence, nano-theranostics, precision medicine, targeted drug delivery

LIVING DRUG DELIVERY SYSTEMS USING ENGINEERED MICROORGANISM

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Abstract

Living drug delivery systems based on engineered microorganisms represent an innovative approach in modern therapeutics. Unlike conventional drug carriers, these living systems possess the ability to sense their environment, respond to specific stimuli, and release therapeutic agents in a controlled and targeted manner. Advances in synthetic biology and genetic engineering have enabled the modification of bacteria, yeast, and other microbes to perform precise medical functions, such as site-specific drug release, real-time disease monitoring, and self-regulation of dosage. These microorganisms can be programmed to survive in specific biological niches, enhancing treatment efficacy while minimizing systemic side effects. Furthermore, their capacity for self-replication and adaptability offers long-term therapeutic potential. Despite promising advantages, challenges such as biosafety, immune responses, and regulatory concerns remain significant. Overall, living drug delivery systems provide a transformative platform for personalized and responsive medicine, opening new possibilities in the treatment of cancer, metabolic disorders, and infectious diseases.

Key words: Living drug delivery systems, engineered microorganisms, synthetic biology, targeted therapy, smart drug release, microbial therapeutics, controlled drug delivery, personalized medicine

AI IN CLINICAL TRIALS: ACADEMIC RESEARCH TO REAL-WORLD EVIDENCE

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Abstract

The field of Artificial Intelligence (AI) is changing the way clinical trials are conducted and designed, thus reducing the gap between scholarly research and practical findings. In the academic setting, AI assists in faster data processing, study design, and helps to predict the therapy results early. Once these approaches are utilized in the context of a real-world clinical trial, AI may enable better selection of the patient, shorter time of the trial, and cost reduction. Artificial Intelligence uses algorithmic questioning of large volumes of data based on electronic health records, wearable devices and comprehensive and practical findings. This helps to understand the pharmacological efficacy in a more profound way in the conditions of the normal clinical practice, rather than in the closed-controlled laboratory setup. There is also a rise of patient safety with the use of AI that can recognize adverse events at their early stages and facilitate more informed decision making. Together, with AI, the efficiency, reliability and patient-centredness of clinical trials are increased. The connection between academic research and actual evidence makes AI essential in the future of safer and more efficient therapies.

Keywords: Artificial intelligence, Clinical trial, academic research, real-world evidence, data analysis, patient Safety

AQUASOME-MEDIATED DELIVERY OF AVOBENZONE FOR IMPROVED SUNSCREEN PERFORMANCE

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Abstract

Avobenzone is a widely used UVA filter in sunscreen formulations, but its clinical performance is limited by poor photostability, low aqueous solubility, and reduced skin retention. These drawbacks often lead to loss of efficacy and the need for higher concentrations, which may increase the risk of skin irritation. The present work focuses on the development of an aquasome-based nanocarrier system to enhance the stability and sunscreen performance of avobenzone. Aquasomes were prepared using a carbohydrate-coated ceramic core through a self-assembly technique, ensuring preservation of the drug's molecular integrity. The formulated avobenzone-loaded Aquasomes were evaluated for particle size, surface morphology, drug loading efficiency, and in vitro release behaviour. The optimized formulation showed nanosized particles with uniform distribution and satisfactory entrapment efficiency. In vitro release studies indicated a controlled release pattern compared to conventional avobenzone formulations. Photostability studies demonstrated a significant reduction in avobenzone degradation upon UV exposure when incorporated into Aquasomes. Ex vivo skin permeation and retention studies revealed enhanced drug deposition in the upper layers of the skin, indicating improved topical targeting with minimal systemic absorption. Overall, aquasome-mediated delivery of avobenzone offers a promising approach to overcome formulation challenges associated with conventional sunscreens. The developed system has the potential to improve sunscreen efficacy, reduce photodegradation, and enhance user safety, making it a suitable nanocarrier platform for advanced topical photoprotective formulations.

Keywords: Aquasomes, avobenzone, nanocarrier drug delivery, sunscreen formulation, photostability, topical delivery

**DEVELOPMENT AND VALIDATION OF UV SPECTROPHOTOMETRIC METHOD
FOR SIMULTANEOUS ESTIMATION OF RUTIN AND QUERCETIN NOVEL GEL
FORMULATION AND ANALYSIS OF WAVELENGTH IN BUFFER AT PH 7.4**

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Abstract

This study aims to authenticate a proposed simultaneous methodology for quercetin and rutin by UV-visible spectroscopy technique. In present time, research come up with various combination formulations and its significance increased day by day. These combination formulations are having great importance in providing treatment with less side effects and faster action to meet standard criteria. To validate their therapeutic effect different analytical methods performed. These analytical techniques provide statistical validation. As rutin and quercetin shows maximum absorbance at 264 and 371nm respectively. Both the drugs, Rutin and Quercetin obey the Beer-lambert's law in the concentration ranges of 0-12µg/ml. Simultaneous method for both the drugs validate with UV- spectrophotometer to determine single wavelength.

Keywords: Rutin, Quercetin, Simultaneous method, validation, U.V. spectrophotometer

ARTIFICIAL INTELLIGENCE AS A CATALYST FOR ACADEMIA-INDUSTRY COLLABORATION IN PHARMA

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Abstract

Artificial intelligence (AI) is rapidly transforming the pharmaceutical industry by reshaping drug discovery, clinical development, manufacturing, and post-market surveillance. Despite significant advances, a critical gap persists between academic AI innovation and industry adoption. Academic research predominantly focuses on algorithm development and proof-of-concept studies, while the pharmaceutical industry prioritizes scalability, regulatory compliance, data integrity, and real-world impact. The role of AI in the pharmaceutical value chain and highlights the structural, technical, and cultural barriers that get in the way effective collaboration between academia and industry. By aligning academic innovation with industrial imperatives. AI can significantly accelerate drug development, reduce attrition rates, and enhance patient-centric outcomes. Strengthening academia–industry partnerships will be pivotal in realizing the full potential of AI-driven pharmaceutical innovation and shaping the future of precision medicine.

Keywords: Regulatory- alignment, Model Interpretability, Talent Hybridization

COMPUTATIONAL DESIGN, SYNTHESIS AND BIOLOGICAL EVALUATION OF CHLOROTHIAZIDE DERIVATIVES

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Abstract

Hypertension remains a major risk factor for cardiovascular morbidity and mortality worldwide, and thiazide diuretics are still recommended as first-line antihypertensive therapy because of their proven efficacy and safety. Chlorthiazide, a classical thiazide diuretic, is extensively used in the management of hypertension as well as chronic kidney disease. In addition to its blood pressure-lowering effect, recent studies have revealed several additional pharmacological properties of chlorthiazide, including antimicrobial activity and a possible beneficial role in osteoporosis management through modulation of calcium homeostasis. These emerging and pleiotropic therapeutic effects provide a strong scientific rationale for structural modification of chlorthiazide with the aim of enhancing its multifunctional therapeutic potential. The present study was designed to synthesize and preliminarily evaluate novel chlorthiazide derivatives as multifunctional therapeutic agents. Chlorthiazide was chemically modified through a chloro-acetylation reaction using chloroacetyl chloride as the acylating agent, with ethanol employed as the reaction solvent under reflux conditions at 60 °C. The obtained reactive intermediate was subsequently subjected to nucleophilic substitution with various N,N-dialkyl amines to obtain structurally diverse derivatives. Six substituted chlorthiazide derivatives were successfully synthesized and characterized for further biological evaluation of their antihypertensive, antimicrobial, and osteoporosis-related potential applications.

Keywords: Chlorthiazide, Thiazide Diuretics, Hypertension, Antimicrobial Activity, Drug Design

ARTIFICIAL INTELLIGENCE IN DRUG DISCOVERY AND DEVELOPMENT

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Artificial Intelligence (AI) has recently emerged as a powerful technology with wide applications across many sectors, especially in the pharmaceutical industry. The pharmaceutical sector has become one of the leading beneficiaries of AI due to its ability to handle complex data, reduce time consumption, and improve decision-making. This review highlights the significant role of AI in various pharmaceutical areas such as drug discovery and development, drug repurposing, clinical trials, and enhancement of overall pharmaceutical productivity. AI-based tools help in identifying potential drug candidates, predicting drug–target interactions, optimizing formulations, and improving clinical trial design, thereby reducing human effort and accelerating research outcomes. The integration of AI also supports cost reduction and increases efficiency throughout the drug development pipeline. In addition, this review discusses the major tools and techniques used in AI applications, including machine learning and deep learning models. The existing challenges such as data quality, regulatory concerns, and lack of transparency are also addressed, along with possible strategies to overcome them. Finally, the future prospects of AI in the pharmaceutical industry are explored, emphasizing its potential to transform traditional drug development processes and improve patient outcomes. Overall, AI is expected to play a crucial role in shaping the future of pharmaceutical research and innovation.

Keywords: Artificial Intelligence, Pharmaceutical Industry, Drug Discovery, Drug Development, Drug Repurposing.

NETWORK PHARMACOLOGY REVEALS SYNERGISTIC MULTI-TARGET ANTI-ULCER MECHANISMS IN PLANT FORMULATIONS

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Abstract

Peptic ulcer disease is a complex condition driven by inflammation, oxidative stress, excess gastric acid, and weakened mucosal defenses. Traditional plant-based formulations are commonly used to treat ulcers, but their precise molecular actions are not fully defined. This study used a network pharmacology strategy to clarify the synergistic anti-ulcer mechanisms of selected medicinal plants. Bioactive phytoconstituents were filtered according to oral bioavailability and drug-likeness, and putative targets were obtained from bioinformatics resources. The resulting compound–target and protein–protein interaction networks identified key hub proteins such as TNF, IL-6, PTGS2, MAPK1, and AKT1. Enrichment analysis further indicated that NF- κ B, MAPK, PI3K-Akt, and gastric acid secretion pathways are critically involved. Collectively, these results indicate that plant formulations act through multi-target, multi-pathway mechanisms to produce anti-ulcer effects and substantiate their therapeutic promise.

Keywords: Peptic ulcer; Network pharmacology; Synergistic; Multi- target; Plant formulations

INTEGRATING ARTIFICIAL INTELLIGENCE IN NATURAL PRODUCT RESEARCH: NEW FRONTIERS IN PHARMACOGNOSY

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Abstract

Natural products remain a vital source of therapeutic agents, yet their development is often limited by chemical complexity, variability, and time-intensive experimentation. Recent advances in artificial intelligence (AI) offer powerful tools to accelerate plant-based drug discovery and formulation development. Machine learning and deep learning techniques are increasingly applied to metabolomic data, spectral analysis (LC–MS and NMR), and structure–activity relationship modeling to predict bioactive phytoconstituents and optimize extract standardization. This presentation focuses on the integration of AI in pharmacognosy with emphasis on plant-derived formulations. AI-assisted modeling enables prediction of drug release behavior, stability, and quality attributes, supporting rational formulation design and Quality by Design (QbD) approaches. The application of AI also aids in reducing batch-to-batch variability and improving reproducibility of herbal products. Challenges related to data quality, interpretability, and regulatory acceptance are briefly discussed. By combining traditional plant knowledge with AI-driven analytics, pharmacognosy can evolve into a more predictive, efficient, and translational discipline for modern pharmaceutical development.

Keywords: Artificial intelligence; Pharmacognosy; Natural products; Plant-based formulations; Machine learning

DUAL GIP/GLP-1 RECEPTOR AGONISM WITH TIRZEPATIDE: IMPLICATIONS FOR OBESITY AND CEREBROVASCULAR PROTECTION

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Abstract

Obesity is a chronic metabolic disorder associated with an increased risk of cardiovascular and cerebrovascular diseases, including ischemic stroke. Mounjaro® (tirzepatide) is a novel once-weekly dual glucose-dependent insulintropic polypeptide (GIP) and glucagon-like peptide-1 (GLP-1) receptor agonist that has demonstrated superior efficacy in weight reduction compared with existing incretin-based therapies. Clinical trials in patients with obesity, with or without type 2 diabetes mellitus, have shown that tirzepatide produces significant and sustained reductions in body weight, body mass index, and waist circumference, along with improvements in glycemic control, lipid parameters, and blood pressure. These pharmacologically mediated effects contribute to a substantial reduction in major cardiovascular risk factors closely linked to stroke development. Emerging cardiovascular outcome data suggest that tirzepatide and related incretin therapies may reduce the incidence of major adverse cardiovascular events, including stroke, primarily through metabolic regulation, anti-inflammatory actions, and endothelial function improvement. Additionally, preclinical evidence indicates potential neuroprotective effects of tirzepatide through modulation of blood–brain barrier integrity and reduction of neuroinflammation in ischemic conditions. Although direct clinical evidence for stroke prevention is still limited, current findings highlight tirzepatide as a promising pharmacotherapeutic agent with benefits extending beyond weight management. Further clinical studies are warranted to confirm its role in stroke risk modulation.

Keywords: Tirzepatide, Mounjaro®, Obesity, Dual incretin therapy, Stroke risk, Pharmacotherapy

TEUCRIUM POLIUM AS A MULTI-TARGET NEUROPROTECTIVE CANDIDATE AGAINST AMYLOID- β -INDUCED CHOLINERGIC DYSFUNCTION IN ALZHEIMER'S DISEASE

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Abstract

Alzheimer's disease (AD) is characterized by early cholinergic synaptic failure, disruption of brain networks, and progressive cognitive and behavioral impairments driven largely by amyloid- β ($A\beta$) toxicity. *Teucrium polium*, a medicinal plant with reported neuroactive and antioxidant properties, has emerged as a promising research candidate for neuroprotection; however, its role in modulating $A\beta$ -induced cholinergic network dysfunction and synaptic plasticity requires further investigation. The present study highlights *Teucrium polium* as a potential therapeutic candidate for delaying AD progression by restoring functional integrity of cholinergic circuits.

In experimental models, chronic intracerebroventricular administration of $A\beta$ (25–35) induced marked alterations in cholinergic pathways connecting the nucleus basalis magnocellularis (NBM) with the hippocampus and basolateral amygdala. These changes were characterized by reduced excitatory responses, enhanced inhibitory synaptic activity, and impaired short-term synaptic plasticity, reflecting network-level dysfunction associated with early AD pathology. Treatment with *Teucrium polium* significantly improved the balance between excitatory and inhibitory responses, strengthened synaptic transmission, and restored short-term plasticity within affected circuits. Acute administration of *Teucrium polium* transiently suppressed abnormal spiking activity in NBM neurons, suggesting a regulatory effect on cholinergic neuronal excitability.

Behavioral evaluation using the open field test demonstrated that $A\beta$ -treated rats exhibited increased anxiety-like behavior and reduced exploratory activity. These behavioral deficits were significantly attenuated following *Teucrium polium* treatment, indicating functional recovery associated with synaptic and network normalization.

In addition, evidence from systems-based approaches, including network pharmacology and metabolomics, supports the concept that bioactive phytochemicals from medicinal plants may act on multiple AD-relevant targets and signaling pathways involved in synaptic survival and neuroprotection. Collectively, these findings position *Teucrium polium* as a promising multi-target neuroprotective candidate capable of mitigating amyloid- β -induced cholinergic dysfunction and supporting its further exploration as a preventive strategy in Alzheimer's disease.

Keywords: *Teucrium polium*, Alzheimer's disease, Amyloid- β , Neuroprotection.

AI-DRIVEN DRUG REPURPOSING: A FAST-TRACK SOLUTION FOR UNMET MEDICAL NEEDS

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Abstract

The traditional drug discovery model is cumbersome, expensive, and has high, usually longer than ten years, failure rates, making it take more than ten years to turn a candidate compound into an approved drug. Nevertheless, many diseases, such as rare diseases, neurodegenerative diseases, and chronic inflammatory diseases, do not have effective treatments. One way to overcome these issues could be drug repurposing, i.e., the discovery of new therapeutic uses of existing or formerly approved drugs. Nevertheless, the conventional methods of repurposing are also mostly empirical and narrow.

The latest developments in artificial intelligence (AI) have greatly increased the effectiveness and accuracy of drug repurposing. Machine learning and deep learning models can take into account a wide range of biomedical data, such as chemical structures, gene expression relationships, protein interaction maps, disease networks, and patient data, to make predictions on new drug-disease relationships. These Artificial Intelligence approaches are known to save time on development, reduce expenses, and improve the chances of successful clinical outcomes by placing greater emphasis on high-potential candidates to be evaluated in experiments.

There are a number of successful case reports, including COVID-19, cancer, and neurodegenerative disorder repurposed drugs, which are the result of AI-based repurposing strategies. In this presentation, the author explains major methodologies, applications, and translation issues of AI-driven drug repurposing. Finally, the strategy is a rapid, economical way of supporting the unmet medical demands and enhancing the partnership between academia and industry to hasten the process of patient-centred drug development.

Keywords: AI, Drug repurposing, neurodegenerative, inflammatory disease

ROLE OF AI FOR THE TREATMENT OF POLYCYSTIC OVARIAN SYNDROME

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Polycystic ovarian disease (PCOD) is a multifaceted hormonal condition commonly observed in women of reproductive age and is marked by disturbances in ovarian activity and systemic metabolism. The disorder primarily involves irregular or absent ovulation, which leads to altered menstrual patterns and reduced fertility. In PCOD, ovarian follicles often fail to mature fully, resulting in their persistence within the ovaries rather than normal ovulatory release. Hormonal imbalance is a central feature of PCOD. Elevated androgen levels interfere with normal reproductive hormone signaling and may manifest as acne, excessive facial or body hair, and scalp hair thinning. These hormonal changes are frequently intensified by abnormal insulin action. Reduced insulin. This review highlights the underlying factors that contribute to the elevated health risks associated with PCOD and outlines available management approaches. In conclusion, abnormalities in hormone synthesis, impaired insulin action, increased oxidative stress, and genetic predisposition collectively influence the development of PCOD, with evidence suggesting that these disturbances may originate during early life, including the prenatal period. However, the complex interactions among these contributing factors remain incompletely understood. Further well-designed studies are required to clarify the mechanisms linking these susceptibility elements and to support the development of more precise and effective preventive and therapeutic strategies for PCOD.

Keywords- Polycystic Ovarian Disease (PCOD), Hormonal imbalance, Anovulation, Hyperandrogenism, Insulin resistance, Metabolic dysfunction, Menstrual irregularities, psychological impact

INVESTIGATION OF HEPATOPROTECTIVE ACTIVITY OF IPOMOEA STAPHYLINA IN *WISTAR ALBINO RATS*

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Background - The liver performs diverse functions that are essential for life. In the absence of reliable liver protective drugs, a large number of natural medicinal preparations are used for the treatment of liver diseases. Therefore, the present study aims to investigate the hepatoprotective effects of *Ipomoea staphylina* leaves aqueous extract (ISAE) against INH and RIF induced liver damage.

Methods - Animals were divided into five groups of five animals each as Group1 (saline solution), Group 2 (INH+RIF), Group 3 (INH+RIF+Silymarin), Group 4 (INH + RIF + Aqueous extract of *Ipomoea staphylina*, 200mg/kg), and Group 5 (INH + RIF + Aqueous extract of *Ipomoea staphylina*, 400mg/kg). Since day 1 to 9, the vehicles or drug therapies were administered orally, along with rifampicin and isoniazid. During medication treatment phase, the rats were feed a normal food and given free access to water. On day 10, blood was taken via the retro-orbital plexus under ether anesthesia. Collected samples was centrifuge and serum was separated for the estimation of Direct Bilirubin, Total Bilirubin, Triglycerides and Cholesterol by using kit method.

Result - The administration of ISAE showed hepatic protection at an oral dose of 200mg/kg and 400 mg/kg. ISAE significantly reduced the elevated direct and total bilirubin, Triglycerides and cholesterol level. These findings were confirmed with the histopathological observations, where ISAE was capable of reversing the toxic effects of INH and RIF on liver cells compared to that observed in INH and RIF-intoxicated animals. ISAE therapy has restored the elevated amounts of Biochemical markers in this design to near-normal amounts.

Conclusion - Our results show that ISAE has potential hepatoprotective effects at 200 mg/kg and 400 mg/kg.

Keyword - Hepatoprotective, *Ipomoea staphylina*, Total and direct bilirubin, triglycerides and cholesterol.

REVOLUTIONIZING SURGICAL CARE AND PATIENT MONITORING WITH AI- AND 5G-ENABLED REMOTE TECHNOLOGIES: SHAPING THE NEXT GENERATION OF MEDICAL PRACTICE

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Abstract

The combination of artificial intelligence (AI) and fifth generation (5G) wireless technology marks a significant change in surgical care and patient monitoring. AI provides powerful data analysis, predictive modelling, and support for decision-making in preoperative, intraoperative, and postoperative settings. Meanwhile, 5G offers reliable, low-latency communication and fast connectivity, which are crucial for real-time applications. Together, these technologies allow for precision-guided robotic surgery, remote surgical procedures, continuous patient monitoring, and risk assessment predictions. These advancements improve safety, efficiency, and access to healthcare services. This review summarises the latest developments in AI and 5G systems for surgical practice and patient monitoring. It highlights applications such as telesurgery, augmented and virtual reality-based visualisation, integration with the Internet of Medical Things (IoMT), and AI-driven predictive analytics. It also addresses challenges such as infrastructure needs, cybersecurity, interoperability, and ethical issues. By gathering current evidence and outlining future directions, this article emphasises the transformative impact of AI and 5G integration in shaping the future of healthcare. It also discusses key priorities for safe, fair, and sustainable implementation.

Keywords: *Surgical care; patient monitoring; artificial intelligence; fifth generation; remote technologies; robotic surgery*

MULTI-OMICS BIOMARKERS FOR PREDIABETES

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Molecular omics biomarkers are critical for the early detection and correct diagnosis of prediabetes by identifying biological modifications that take place prior to clinical hyperglycemia. These biomarkers demonstrate early insulin resistance, β -cell dysfunction, inflammation, and metabolic imbalance through genetics, transcriptomics, proteomics, metabolomics, and microbiomics. Omics-based biomarkers offer more sensitivity and predictive value than conventional glycemic markers, enabling for earlier intervention and customized techniques to halt prediabetes from progressing into diabetes.

Objective: This review aims to investigate the use of multi-omics technologies for biomarker discovery and precise prediabetes diagnosis, by various research paper which had an experimental animal model to identify new prediabetic biomarkers that emerge during the transition from prediabetes to type 2 diabetes and review article had detail about multi-omics biomarkers.

Methods: The experimental study used a high-fat diet-induced prediabetic mouse model with time-dependent serum and liver sampling, cytokine array profiling, qPCR, and protein validation to identify inflammatory and metabolic biomarkers, whereas the review paper synthesized evidence from genomics, epigenomics, transcriptomics, proteomics, metabolomics, microbiomics, and radiomics to evaluate emerging biomarkers and their clinical significance.

Keywords: Prediabetes, Multi-omics, Biomarkers, β -cell dysfunction, Early diagnosis, Precision medicine, Inflammation, Disease progression.

NEUROPROTECTIVE POTENTIAL OF PHYTOCONSTITUENTS AGAINST ALUMINIUM-INDUCED NEUROTOXICITY IN ALZHEIMER'S DISEASE

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Abstract

Alzheimer's disease is a complex, multifactorial neurodegenerative disorder characterized by progressive memory loss and cognitive decline. The disease is neuropathologically defined by the accumulation of extracellular A β plaques and NFTs. AD is the most common cause of dementia, with millions affected globally, and numbers projected to double every 20 years and shows rising prevalence, especially with aging populations. Starting at age 65, the risk doubles every five years. Aluminium that is widely used in foils, wrapping sheets, and utensils, is recognized as a neurotoxin that can induce oxidative stress, inflammation, and neuronal cell death and its ability to impair synaptic function links it to neurodegenerative diseases such as Alzheimer's. Aluminium accumulates in the brain, damages cellular components, disrupts neurotransmitter systems, and contributes to the formation of abnormal proteins like amyloid-beta and tau, leading to cognitive decline and memory issues. Many herbal extracts and natural phytoconstituents are effective in alleviating the symptoms and pathological effects of AD are β -sitosterol, gallic acid, lupeol, quercetin, kaempferol, myricetin, lauric acid, betulinic acid are derived from various plant species. Therapeutic efficacy of these phytoconstituent against Alzheimer's disease heads to be evaluated through pre-clinical and clinical study.

Keyword: Alzheimer's disease, Aluminium chloride

**PHYTOSOME BASED DRUG DELIVERY SYSTEM OF GALLIC ACID:
DEVELOPMENT, OPTIMIZATION, CHARACTERIZATION AND *IN SILOCO*
STUDIES**

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Abstract

Plants and their bioactive-chemicals have come up as a valuable treatment choice for various disorders throughout history. yet, low bioavailability and selectivity can limit their therapeutic applications. Numerous herbs and fruits including tea, cashew nuts, wine, amla, walnuts, blackberries pineapple, strawberries, mangoes, grapes and blueberries are reported to have gallic acid (GA), as main bioactive compound. It is reported in literature that GA shows numerous pharmacological actions, including anti-inflammatory, antioxidant, hepatoprotective, antibacterial, and antineoplastic properties. Despite its remarkable therapeutic potentials, GA is challenged by poor permeability and low bioavailability, which significantly restrict its clinical effectiveness. To address these limitations, advanced drug delivery strategies have become essential. Phytosomes, a specialized nano formulation has been developed for GA to improve its permeability and overcome bioavailability-related constraints. In present investigation GA was refluxed with HSPC and dichloromethane as solvent for 2 hr and hexane was added to obtain GA loaded phytosomes and developed formulation was optimized and characterized by standard and advanced methods. In silico studies was also performed.

Keywords: Gallic acid, Phytosomes, nano- formulation

IGF-AKT PATHWAY AS A NEUROPROTECTIVE AXIS: MECHANISMS AND THERAPEUTIC POTENTIAL

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Abstract

Neuronal survival and functional integrity are critically regulated by intracellular signaling pathways that respond to growth factors and metabolic cues. Among these, the insulin-like growth factor (IGF)–AKT signaling pathway has emerged as a central neuroprotective axis in the central and peripheral nervous systems. Activation of IGF receptors triggers the phosphoinositide 3-kinase (PI3K)/AKT cascade, leading to enhanced neuronal survival, synaptic plasticity, neurogenesis, and resistance to oxidative and apoptotic stress. Dysregulation of IGF–AKT signaling has been implicated in the pathogenesis of several neurological disorders, including Alzheimer's disease, Parkinson's disease, ischemic stroke, and diabetic neuropathy. This review summarizes the molecular mechanisms underlying IGF-AKT–mediated neuroprotection, with particular emphasis on its role in inhibiting apoptosis, modulating neuroinflammation, and maintaining mitochondrial function. Furthermore, the therapeutic potential of targeting the IGF-AKT pathway is discussed, highlighting current pharmacological strategies, experimental interventions, and emerging challenges such as pathway resistance and systemic side effects. Understanding the complex regulatory network of IGF-AKT signaling may facilitate the development of novel neuroprotective therapies for neurodegenerative and neurovascular disorders.

Keywords: IGF-AKT signaling pathway, Neuroprotection, Neuronal survival, Neurodegenerative disorders

**FORMULATION 4.0 - COMPUTATIONAL STUDIES OF PHYSICOCHEMICAL AND
SURFACE INTERACTION STUDIES OF BHASMA DRIVEN NANO-HYBRID DRUG
DELIVERY SYSTEM FOR COLORECTAL CANCER THERAPY BY USING
INDIGENOUSLY DEVELOPED FORMULATIONAI**

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Abstract

The evolution from Pharma 4.0 to 5.0 is transforming healthcare with a focus on human-centered innovations supported by artificial intelligence technology. In this context, the present study “Physicochemical and surface interaction studies for a bhasma-driven nano-hybrid drug delivery system for colorectal cancer.” The approach integrates traditional Ayurvedic materials with modern formulation science to create a stable and efficient delivery platform for chemotherapeutic agents.

To address the limitations of conventional ‘trial-and-error’ series of formulations, the nano-hybrid system is optimized using FormulationAI software by Geinforce Pvt. Ltd. This innovative tool features an efficient data-driven, rapid process for assessing physicochemical properties, including particle size, stability, polydispersity index, zeta potential, encapsulation efficiency, and drug loading, etc. The incorporation of an in silico predictive modeling approach further strengthens this workflow by enabling virtual screening and pre-formulation assessment before laboratory execution. Through this work, the results demonstrate the potential of integrating bhasma-based nano-hybrid platforms with AI-enhanced formulation optimization towards the development of more effective targeted therapies for colorectal cancer.

This work represents a forward-thinking implementation of an Industry 5.0 type of approach that promotes the accuracy of formulations and assist development of next-generation drug delivery technologies. This platform serves as one of the most effective approaches for defining and achieving an optimal Quality Target Product Profile (QTPP).

Keywords - Formulation AI, In silico optimization, Nanohybrid, Colorectal cancer therapy

AI IN PREDICTING DRUG RELEASE

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Abstract

The timing and rate at which a drug is released in the body is critical for its effectiveness. Traditional methods of predicting drug release often rely on laboratory experiments that can be time-consuming, costly, and sometimes inaccurate. Artificial Intelligence (AI) is emerging as a powerful tool to address these challenges by analyzing complex datasets, such as drug formulations, material properties, and patient-specific factors, to accurately predict drug release profiles. By leveraging machine learning algorithms, AI can simulate how a drug will behave in different conditions, helping researchers design better drug delivery systems and optimize dosages. This not only accelerates the development process but also improves patient outcomes by ensuring consistent and controlled drug release. The integration of AI in drug release prediction marks a significant step toward smarter, more efficient pharmaceutical research and personalized medicine.

Keywords: Artificial Intelligence, Drug Release, Controlled Drug Delivery, Machine Learning, Pharmaceutical Technology, Personalized Medicine

NANOFIBER-BASED BUCCAL DELIVERY SYSTEMS FOR BIOLOGIC THERAPEUTICS

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Abstract

Biologic therapeutics such as peptides, proteins, and nucleic acids offer high therapeutic efficacy but face major limitations with conventional oral delivery due to enzymatic degradation, poor permeability, and low bioavailability. Buccal drug delivery provides a non-invasive alternative route that bypasses hepatic first-pass metabolism and enables rapid systemic absorption. However, the buccal mucosa presents its own challenges, including limited residence time and restricted transport of large biomolecules. Nanofiber-based drug delivery systems have emerged as a promising strategy to overcome these barriers.

Nanofibers, typically fabricated using electro spinning, possess a high surface-to-volume ratio, excellent mucoadhesive properties, and the ability to encapsulate and protect sensitive biologics. These systems enable controlled drug release, improved stability, and enhanced permeation across the buccal mucosa. Various natural and synthetic polymers such as chitosan, gelatin, polyvinyl alcohol, and PLGA are commonly used to design biocompatible nanofiber mats for buccal application.

Recent advances demonstrate the potential of nanofiber-based buccal platforms for the delivery of insulin, vaccines, hormones, and immunotherapeutic. This review highlights the formulation approaches, mechanisms of drug release, evaluation methods, and future prospects of nanofiber-based buccal delivery systems for biologic therapeutics. With continued innovation, these systems may provide an effective alternative to injectable biologic therapies and significantly improve patient compliance.

Keywords: Peptides, proteins, nucleic acids, nanofiber-based buccal platforms

POLYPHARMACOLOGY MEETS AI: DESIGNING ONE DRUG FOR MULTIPLE TARGETS

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ABSTRACT

Polypharmacology or the utilization of a single drug influencing multiple targets in the body is the emerging trend for treating complex diseases such as cancer, neurological disorders and metabolic syndromes. Traditional pharmacology which is mainly based on the "one drug-one target" paradigm often does not address the multifactorial nature of such diseases.

Recent developments in Artificial Intelligence (AI) have revolutionized the field of polypharmacology by allowing to combine large and diverse biological data, such as genome, proteome and signalling pathway data. Based on artificial intelligence (AI) and models, drug-target interactions and synergistic target networks can be predicted. These approaches also offer the opportunity for the geometrical structure of molecules to be optimized, which will translate into better efficacy with less toxicity.

This presentation examines the interconnectedness in the cross-pollination of AI from academia to industry in order to accelerate the discovery of new drugs through experimentation and development. Assisting with multi-target drug design, AIs-based methods may decrease such rates and increase translational success. The role of machine learning, network-based methods and in silico validation in remolding the essence of modern pharmacology is highlighted. In general, polypharmacology/AI convergence represents a paradigm shift of more effective, safer and system-oriented therapeutic approaches.

Keywords: Artificial Intelligence, Polypharmacology, Machine Learning

COVALENT ORGANIC FRAMEWORKS FOR FOOD SAFETY: RECENT ADVANCES IN EXTRACTION AND SENSING OF FOOD CONTAMINANTS

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Abstract

Food safety remains a major global concern due to the widespread presence of chemical and biological contaminants, including pesticides, antibiotics, mycotoxins, heavy metals, and foodborne pathogens in complex food matrices. Conventional analytical materials often suffer from limited selectivity, sensitivity, and stability, restricting their effectiveness in real food analysis. In recent years, covalent organic frameworks (COFs) have emerged as a promising class of crystalline porous materials for food safety applications owing to their high surface area, tunable pore structures, and chemical robustness.

This review highlights recent advancements in COF-based materials for food safety reported over the last five years, with particular emphasis on their applications in sample preparation and sensing. The development of functionalized, magnetic, and conductive COFs for solid-phase extraction and microextraction techniques is discussed, demonstrating improved adsorption efficiency and selectivity toward diverse food contaminants. In addition, recent progress in COF-based electrochemical, fluorescent, and colorimetric sensing platforms for rapid and sensitive detection of foodborne hazards is critically analyzed. Practical applications in real food samples, such as milk, cereals, vegetables, and meat products, are also summarized. Finally, current challenges and future perspectives related to green synthesis, scalability, and real-world implementation of COF-based food safety technologies are addressed.

Keywords: Covalent organic framework, Food safety, mycotoxin, Magnetic COFs

PHARMACOGENOMICS IN PAIN MANAGEMENT: TOWARDS PRECISION MEDICINE AND REDUCED ADVERSE EVENTS

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Abstract

Pain management with opioid medications shows significant differences among patients in how well they work and their safety. This often leads to ineffective pain relief or negative reactions when using the standard "one-size-fits-all" dosing. Pharmacogenomics offers a way to tailor opioid treatment by considering genetic differences that affect how drugs are processed, transported, and how they respond at the receptor level. This poster emphasizes the importance of key genes involved in opioid pharmacokinetics (PK) and pharmacodynamics (PD), such as CYP2D6 and CYP3A4 (responsible for drug metabolism), ABCB1 (which handles drug transport across the blood-brain barrier), and OPRM1 (related to μ -opioid receptor binding and signaling). Variations in these genes can significantly change how prodrugs are activated, how quickly active drugs are cleared, how much drug reaches the central nervous system, and how sensitive receptors are. This can influence both treatment success and the risk of side effects. For instance, patients with CYP2D6 poor metabolism might find codeine less effective, while ultra-rapid metabolizers face a higher risk of side effects. Strategies like pre-emptive genotyping, clinical decision support systems, and adjusting doses based on genetics help create personalized opioid treatment plans. Overall, pharmacogenomics moves pain management away from general prescribing to a more precise, mechanism-based approach. This improves pain control, reduces the risk of adverse events, and enhances patient safety and health outcomes.

Keywords: Pharmacogenomics, Pain management, Opioids, CYP2D6, ABCB1, OPRM1, Precision medicine, Personalized therapy, Pharmacokinetics, Pharmacodynamics

ARTIFICIAL INTELLIGENCE IN PALLIATIVE CARE: ENHANCING COMMUNICATION, DECISION-MAKING, AND EMOTIONAL WELLBEING

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Abstract

Artificial Intelligence (AI) is one of the very recent technologies that allows computers to perform jobs that were previously only performed by humans. Palliative care, which focuses on comfort and quality of life, is one area of healthcare that now uses AI. This review examined how AI can improve communication and help patients and their families make challenging treatment decisions. Nine studies concerning AI and palliative care were found by the authors. The results were categorized into four areas based on Jean Watson's caring theory: emotional wellbeing; decision support through personalized patient data; communications enhancement and advance (end-of-life) care planning; and trust-building and patient-centered care.

Keywords: Artificial Intelligence (AI), Palliative Care, Patient-Centred Care, Decision-Making Support, Communication in Healthcare, End-of-Life Care, Emotional Wellbeing, Jean Watson's Caring Theory, Healthcare Technology

ROLE OF IMPAIRED MUCOSAL REPAIR MECHANISMS IN AGE-RELATED GASTRIC ULCER AND PHARMACOLOGICAL STRATEGIES FOR RESTORATION

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Abstract

Gastric ulcer remains a significant clinical problem in the elderly population, with aging itself emerging as an independent risk factor for impaired mucosal healing and increased ulcer recurrence. The integrity of the gastric mucosa depends on coordinated repair mechanisms, including epithelial restitution, angiogenesis, growth factor signaling, prostaglandin synthesis, and antioxidant defense systems. Aging is associated with dysregulation of these protective processes, characterized by reduced epithelial cell proliferation, diminished angiogenic response, impaired growth factor signaling, mitochondrial dysfunction, and exaggerated oxidative and inflammatory stress. These age-related alterations compromise mucosal repair, thereby increasing susceptibility to ulcer formation and delayed healing. This review critically examines the cellular and molecular mechanisms underlying impaired gastric mucosal repair in aging and highlights how these changes contribute to the pathogenesis of age-related gastric ulcer. Furthermore, current and emerging pharmacological strategies aimed at restoring mucosal integrity are discussed, including acid-suppressive agents, prostaglandin analogues, cytoprotective drugs, antioxidants, growth factor-based therapies, and novel pathway-targeted interventions. A comprehensive understanding of age-dependent changes in mucosal repair may facilitate the development of targeted pharmacological approaches to improve ulcer prevention and healing outcomes in elderly patients.

Keywords Gastric ulcer, aging

ISOLATION, STRUCTURAL CHARACTERIZATION, AND HEPATOPROTECTIVE POTENTIAL OF BIOACTIVE COMPOUNDS FROM *MORINGA* SPECIES

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Abstract

Moringa species, particularly *Moringa oleifera*, are well known for their medicinal properties and rich phytochemical composition. The present study was carried out to isolate bioactive compounds from *Moringa* species, to characterize their chemical structures, and to evaluate their hepatoprotective potential. Plant material was subjected to extraction using suitable solvents, followed by isolation of individual compounds through chromatographic techniques such as column chromatography and thin-layer chromatography (TLC). Structural characterization of the isolated constituents was performed using standard spectroscopic methods, including UV–Visible spectroscopy, FT-IR, NMR, and mass spectrometry.

Preliminary phytochemical analysis revealed the presence of flavonoids, phenolic compounds, and glycosides, which are widely reported for their antioxidant and liver-protective properties. The hepatoprotective activity of the isolated compounds was assessed using experimental models of chemically induced liver toxicity. Evaluation was carried out by measuring biochemical parameters such as serum transaminases, alkaline phosphatase, and bilirubin levels, along with histopathological examination of liver tissue. The results demonstrated a significant reduction in elevated liver enzyme levels and noticeable improvement in liver architecture when compared with the toxic control group. The observed effects were comparable to those of standard hepatoprotective agents.

The findings of the present study support the traditional use of *Moringa* species in the management of liver disorders and indicate their potential as a natural source of hepatoprotective compounds. Further studies may help in the development of safe and effective plant-based therapeutic agents for liver diseases.

Keywords: *Moringa* species; Bioactive compounds; Structural characterization; Hepatoprotective activity; Phytochemicals

DESIGN AND EVALUATION OF MODIFIED-RELEASE PELLETS OF ESOMEPRAZOLE AND ONDANSETRON

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Abstract

Peptic ulcers, sores on the stomach or duodenal lining, often result from damage caused by *Helicobacter pylori* (*H. pylori*) bacteria, compromising the protective mucous coating and allowing stomach acid to erode the sensitive lining. Modified release formulations, including enteric coatings and pellet-based drug delivery systems, aim to optimize drug bioavailability and achieve sustained therapeutic action. This study focused on preparing pellets containing Esomeprazole Magnesium Trihydrate and Ondansetron HCl via a wet extrusion process, evaluating their characteristics, and conducting in vitro dissolution studies. Pellet coating using Eudragit L100 at varying concentrations was performed, and the coated pellets were assessed for sphericity and coating efficiency through SEM analysis. Dissolution profiles were compared using the similarity factor (f_2), indicating similarity or dissimilarity between release profiles. Stability studies conducted under specified conditions aimed to evaluate the formulation's stability over time. The results highlighted the potential of these modified release systems to enhance drug delivery, offering insights into their efficacy and stability for further pharmaceutical applications.

Keywords: Peptic ulcer, pellet-based drug delivery system, bioavailability

APPROACH TOWARDS BIOMOLECULAR INTERACTION OF BENIDIPINEJaime Mendonsa^{1*}, Dr. Anand Mahajan²^{1*}Ph.D. Research Scholar, Department of Pharmaceutical Analysis, Goa College of Pharmacy, 18th June Road, Panaji-Goa, 403001, India²Professor, Department of Pharmaceutical Analysis, Goa College of Pharmacy, 18th June Road, Panaji-Goa, 403001, India**Corresponding author: jaimemary10@gmail.com****Abstract**

The drug benidipine (BEN) is fourth-generation calcium channel blocker, generally prescribed for the treatment of hypertension in India. The biomolecular interaction of BEN was studied with Bovine Serum Albumin (BSA) and Calf Thymus DNA (ct-DNA) to generate valuable pharmacological information. The interaction of BEN with BSA was studied using UV-visible, fluorescence spectrophotometry and circular dichroism (CD). The UV-visible spectrophotometric study showed increased absorbance at 280 nm, while fluorescence study showed a concentration-dependent decrease in BSA fluorescence intensity with a blue shift in emission maxima, indicating static quenching. Synchronous fluorescence spectrophotometry (SFS) was used to study structural changes in BSA upon interaction with BEN. A concentration-dependent decrease in fluorescence intensity and a blue shift in emission maxima for tyrosine and tryptophan residues indicated conformational changes. These shifts suggested a more hydrophobic microenvironment around the residues, reflecting BEN-induced structural rearrangement in BSA. Three-dimensional (3D) fluorescence spectrophotometry revealed conformational changes in BSA upon interaction with BEN. Increased Rayleigh scattering and decreased fluorescence intensity, along with a blue shift in emission for tryptophan and tyrosine residues, indicate structural alterations. These changes suggest an expanded BSA structure and a modified microenvironment around key aromatic residues due to BEN binding. Circular dichroism (CD) study confirmed a slight reduction in α -helical content, further supporting structural changes in BSA upon BEN binding. Additionally, agarose gel electrophoresis demonstrated BEN's interaction with Calf Thymus DNA (Ct-DNA), suggesting potential implications for its biological activity. These results contribute to a better understanding of BEN's pharmacokinetic and pharmacodynamic profiles through its interaction with plasma proteins and nucleic acids.

Keywords: Cilnidipine, Bovine Serum Albumin, UV-Visible Spectrophotometry, Fluorescence Quenching, Molecular Docking, Gel electrophoresis, Calf Thymus DNA Interaction

ROLE OF PHYTOCONSTITUENTS IN MSG INDUCED HEPATOTOXICITY

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Liver is a highly complex organ with digestive, endocrine, and immune-regulatory functions, the liver is crucial in maintaining physiological homeostasis through its roles in metabolism, detoxification, and immune response. Various factors including viruses, alcohol, metabolites, toxins, food additives and other pathogenic agents can compromise liver function, leading to acute or chronic injury that may progress to end-stage liver diseases. Currently, liver diseases contribute to approximately 2 million deaths globally (4% of all global deaths) each year, imposing significant economic and social burdens worldwide. Liver disease is a major health concern, currently ranking as the 11th leading cause of death globally. There are several food additives are widely used all over the world to enhance food palatability like Monosodium glutamate (msg) Nitrosamines and titanium dioxide etc. (MSG) induces hepatotoxicity by generating oxidative stress in liver cells. Excess glutamate increases reactive oxygen species, depletes antioxidants, and causes lipid peroxidation of hepatocyte membranes. This leads to mitochondrial dysfunction, enzyme leakage, and hepatocyte damage, resulting in liver injury. Many herbal/natural phytoconstituents like quercetin, kaempferol, Rutin and hyperin possesses significant hepatoprotective activity and may serve as a potential natural therapeutic agent for the management of hepatic disorders. The exact mechanism & efficacy of these phytoconstituents needs to be explained via detected pharmacological studies. These phytoconstituents can be utilized to protected the hepatotoxicity.

Keyword: Hepatotoxicity, food additives (MSG)

BRIDGING ACADEMIA AND INDUSTRY: HARNESSING ARTIFICIAL INTELLIGENCE FOR THE FUTURE OF PHARMACEUTICALS

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Abstract

(AI) is drastically changing the pharmaceutical sector. Machine learning, data analytics, and natural language processing are examples of AI technologies that make it possible to analyze big datasets efficiently, identify therapeutic targets early, forecast medication responses, and optimize clinical trial design. In pharmaceutical research, these applications aid in lowering development time, expense, and failure rates. Through basic research, algorithm creation, and innovation in AI techniques, academic institutions make a substantial contribution. In the meantime, the pharmaceutical sector offers large-scale implementation, manufacturing capacity, regulatory knowledge, and real-world clinical data. The translation of AI-driven research into useful applications is frequently hampered by a lack of collaboration between academia and industry, despite their complimentary responsibilities. There are still issues including regulatory concerns, conflicting research goals, and obstacles to data exchange. To fully exploit the potential of AI, significant collaborative collaborations are necessary to bridge the gap between academia and industry. This kind of cooperation can guarantee ethical and legal compliance, speed up pharmaceutical discovery, and enhance healthcare results.

Keywords: Artificial intelligence, pharmaceutical industry, academia-industry collaboration, drug discovery, clinical trial optimization, patient-centered healthcare, machine learning, data analytics

INTEGRATING AI AND NMR TO ACCELERATE PHARMA: ALIGNING ACADEMIC INSIGHT WITH INDUSTRIAL NEEDS

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Abstract

Artificial intelligence (AI) is reshaping the pharmaceutical landscape by accelerating drug discovery, optimizing development pipelines, and enabling data-driven decision-making. As R&D faces rising costs, long timelines, and increasingly complex datasets, AI-driven methods such as machine learning, deep learning, and predictive analytics offer powerful solutions. Nuclear magnetic resonance (NMR) spectroscopy is also undergoing a transformation through AI, with automated spectral interpretation, structural elucidation, impurity profiling, and metabolomics analysis becoming faster and more accurate. The convergence of AI and NMR is expanding the applications of both technologies, strengthening early discovery, enhancing analytical robustness, and improving downstream development and manufacturing. Academic research continues to drive innovation in AI algorithms and NMR methodologies, while industry provides the infrastructure, regulatory expertise, and scalability required for real-world implementation. Yet misalignment persists due to differing priorities, timelines, data-sharing practices, and performance expectations. This work examines how AI-enabled NMR applications can serve as a shared platform for collaboration, bridging the gap between academic innovation and industrial needs. Strategies such as joint research models, shared data ecosystems, translational training, and coordinated governance frameworks are essential to harmonize efforts. As AI and NMR become increasingly central to pharmaceutical innovation, closer alignment between academia and industry is critical. Strengthening this partnership will ensure that these technologies deliver meaningful, scalable, and patient-centered advances across the drug discovery and development continuum.

Keywords: Artificial Intelligence in Drug Discovery; NMR Spectroscopy; Academia Industry Collaboration; Pharmaceutical Innovation

NANOBUBBLES IN MEDICINE AND TECHNOLOGY: SMALL STRUCTURES WITH BIG IMPACT

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Abstract

Nanobubbles are nanoscale gas-filled structures, typically less than 200 nm in diameter, that exhibit remarkable stability and unique physicochemical properties. In recent years, nanobubbles have gained significant attention in both medicine and technology due to their high surface area, negative surface charge, and enhanced gas solubility. In medical applications, nanobubbles are emerging as promising tools for targeted drug delivery, diagnostic imaging, cancer therapy, wound healing, and antimicrobial treatments. Their ability to improve oxygen delivery, enhance ultrasound contrast, and increase drug penetration makes them highly effective in precision medicine. Oxygen and ozone nanobubbles, in particular, show potential in treating hypoxia-related conditions and infections.

Beyond healthcare, nanobubbles play a transformative role in technological and industrial sectors. They are widely applied in water and wastewater treatment, agriculture, food processing, and environmental remediation, where they enhance mass transfer, pollutant degradation, and microbial control. Nanobubble technology also contributes to improved cleaning efficiency and reduced chemical usage, supporting sustainable and eco-friendly practices. Despite these advantages, challenges related to large-scale production, standardization, and long-term safety remain. Continued research and interdisciplinary collaboration are essential to fully harness the potential of nanobubbles. Overall, nanobubbles represent small structures with a big impact, offering innovative solutions across diverse fields.

Keywords: Nanobubbles, Drug Delivery, Medical Applications, Water Treatment, Nanotechnology, Sustainable Technology

IN-VITRO INVESTIGATION OF THE ANTI-INFLAMMATORY AND ANTI-ARTHRITIC PROPERTIES OF *FLACOURTIA JANGOMAS*

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Abstract

Arthritis is a chronic inflammatory disorder characterized by synovial inflammation, cartilage degradation, oxidative stress and progressive joint dysfunction, leading to pain and disability worldwide. Despite the availability of non-steroidal anti-inflammatory drugs and disease-modifying agents, long-term therapy is often limited by adverse effects, highlighting the need for safer, plant-derived alternatives. *Flacourtia jangomas* (Lour.) Raeusch, traditionally used in South Asian folk medicine, is rich in flavonoids, phenolic acids and other bioactive constituents known for anti-inflammatory and antioxidant properties. The present study aimed to evaluate the in-vitro anti-arthritic potential of *F. jangomas* extracts using established experimental models. Methanolic extracts were assessed through protein denaturation inhibition, human red blood cell (HRBC) membrane stabilization, cyclooxygenase/lipoxygenase inhibition and antioxidant assays (DPPH/ABTS). The extracts exhibited significant, concentration-dependent inhibition of protein denaturation and stabilization of erythrocyte membranes, indicating protection against inflammatory damage associated with arthritis. Additionally, notable antioxidant activity and enzyme inhibition suggest modulation of oxidative and inflammatory pathways involved in arthritic progression. These findings scientifically validate the traditional use of *F. jangomas* in inflammatory disorders and demonstrate its promising anti-arthritic potential. Further mechanistic studies, bioactive compound isolation and in-vivo evaluations are warranted to establish its therapeutic relevance in arthritis management.

Keywords: *Flacourtia jangomas*; Anti-arthritic activity; In-vitro study; Inflammation; Antioxidant activity.

CAR-T CELLS THERAPY IN GLIOBLASTOMA: A SYSTEMATIC REVIEW ON MOLECULAR TARGETS AND TREATMENT STRATEGIES

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Abstract

Glioblastoma is the most severe initial malignant brain tumor in adults that has a limited survival value based on traditional treatment methods of surgery, radiotherapy, and chemotherapy. Chimeric antigen receptor T-cell therapy has recently become a promising immunotherapeutic intervention in the management of Glioblastoma because it has the capacity to selectively kill tumor cells. This is a systematic review critically appraising the current progress in chimeric antigen receptor T-cell therapy in the treatment of glioblastoma, especially the molecular targets and the treatment strategies that have been investigated in preclinical and clinical trials. The major tumor-associated antigens, such as EGFRvIII, IL13R α 2, HER2, B7-H3, and GD2 are addressed in terms of their expression patterns, biological contexts and clinical implications. Other treatment modalities, including locoregional versus systemic delivery, multi-target chimeric antigen receptor designs, and combination modalities to overcome tumor heterogeneity and the immunosuppressive tumor microenvironment are also mentioned in the review. Although the clinical outcomes are promising during the early phases, the problem of antigen evasion, poor chimeric antigen receptor T-cell persistence, neurotoxicity, and increased manufacturing difficulties remain barriers to effective clinical implementation. Altogether, Chimeric antigen receptor T-cell therapy is a fast-growing and novel therapeutic concept of Glioblastoma treatment, and further optimization of targets, delivery regimens and combinatorics is necessary to increase treatment efficacy and patient survival.

Keywords: CAR-T cell therapy, Glioblastoma, Molecular targets, Immunotherapy, Tumor microenvironment, Treatment strategies

EMERGING BIOMATERIALS AND REGENERATIVE THERAPIES IN CHRONIC NON-HEALING WOUND MANAGEMENT

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Abstract

Chronic non-healing wounds constitute a significant and escalating global health burden, affecting millions of patients across diverse clinical settings and imposing substantial socioeconomic costs. These wounds arise due to a complex interplay of pathological mechanisms including persistent inflammation, impaired angiogenesis, hypoxia, oxidative stress, protease–growth factor imbalance, and microbial biofilm formation. Conventional wound care approaches, although fundamental, frequently fail to adequately address these underlying biological abnormalities, resulting in delayed healing, recurrent breakdown, or complete non-closure. In recent years, rapid advances in biomaterials science, growth factor biology, and regenerative medicine have revolutionized the management of chronic wounds. Bioactive and smart biomaterials, controlled drug delivery systems, growth factor-based therapies, stem cell and exosome-based regenerative approaches, and engineered skin substitutes have demonstrated promising preclinical and clinical outcomes. This review provides a comprehensive and critical evaluation of the current understanding of chronic non-healing wound pathophysiology and discusses recent advances in biomaterials and regenerative strategies aimed at restoring normal wound healing. Furthermore, translational challenges, clinical evidence, and future perspectives, including personalized wound care and integration with digital health technologies, are highlighted. Collectively, this review underscores the transformative potential of advanced biomaterial and regenerative approaches in improving outcomes for patients with chronic non-healing wounds.

Keywords: Chronic non-healing wounds, biomaterials, wound healing, growth factors, regenerative medicine, stem cells, exosomes.

THERAPEUTIC POTENTIAL OF 7-HYDROXYFLAVONE IN LETROZOLE-INDUCED POLYCYSTIC OVARIAN SYNDROME VIA REGULATION OF OXIDATIVE STRESS, INFLAMMATION, HORMONAL AND BIOCHEMICAL DYSREGULATION

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Abstract

Polycystic ovarian syndrome (PCOS) is a common gynaecological and endocrinological disorder that causes anovulatory infertility affecting 4-10% of women of reproductive age. Although current therapeutic options exist, many are accompanied by adverse effects, underscoring the need for safer and more effective alternatives. 7-Hydroxyflavone (7-HF), a natural flavonoid, has demonstrated notable biological properties; however, its therapeutic potential in PCOS remains unexplored. The current study aimed to explore the possible role of 7-HF in treating letrozole-induced PCOS in rats.

Methods: PCOS was induced in Female Wistar Rats by the administration of letrozole (1 mg/kg, p.o.) for 21 days. After induction, rats were treated with 7-Hydroxyflavone at various doses (5, 10 and 15 mg/kg) and metformin (300 mg/kg) for 14 consecutive days.

Result: Letrozole-induced PCOS was characterized by disrupted estrous cycle, increased body and ovarian weights, cystic ovarian follicles, altered metabolic and hormonal levels, enhanced oxidative stress (elevated LPO, SOD; reduced GSH), and elevated inflammatory markers (TNF-alpha and IL-6). Treatment with 7-Hydroxyflavone significantly mitigated these alterations, restored normal estrous cycles and hormonal balance, reduced oxidative stress and inflammation, and improved ovarian histology in a dose-dependent manner. **Conclusion:** This study provides the first evidence that 7-Hydroxyflavone effectively mitigates letrozole-induced PCOS manifestations in rats, likely through its antioxidant, anti-inflammatory, and endocrine-modulating effects. These findings support the therapeutic potential of 7-HF as a novel candidate for PCOS management.

Keywords: Polycystic Ovarian Syndrome (PCOS), 7- Hydroxyflavone (7-HF), Letrozole, Estrus Cycle (EC), Metformin

FORMULATION AND EVALUATION OF PRNIOSONES OF BCS CLASS-IV DRUG FOR TOPICAL TREATMENT OF FUNGAL INFECTION

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Abstract

By reducing physical stability problems minimizing the adverse effect of conventional intravenous and localizing the drug at the site of action the current study on drug proniosomal aims to increase patient compliance. Methods. The coacervation phase separation technique is used to create proniosomal gels with varying concentrations of non-ionic surfactants (tween and span) for uniform vesicles providing prolonged release. The prepared gels were evaluated for viscosity, pH, spread ability, entrapment efficacy, drug content homogeneity extrudability, in vitro drug release, permeability, and stability this study looked into the use of proniosomal gel for the topical administration of an antifungal drug used to treat fungal infections caused by pathogenic fungi. Gels were evaluated using a variety of metrics, including particle size (PS), drug entrapment efficiency percentage (EE%), and in vitro drug release. The testing results show that the generated formulae are nanosized have acceptable, and the diffusion from the gels produced the desired sustaining effect. The results showed that the antifungal drug in the generated gel had strong physical stability and a well-defined spherical vesicle with clear boundaries better microbiological action, as shown by a larger zone of inhibition against *Candida albicans*. This study showed that when antifungal drug is applied topically to treat fungal infections, the proniosomal gel can achieve the desired sustainment effect.

Keywords: Antifungal drugs BCS-IV drug, Proniosomal gel, Topical treatment

AI AS THE MOST PROMISING TECHNOLOGY IN THE DEVELOPMENT OF NUTRACEUTICALS AND PHARMACEUTICALS

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Abstract

The scientific community has taken notice of AI's remarkable growth and accomplishments, and it is gradually being acknowledged in the public sphere. Conducting a scoping review of current research and potential future trajectories is essential given the rapid expansion of artificial intelligence (AI) in precision nutrition. Artificial intelligence (AI) is the ability of computer systems to perform tasks that typically require human intelligence. AI is constantly developing and transforming the healthcare sector, particularly in the field of nutrition. By identifying potential drug candidates through biological database mining and enhancing clinical trial designs to increase patient recruitment and retention, we investigate AI's potential to speed up drug discovery. The conventional method of developing new drugs is costly, time-consuming, and frequently results in a high failure rate. The introduction of numerous new medications in the pharmaceutical and nutraceutical industries shows how advancements in artificial intelligence have created exciting new possibilities for intelligent modeling. The pharmaceutical and nutraceutical industries have seen a revolution thanks to artificial intelligence (AI), which has improved patient care, drug development, and discovery. AI has improved productivity, accuracy, and creativity in the field by utilizing machine learning (ML), deep learning, natural language processing (NLP), and robotic automation.

Keywords: AI Resources, AI Innovations in the Healthcare Sector, Machine Learning, Nutraceuticals and Pharmaceuticals, Dietary Supplements.

NANO-ARCHITECTING SMART AYURVEDIC NANOSURGEONS: SELF-ASSEMBLY OF SODIUM ALGINATE AND GUAR GUM AS PH RESPONSIVE DRUG VEHICLES FOR AYURVEDIC FORMULATIONS

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Abstract

Ayurvedic medicines although being therapeutically potent, often undergo pharmacological hurdles of low solubility, poor bioavailability and systemic clearance due to impaired absorption of its phytoconstituents. Nanotechnology has revolutionized field of pharmacology by transforming how drugs could be in controlled, sustained and targeted manner. This study explores development of '*Ayurvedic nanosurgeons*' designed to navigate gastrointestinal tract to deliver payload in sustained-controlled manner. The architecting plan for these nanosurgeons is through electrostatic self-assembly of two polysaccharides- sodium alginate and guar gum. By optimizing polymer ratios, a dense interpenetrating network of polymer could be engineered as delivery vehicle to encapsulate ayurvedic medicine using 'green' approach via '*Ionotropic Gelation*' technique. The self-assembly of dual-polymer system provides a robust, eco-friendly platform for efficient delivery of ayurvedic medicine. The natural polymer matrix ensures superior encapsulation and pH-responsive release of ayurvedic payload, preventing drug disintegration in acidic environment of stomach (pH 1.2) and undergo controlled and sustained swelling and degradation in neutral intestinal environment (pH 6-7). Thus, this study demonstrates potential of transforming traditional ayurvedic formulation into autonomous drug delivery units, enhancing bioavailability and therapeutic index through green nanotechnology.

Keywords: Ayurvedic Nanomedicine, Self-assembly, Ionotropic Gelation, pH-responsive Release, Biopolymers

CHRONOPHARMACOLOGICAL IMPACT OF SPIRITUAL PRACTICES IN THE MANAGEMENT OF GENERALIZED ANXIETY DISORDER (GAD): A SCIENTIFIC AND PHARMACOLOGICAL REVIEW

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Abstract

Generalized anxiety disorder (GAD) is one of the health issues that has not lost its importance in the world despite the incredible progress in the field of pharmaceutical interventions. Compiling evidence in the past two decades has shown that the time of medication intake, in conjunction with psycho-spiritual practices including meditation, prayer, reciting mantras, yogic breathing procedures, and rituals of the circadian rhythm, can be used to upregulate and down-regulate therapeutic effectiveness. The chronopharmacological concepts are synthesized in the current review with recent facts on spiritual activities as a reflection on the manner in which both interrelate to modify neuroendocrine rhythms, autonomic equilibrium, and sensitivity to anti-anxiety pharmacologic intervention. The paper highlights how spiritually based therapies, in conjunction with circadian biology, normalize the dysregulated levels of cortisol, balance sympathetic-parasympathetic rhythms, and improve the activities of serotonergic and GABAergic circuits. The following parts of the paper discuss the pharmacodynamic results with increased sleep structure, lower oxidative stress, and epigenetic changes with sustained spiritual involvement. Combined, the evidence presented supports an integrative theory where the role of spirituality is that of a significant chronobiological controller and not an add-on, thus having the potential to change the course of GAD treatment.

Keywords: Generalized anxiety disorder, Chronopharmacology, Spiritual practices, Circadian rhythm.

ADVANCEMENTS IN NOSE-TO-BRAIN DRUG DELIVERY FOR ALZHEIMER'S DISEASE: A REVIEW OF NANOCARRIERS

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Abstract

Alzheimer's disease (AD) is a progressive neurodegenerative condition characterized by cognitive decline. Current FDA-approved treatments, including cholinesterase inhibitors and NMDA receptor antagonists, offer limited efficacy. To enhance therapeutic delivery to the brain, intranasal route provides targeted delivery by olfactory and trigeminal nerve pathways to bypass the blood-brain barrier. Microneedles, a novel drug delivery system, provide a promising solution by overcoming physiological barriers such as the skin and nasal mucosa. These microneedles provide targeted drug delivery through minimal invasiveness and enhancing bioavailability. Various microneedle types such as solid, coated, hollow, dissolving, and hydrogel-forming-enable controlled release of drugs, vaccines, and proteins, and can be tailored for specific applications like Alzheimer's treatment. Microneedles represent a versatile, efficient method to improve brain drug delivery.

Keywords: Microneedles, Nose to Brain delivery, Targeted strategies, Alzheimer's Disease

HARNESSING ARTIFICIAL INTELLIGENCE TO ALIGN ACADEMIC DISCOVERY WITH PHARMACEUTICAL INDUSTRY DEMANDS

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Abstract

Artificial Intelligence (AI) is redefining pharmaceutical research and development by enabling data-driven decision-making across the entire drug development pipeline. While academic institutions continue to generate innovative AI models and computational methodologies, their translation into industrial pharmaceutical practice remains limited due to misalignment in objectives, scalability, regulatory readiness, and data integration. This presentation examines how AI can effectively align academic discovery with pharmaceutical industry demands by fostering translational research frameworks and collaborative innovation ecosystems. Key applications of AI in drug discovery, target validation, lead optimization, clinical trial design, and pharmacovigilance are discussed, highlighting their potential to reduce development timelines, costs, and attrition rates. Emphasis is placed on the role of shared datasets, standardized validation protocols, and interdisciplinary training in enhancing the transfer of academic AI innovations into industry-ready solutions. The presentation also addresses regulatory, ethical, and data-governance challenges associated with AI adoption, underscoring the need for early regulatory engagement and transparent model development. Selected case examples illustrate successful academia industry collaborations where AI-driven approaches have accelerated therapeutic development while maintaining scientific and patient-centric integrity. By strategically integrating academic innovation with industrial priorities, AI offers a transformative pathway to advance pharmaceutical productivity and deliver safer, more effective therapies to patients worldwide.

Keywords: Artificial Intelligence, Pharmaceutical Industry, Academic Research, Drug Development, Translational Innovation.

HEPATOPROTECTIVE EFFECT OF MINT (MENTHA PIPERITA) AND LEMON (CITRUS LIMON) EXTRACT AGAINST ANTI-TUBERCULAR DRUG INDUCED HEPATOTOXICITY

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Abstract

Anti-tubercular drugs, particularly isoniazid and rifampicin, are the cornerstone of tuberculosis therapy; however, their prolonged administration is frequently associated with hepatotoxicity, which remains a major limitation in effective disease management. Hepatic injury induced by these drugs is primarily attributed to oxidative stress, lipid peroxidation, and the formation of toxic metabolites. The present investigation is evaluating the hepatoprotective potential of Mint (*Mentha piperita*) and Lemon (*Citrus limon*) extracts against anti-tubercular drug-induced hepatotoxicity. Hepatotoxicity was experimentally induced using isoniazid and rifampicin, followed by oral administration of the selected herbal extracts. Liver function was assessed through biochemical estimation of serum transaminases (SGOT and SGPT), alkaline phosphatase, and total bilirubin levels, along with histopathological examination of hepatic tissue. Treatment with Mint and Lemon extracts produced a significant normalization of altered biochemical parameters and marked improvement in liver. The observed hepatoprotective activity may be attributed to the antioxidant and free-radical-scavenging properties of the phytoconstituents present in the extracts.

Keywords: Hepatoprotective, Antioxidant, Antitubercular drugs, Oxidative stress, SGOT, SGPT.

AI-DRIVEN PERSONALISED HEALTHCARE: MONITORING, DATA ANALYSIS AND ASSISTANCE

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Abstract

Artificial Intelligence (AI) has propelled the potential for moving toward personalized health and early prediction of diseases. AI models can turn continuous signals such as heart rate, movement, sleep, and phone interactions into digital biomarkers that show health trends in real time. This data can be collected using digital twins, federated learning frameworks, and multimodal data analytics enable real-time integration of genomic, clinical, and lifestyle data to create highly individualised care models. Such tools can enable early detection, useful alerts, and timely advice to improve self-care and clinical decisions. Additionally, AI-driven wearables and IoT-based biosensors ways in which Artificial Intelligence can significantly contribute to and revolutionise the pharmacy filed. Clear workflows can be designed for collecting sensor data, applying machine learning to find patterns, and providing suggestions that people and clinicians can understand. Concerns like data quality, privacy and security issues and ethical guidelines from WHO, such as transparency, accountability, safety, and equity for all users can also be ensured with the use of Artificial Intelligence. The goal is to show simple, practical steps that are safe, explainable, and truly useful for patients and medical professionals. This study highlights the significance of AI and digital innovation in healthcare and pharmaceuticals, advocating for the ethical and responsible application of artificial intelligence to enhance patient care and clinical outcomes. The integration of AI technologies enables the development of personalized, accurate, and accessible health monitoring systems, paving the way for more proactive, efficient, and data-driven healthcare solutions

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

PHYTOCHEMICAL-BASED ON GREEN NANO CARRIERS FOR TARGETED THERAPY IN RARE CANCER

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Abstract

Rare cancers present significant therapeutic challenges due to their heterogeneity, limited clinical data, and lack of effective targeted treatment strategies. Recent advances in green nanotechnology have opened new avenues for the development of sustainable and biocompatible drug delivery systems. Phytochemical-based green nanocarriers, synthesized using plant-derived bioactive compounds, have emerged as promising platforms for targeted cancer therapy. These phytochemicals act as reducing and stabilizing agents during nanoparticle synthesis while also imparting intrinsic anticancer, antioxidant, and anti-inflammatory properties. Green nanocarriers, including metallic, polymeric, and lipid-based nanoparticles, demonstrate enhanced drug loading capacity, improved stability, and controlled release behavior. Functionalization of these nanocarriers with targeting moieties enables selective delivery to tumor tissues, thereby reducing systemic toxicity and improving therapeutic efficacy. In the context of rare cancers, phytochemical-based green nanocarriers offer a cost-effective and environmentally sustainable strategy to enhance drug bioavailability, overcome biological barriers, and modulate the tumor microenvironment. This approach holds significant potential for advancing targeted and personalized therapies for rare cancer management.

Keywords: Phytochemicals; Green nanotechnology; Nanocarriers; Targeted drug delivery; Rare cancers; Sustainable therapeutics; Plant-mediated nanoparticles

ARTIFICIAL INTELLIGENCE IN PHARMACOVIGILANCE AND ADR MONITORING

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Abstract

By detecting, evaluating, and averting adverse drug reactions (ADRs), pharmacovigilance is essential to maintaining medication safety. Conventional pharmacovigilance systems frequently result in underreporting, delayed signal detection, and increased human error because they mainly rely on spontaneous reporting and manual data interpretation. Opportunities to enhance medication safety monitoring through the use of artificial intelligence (AI) have been made possible by the quick expansion of healthcare data. Large and complicated datasets from individual case safety reports, electronic health records, clinical trials, and social media platforms can be efficiently analyzed thanks to AI technologies like machine learning, deep learning, and natural language processing. These solutions facilitate real-time ADR monitoring, improve early signal recognition, and forecast possible safety hazards. AI-powered Pharmacovigilance systems lower operating costs and workload while increasing precision, speed, and decision-making. The use of AI in pharmacovigilance has a lot of potential despite obstacles with data quality, algorithm bias, ethical issues, and regulatory acceptability. All things considered, proactive drug safety monitoring and better patient care can be achieved with artificial intelligence.

Keywords: Adverse drug reaction, pharmacovigilance, artificial intelligence

CBD (CANNABIDIOL)-BASED HERBAL PAIN RELIEVER LOTION FOR NEUROPATHIC PAIN

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Abstract

Neuropathic pain is a chronic and debilitating condition arising from damage or dysfunction of the nervous system, often associated with diabetes, post-herpetic neuralgia, chemotherapy, or nerve injury. Conventional pharmacological treatments frequently provide incomplete relief and may cause significant adverse effects with long-term use. Cannabidiol (CBD), a non-psychoactive phytocannabinoid derived from *Cannabis sativa*, has gained increasing attention due to its analgesic, anti-inflammatory, and neuroprotective properties. This work presents the concept and therapeutic potential of a CBD-based herbal pain reliever lotion formulated for topical application in neuropathic pain. The lotion combines CBD with selected herbal actives known for their anti-inflammatory, analgesic, and nerve soothing properties. Topical delivery allows localized action at the site of pain, minimizes systemic exposure, and improves patient compliance. The formulation aims to provide safe, effective, and non-addictive pain relief, positioning it as a promising complementary or alternative approach for neuropathic pain management.

Keywords: Cannabidiol, CBD lotion, Neuropathic pain, Herbal topical formulation, Pain management, Endocannabinoid system

DEVELOPMENT AND FORMULATION OF ANTI-HEMORRHOID ALUM SUPPOSITORIES

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Abstract

Alum is widely recognized for its astringent and hemostatic properties, yet its therapeutic use in modern dosage forms remains limited. To enhance its applicability, suppositories were developed and systematically evaluated. Alum was authenticated by ion identification tests and pH determination, ensuring purity and quality. Suppositories were prepared using the fusion method with polyethylene glycol-4000 (PEG-4000) and shea butter as bases, followed by solidification under refrigeration. The prepared formulations were assessed for physical appearance, disintegration time, in-vitro drug release, content uniformity, and weight variation. All suppositories were found to be white, odourless, bullet-shaped, smooth, and glossy with acceptable weight uniformity. Content uniformity ranged between 96–98.3%, disintegration time between 15–22 minutes, and dissolution between 80–87%. Among the three formulations, Formulation II exhibited superior performance, with shorter disintegration time (15 minutes), satisfactory dissolution (87%), and good content uniformity (96%). Thus, Formulation II was identified as the optimized formulation, offering a stable and effective alternative dosage form for Alum.

Keywords: Alum, In-vitro release, Liquefaction, Anti-hemorrhoid, Rectal Suppositories

APPLICATION OF KOLLIPHOR®-BASED SOLID DISPERSION TECHNIQUE TO IMPROVE SOLUBILITY AND DISSOLUTION OF ETRAVIRINE

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Abstract

Etravirine, a non-nucleoside reverse transcriptase inhibitor (NNRTI), possesses poor aqueous solubility, resulting in limited oral bioavailability. The present study focuses on enhancing the solubility and dissolution rate of Etravirine through the formulation of solid dispersions using Kolliphor® P 188 as a hydrophilic carrier. Kolliphor® P 188 is widely recognized for its use as a thickening agent and gel binder, offering improved wettability and dispersion of poorly soluble drugs. Solid dispersions of Etravirine were prepared and evaluated in comparison with pure drug and other carriers such as skimmed milk, poloxamer, and Eudragit in a 1:1 ratio. Dissolution studies were conducted using a USP Type II (paddle) apparatus at $37 \pm 0.5^\circ\text{C}$ and 50 rpm, employing 900 ml of phosphate buffer (pH 6.8) as the dissolution medium. Samples withdrawn at regular intervals up to 120 minutes and analyzed by UV spectrophotometry. The dissolution profile demonstrated a markedly faster release of Etravirine from Kolliphor® P 188 solid dispersions compared with the pure drug. The improvement in dissolution behavior is attributed to drug amorphization, enhanced wettability, reduced particle size, and the formation of a uniform solid dispersion. Stability testing confirmed compatibility between the drug and excipients under specified storage conditions. The study concludes that Kolliphor® P 188-based solid dispersions represent a promising and efficient strategy for improving the solubility and dissolution characteristics of poorly water-soluble Etravirine, thereby potentially enhancing its oral bioavailability and therapeutic efficacy.

Keyword: Etravirine, Non-nucleoside reverse transcriptase inhibitor (NNRTI), Kolliphor® P 188, Solid dispersion, Solubility enhancement, Dissolution rate, Amorphization, Wettability, Bioavailability

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN DRUG DISCOVERY AND DEVELOPMENT

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Abstract

The drug discovery process is traditionally characterized by high costs, lengthy timelines, and high rates of clinical failure. The integration of Artificial Intelligence (AI) and Machine Learning (ML) is now revolutionizing this paradigm, offering transformative tools to enhance efficiency, reduce costs, and accelerate the development of novel therapeutics. This abstract explores key applications of AI/ML across the discovery pipeline. In early-stage research, deep learning models analyze vast biomedical datasets including genomics, proteomics, and high-throughput screening data, to identify novel drug targets and elucidate complex disease mechanisms. For hit identification and lead optimization, ML algorithms predict the binding affinities and bioactivity of small molecules, enabling the virtual screening of billions of compounds and the de novo design of molecules with optimized properties. Furthermore, AI-driven predictive models assess pharmacokinetic and toxicity profiles, mitigating late-stage attrition risks. Beyond small molecules, these technologies are critical in advancing biologics and precision medicine, facilitating the design of antibodies and identifying patient subgroups most likely to respond to treatment. Despite these promising advances, significant challenges remain, including the need for high-quality, standardized data, the "black box" nature of some complex models, and the requirement for robust experimental validation. In conclusion, AI and ML are not merely augmenting but fundamentally reshaping drug discovery, transitioning it from a serendipitous, trial-and-error process to a more predictive, data-driven science. Their continued integration promises to unlock new therapeutic avenues and deliver safer, more effective medicines to patients at an unprecedented pace.

Keywords: Artificial Intelligence, Machine Learning (ML), black box, de novo design

EFFECTIVENESS, USES AND PROSPECTS FOR TOPICAL DERMATOLOGY THERAPIES

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Abstract

Topical dermatology therapies are very important for treating many skin conditions because they work on specific areas of the skin, have fewer side effects throughout the body, and are easier for patients to follow. These treatments are commonly used to treat inflammatory conditions like eczema, psoriasis, and dermatitis, as well as infections, acne, pigmentation disorders, and wound healing. Creams, ointments, gels, lotions, foams, and transdermal systems are all common topical dosage forms. They are all made to help drugs get through the skin barrier better. Topical therapies work better or worse depending on a number of things, such as the physicochemical properties of the drug, the composition of the formulation, the condition of the skin, and how well the patient follows the instructions. New types of dermatological formulations, like nanoemulsions, liposomes, solid lipid nanoparticles, and nanoemulgels, have greatly improved drug stability, skin penetration, and therapeutic outcomes while reducing side effects. These new delivery systems allow for controlled drug release and better targeting of skin layers that are sick. Topical dermatology treatments are always changing. New trends are focusing on personalized medicine, natural compounds that are bioactive, and systems based on nanotechnology. Smart topical formulations, carriers that respond to stimuli, and combination therapies that combine better effectiveness with better safety profiles are all possible in the future. Topical dermatology treatments are still a very important part of dermatological treatment, and research is still being done to find new uses for them.

Keywords: Topical therapy, dermatology, skin drug delivery, nanoformulations, transdermal systems, and prospects

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

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Abstract

Relugolix is a non-peptide hormonal drug that is used in prostate cancer and endometriosis. Relugolix is an orally active, non-peptide gonadotropin-releasing hormone (GnRH) receptor antagonist used in the management of hormone-dependent disorders such as advanced prostate cancer, uterine fibroids, and endometriosis. Unlike GnRH agonists, Relugolix rapidly suppresses luteinizing hormone (LH) and follicle-stimulating hormone (FSH), leading to a prompt decline in testosterone and estradiol levels without an initial hormonal surge. Administered once daily, it offers convenience and a favourable safety profile. Clinical studies have demonstrated its effectiveness in achieving and maintaining castration-level testosterone with a lower risk of cardiovascular complications compared to traditional androgen deprivation therapies. Its reversible mechanism allows hormonal recovery after discontinuation. Relugolix represents a major advancement in oral hormonal therapy for both male and female reproductive disorders.

This present work is designed to develop and validate an RP-HPLC method. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10µm particle size. A mixture of methanol and acetonitrile in a specific ratio used as a mobile phase with flow rate of 0.5ml/min. Using UV detector with established 290nm wavelength were used with the run time of 10min. Linearity has been performed in the concentration range of 10 to 50 ppm for Relugolix were used with the run time of 20min.

Keywords: Relugolix, oral hormonal therapy, RP-HPLC

NANO-RUTIN, DEVELOPMENT, CHARACTERIZATION AND PHARMACOLOGICAL EVALUATION

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Abstract

Rutin is a flavonoid compound reported in many medicinal plants. It is used in supplements for potential benefits in strengthening blood vessels, improving circulation, and reducing inflammation. Rutin acts as a pigment, provides “Vitamin P” activity, and is used as a dye, but supplements can have side effects like upset stomach or headache. Chitosan based NPs of rutin were prepared and characterized by standard procedures. The developed nanoparticles were characterized by taking various parameters such as Zeta size, Zeta potential, DSC, TEM analysis, et. Docking study of developed NPs were carried out by using standard software. *In vitro* antioxidant activity of developed NPs was performed by DPPH method. On the basis of observations and findings, it is concluded that rutin loaded chitosan NPs were developed successfully. The developed nanoparticles were found to be potent antioxidant candidate.

Keywords: Rutin, Chitosan, antioxidant, In silico.

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL QUALITY, VALIDATION, AND REGULATORY AFFAIRS

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Abstract

Artificial Intelligence (AI) is increasingly being integrated into the pharmaceutical industry to strengthen quality assurance, validation, and regulatory affairs through advanced data-driven methodologies. Within pharmaceutical quality systems, AI enables real-time process monitoring, predictive quality analytics, trend analysis, and proactive deviation and risk management, thereby enhancing product quality and patient safety.

In validation activities, including process validation, cleaning validation, analytical method validation, and computerized system validation, AI supports automated data evaluation, anomaly detection, and continuous process verification, consistent with lifecycle validation principles outlined in ICH Q8 (Pharmaceutical Development) and ICH Q9 (Quality Risk Management). Furthermore, AI facilitates Quality by Design (QbD) implementation by identifying critical quality attributes (CQAs), critical process parameters (CPPs), and their interactions.

In regulatory affairs, AI-based tools assist in regulatory intelligence, automated document preparation, submission management, and compliance monitoring, supporting effective pharmaceutical quality systems as described in ICH Q10 (Pharmaceutical Quality System). The integration of AI with digital technologies improves data integrity, audit readiness, and risk-based decision-making across the product lifecycle. Although challenges remain regarding data quality, regulatory acceptance, validation of AI systems, and ethical considerations, AI offers significant potential to modernize pharmaceutical quality and regulatory frameworks in alignment with global regulatory expectations.

Keywords: Artificial Intelligence, Pharmaceutical Quality System, ICH Q8-Q10, Validation, Regulatory Affairs

APPLICATIONS AND REGULATORY PERSPECTIVES OF ARTIFICIAL INTELLIGENCE IN THE PHARMACEUTICAL INDUSTRY

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Abstract

Artificial intelligence has emerged as a powerful tool in the pharmaceutical industry, supporting decision-making and innovation across various stages of drug development and healthcare delivery. Techniques such as machine learning and deep learning have been used for several years, but recent advancements in computational power and data availability have significantly expanded their potential applications. Artificial intelligence is now playing an important role in accelerating drug discovery, identifying and validating drug targets, optimizing formulation components such as excipients, and predicting efficient synthetic routes. In addition, AI-based systems contribute to supply chain management, continuous manufacturing monitoring, and predictive maintenance, leading to improved operational efficiency and reduced costs. Personalized medicine has also benefited from artificial intelligence by enabling better treatment selection and dosage optimization based on patient-specific data. Despite these advantages, the growing use of artificial intelligence raises regulatory and ethical concerns related to data quality, transparency, validation, and patient safety. This review provides a comprehensive overview of the current applications of artificial intelligence in the pharmaceutical sector, with a focus on drug discovery, development, safety, and personalized healthcare. By examining recent research trends and practical examples, the article highlights the transformative impact of artificial intelligence on the pharmaceutical industry and discusses its future implications for healthcare systems.

Keywords: Artificial intelligence, AI, Drug development, Target identification, Personalized medicine

ARTIFICIAL INTELLIGENCE–BASED MACHINE LEARNING APPROACHES IN DRUG DESIGN

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Abstract

Drug design is a fundamental aspect of medicinal and pharmaceutical chemistry, focusing on the discovery and optimization of therapeutic compounds with high efficacy and safety. Traditional drug discovery approaches are often time-consuming, costly, and associated with high failure rates, emphasizing the need for computational and data-driven strategies. Artificial intelligence (AI), particularly machine learning (ML), has emerged as a transformative tool in drug design by enabling accurate prediction of molecular properties, biological activity, and safety profiles. AI-based ML models, including quantitative structure–activity relationship (QSAR) models, artificial neural networks, deep learning frameworks, random forest, and support vector machines, analyze large chemical and biological datasets to identify promising drug candidates efficiently. These approaches are applied in virtual screening, lead identification, lead optimization, ADMET prediction, toxicity assessment, and drug repurposing. By prioritizing compounds before laboratory testing, AI-driven methods reduce experimental workload, development time, and research costs. Despite challenges such as data quality, model interpretability, and regulatory compliance, AI-based machine learning continues to gain importance in modern drug discovery. This poster highlights the major AI-driven machine learning approaches in drug design, their applications, advantages, and limitations, emphasizing their growing role in accelerating drug discovery, improving clinical success rates, and supporting the development of safer and more effective therapeutics.

Keywords: Artificial Intelligence, Machine Learning, Drug Design, Medicinal Chemistry, QSAR, ADMET Prediction

PHARMACEUTICAL DEVELOPMENT OF SUSTAINED-RELEASE LINAGLIPTIN TRANSDERMAL PATCHES FOR ANTIDIABETIC TREATMENT

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Abstract

Introduction: Linagliptin, a dipeptidyl peptidase-4 (DPP-4) inhibitor, is commonly used in the management of Type 2 Diabetes Mellitus (T2DM). It enhances insulin secretion and suppresses glucagon release by inhibiting incretin hormone degradation in a glucose-dependent manner. However, its poor oral bioavailability and need for frequent dosing limit therapeutic effectiveness. Transdermal drug delivery systems offer an alternative approach by providing sustained drug release, improved patient compliance, and prolonged therapeutic action.

Materials and Methods: Transdermal patches of linagliptin were formulated using varying concentrations of Methyl Cellulose (MC) and Ethyl Cellulose (EC). Drug–polymer compatibility was assessed using Fourier Transform Infrared (FTIR) spectroscopy. Patches were prepared by the solvent casting method and evaluated for physicochemical properties, including thickness, folding endurance, moisture absorption, moisture loss, drug content, and in-vitro drug release. Six formulations (F1–F6) were developed.

Results: FTIR studies confirmed the absence of significant interactions between linagliptin and polymers. Among all formulations, F4 (MC: EC, 1:1) showed optimal characteristics with a thickness of 0.17 mm, folding endurance of 97.16%, moisture absorption of 1.5%, moisture loss of 10.33%, drug content of 90.29%, and 88.79% drug release over 24 hours.

Conclusion: Linagliptin transdermal patches demonstrated promising potential for sustained drug delivery and may improve therapeutic outcomes and patient compliance in T2DM management.

Keywords: Linagliptin, Transdermal Patch, Type 2 Diabetes Mellitus, DPP-4 Inhibitor, Sustained Drug Release.

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

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Abstract

Difluprednate is a strong corticosteroid formulated for topical use in ophthalmology. It is mainly prescribed to manage eye inflammation and discomfort and is commonly available as an ophthalmic emulsion (eye drops) under brand names such as Durezol.

Ophthalmologists primarily prescribe difluprednate for two key purposes: To manage inflammation and discomfort following ocular surgeries such as cataract procedures, and to treat endogenous anterior uveitis, an inflammation affecting the eye's anterior segment.

Difluprednate, a corticosteroid, functions by reducing the body's inflammation. It achieves this by blocking the release of natural chemicals such as prostaglandins and leukotrienes, which are responsible for causing redness, pain, and swelling in the eye. Difluprednate is a highly potent topical corticosteroid that alleviates inflammation and pain by disrupting the biochemical pathways responsible for inflammatory responses.

By using HPLC validation parameters of Difluprednate like - Linearity, Robustness, Precision, Accuracy and Ruggedness will be performed.

This project is to perform fast and accurate RP-HPLC method of Difluprednate. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10µm particle size.

Keywords: Difluprednate, RP-HPLC, Durezol

SYNTHESIS, ESTIMATION, AND METHOD DEVELOPMENT OF A MUTUAL PRODRUG OF ACECLOFENAC AND PARACETAMOL THROUGH RP-HPLC

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Abstract

Acetoclofenac and paracetamol are widely used analgesic and anti-inflammatory agents and are often co-administered to achieve enhanced therapeutic efficacy in the management of pain and inflammation. However, gastrointestinal irritation and variable pharmacokinetic profiles may be produced by their combined use. Therefore, the present work was undertaken to design, synthesize, and evaluate a mutual prodrug of acetoclofenac and paracetamol to improve safety, stability, and patient compliance. The mutual prodrug was synthesized by chemically linking acetoclofenac and paracetamol through a biodegradable ester linkage. The synthesized compound was purified and characterized by melting point determination, thin layer chromatography (TLC), and spectroscopic techniques such as UV–Visible spectroscopy, Fourier Transform Infrared (FT-IR) spectroscopy to confirm the structural integrity of the prodrug. The percentage yield and purity of the synthesized prodrug were also determined. A simple, accurate, and reproducible UV spectrophotometric method was developed and validated for the estimation of the synthesized prodrug in bulk form. The developed method was validated in accordance with ICH guidelines for parameters including linearity, accuracy, precision, limit of detection, and limit of quantification. Hydrolysis studies were conducted to evaluate the enzymatic cleavage of the prodrug, and the results indicated its conversion into the parent drugs under physiological conditions. This present work is designed to develop and validate an RP-HPLC method. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by a C18 column (3.9×300mm) with 10µm particle size. A mixture of methanol and acetonitrile in a specific ratio is used as a mobile phase with flow rate of 0.5ml/min. A UV detector with an established 240nm wavelength were used with a run time of 10min. Linearity has been performed in the concentration range of 2 to 10 ppm for the prodrug of paracetamol and acetoclofenac were used with a run time of 10 minutes.

Keywords: Acetoclofenac and paracetamol, analgesic and anti-inflammatory agents

CREATINE SUPPLEMENTATION AS A NEUROPROTECTIVE STRATEGY IN CHRONIC STRESS

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Abstract

Chronic stress is a major contributor to neurobehavioral and biochemical impairment, including oxidative damage, impaired energy metabolism, and cognitive decline. The chronic unpredictable stress model is commonly used to replicate these pathological changes in experimental settings. Creatine monohydrate (CM), a naturally occurring compound involved in ATP regeneration, has emerged as a potential neuroprotective agent due to its role in maintaining cellular energy homeostasis. Recent research has demonstrated that creatine supplementation reduces depression-like behaviors in animal models, preserves serotonin neurons, and inhibits stress-induced decreases in hippocampal neurogenesis through the Wnt/GSK3 β / β -catenin pathway; in human trials, creatine loading has been shown to improve cognitive performance, sleep quality, and recovery in physically active individuals.

Together, these findings suggest that supplementing with creatine acts on energy metabolism in neurons by improving behavioral symptoms, reducing oxidative stress, and enhancing ATP levels. Thus, creatine appears promising as a supplement in countering the negative impacts of stress and stress-related neurological disorders.

Keywords: Creatine monohydrate, chronic stress, neuroprotection, oxidative stress, energy metabolism, behavioral outcomes

A GASTRORETENTIVE DRUG DELIVERY STRATEGY FOR ENHANCING THE ORAL BIOAVAILABILITY OF GABAPENTIN

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Abstract:

Gastroretentive drug delivery system (GRDDS) are the systems which are developed to enhance oral bioavailability of drugs that have narrow absorption window in the upper GI tract. Gabapentin, an anticonvulsant agent, is characterized by saturable and site-specific absorption and poor bioavailability following its delivery in conventional pharmaceutical dosage forms. In this research work, an attempt has been made to design and evaluate gastric retentive drug delivery system of gabapentin with an aim to prolong the gastric residence time and sustain the drug release. Floating matrix tablets were formulated with hydrophilic polymers that include effervescent agents to provide buoyancy and extended release properties. Physical pre-compression characteristics, physicochemical characters of the formulation to be used in the preparation of floating tablets such as weight variation and hardness floating lag time, total period of swelling drug content uniformity and in vitro dissolution studies were determined. The optimized formulation showed floating lag time was less and were buoyant for more than 12 h thus suggesting its proper gastric retention. In vitro drug release studies indicated a prolonged release profile of gabapentin for long durations indicating increased drug availability. The prepared gastroretentive system could improve, reduce dosing frequency, and improve patient compliance, making it a promising approach for optimized anticonvulsant therapy.

Keywords: Anticonvulsant; Floating tablets; Gabapentin; Gastroretentive drug delivery; Sustained release

DEVELOPMENT AND CHARACTERIZATION OF ELLAGIC ACID LOADED CHITOSAN NANOPARTICLES

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Abstract

Ellagic acid is a bioactive polyphenolic compound present in various vegetables, fruits, herbs, and nuts. It is used for its anti-oxidant, anti-inflammatory and anti-cancer properties. Ellagic acid is being investigated for use in follicular lymphoma, brain injury in intrauterine growth restricted babies, obese adolescents, and solar lentigines. In the present investigation ellagic acid loaded chitosan nanoparticles were prepared and characterized by using standard and advanced techniques. Zeta sizer, zeta potential, DSC and TEM analysis were carried out for characterization of developed nanoparticles. *In silico* and *in vitro* antioxidant activity were evaluated. It is concluded that ellagic acid loaded chitosan nanoparticles were developed and characterized successfully. The results of *in-silico* studies depicted various pharmacological actions. The developed nanoparticles showed potent antioxidant activity in DPPH assay.

Keywords: Ellagic acid, chitosan, nanoparticle, antioxidant.

POLYPHENOLS FROM *MEDICAGO SATIVA*: COMPUTATIONAL EVIDENCE AND STANDARDISATION APPROACHES IN BLOOD SUGAR MANAGEMENT

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Abstract

Medicago Sativa (*alfalfa*) is well recognized in traditional medicine for its therapeutic potential and has gained growing scientific attention for its role in the management of metabolic disorders, particularly diabetes mellitus. Among its bioactive constituents, polyphenols are of special interest due to their strong antioxidant capacity and their ability to modulate glucose homeostasis. The study explores the role of *Medicago Sativa* polyphenolic compounds in blood sugar regulation by integrating computational approaches with herbal drug standardisation strategies. Major polyphenolic classes reported from the plant, including flavonoids, phenolic acids, and isoflavones, were evaluated through In-silico techniques such as molecular docking and pharmacokinetic prediction. These analyses focused on key molecular targets involved in glucose metabolism, namely α -amylase, α -glucosidase, dipeptidyl peptidase-4 (DPP-4), and peroxisome proliferator-activated receptors (PPARs). The computational findings revealed strong binding affinities of several compounds toward these targets, along with favourable ADMET profiles, indicating their potential efficacy and safety in glycaemic control. In parallel, the study highlights the necessity of herbal drug standardisation through comprehensive phytochemical profiling, quantification of polyphenol content, and implementation of quality control parameters to ensure reproducibility and therapeutic consistency. Overall, the integration of computational validation with standardisation protocols provides a scientific framework for the rational development of *Medicago Sativa* based herbal formulations for effective blood sugar management.

Keywords: Polyphenols, molecular docking, glycaemic control, *Medicago Sativa*, herbal drug standardisation

ARTIFICIAL INTELLIGENCE IN CLINICAL TRIALS: ENHANCE MONITORING EFFICIENCY AND RECRUITMENT

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Abstract

Clinical trials play a pivotal role in the development and approval of drugs and therapies, but they have a number of issues, such as patient recruitment, data management, protocol non-compliance, and limited real-time monitoring. Such difficulties lead to longer trial duration, higher operational costs, and delayed regulatory approvals. Artificial Intelligence (AI) is a revolutionary technology that can significantly boost the effectiveness, precision, and quality of clinical trials.

AI comprises machine learning, natural language processing, and predictive analytics that can open up the value of massive and heterogeneous datasets such as electronic health records, genomic databases, medical imaging, and real-world evidence. As such, patient identification can become more rapid and accurate, patient stratification can be improved, and recruitment timelines can be shortened. Moreover, AI-powered systems for monitoring enable real-time detection of protocol deviations, safety signals, and data inconsistencies, which, in turn, facilitate better trial oversight and allow regulatory compliance.

AI integration facilitates decentralisation and adaptive trial designs, boosts patient engagement, and decreases participant dropouts. In general, AI-driven methods raise data quality, speed up decision-making, and reduce the cost of trials. Employing AI in clinical research is a major shift towards more patient-centric, centric, data, driven, and efficient clinical trials, which, in the end, will speed up drug development and improve healthcare outcomes.

Keywords: Artificial Intelligence, Clinical Trials, Patient Recruitment, Trial Monitoring, Machine Learning, Digital Health

SENILE DEMENTIA: A PREDOMINANT CLINICAL TYPE OF ALZHEIMER'S DISEASE

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Abstract

Senile dementia is a condition that gets worse over time. It is most often linked to Alzheimer's disease. It mostly affects people. People with dementia have a hard time remembering things, learning new things and using good judgment. They also have trouble with language. Behaving properly. This makes it difficult for them to do things and enjoy their life. When we look at what's happening in the body, we see that senile dementia is caused by a buildup of bad things like amyloid- β plaques and neurofibrillary tangles. These tangles are made up of a protein called tau that has been changed. The connections, between brain cells called synapses do not work properly. Many brain cells are lost. This happens in the hippocampus and cerebral cortex, which are important parts of the brain. Senile dementia is a condition that affects the brain and it is important to understand what is happening with senile dementia. This results in a defective neurotransmission and subsequently brain atrophy. In clinical practice, patients manifest early short-term memory loss both followed by disorientation, judgement impairment and mood disturbances ending up in no more independent living. In spite of intensive research, the current therapeutic approach is mainly symptomatic and no conclusively effective treatment has been developed. Early detection, lifestyle measures and current and future disease-modifying therapies are key to controlling Senile Dementia as its increasing socioeconomic burden.

Keywords: Senile Dementia, Alzheimer's disease, neurodegenerative disease, amyloid- β plaques.

ROLE OF ARTIFICIAL INTELLIGENCE IN PERSONALIZED MEDICINE

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Abstract

Personalized medicine is a revolutionary approach to healthcare that focuses on tailoring medical treatment to the individual characteristics of each patient, including genetic, clinical, and lifestyle information. Artificial Intelligence (AI) has emerged as a key enabler in this field, providing the ability to analyze vast and complex datasets quickly and accurately, which is essential for precision healthcare. AI assists in patient data analysis by integrating electronic health records, laboratory results, imaging studies, and lifestyle information to build comprehensive health profiles, facilitating more informed clinical decisions. In genetic and genomic analysis, AI identifies mutations, predicts disease risk, and anticipates patient-specific drug responses, thereby enabling targeted therapy and reducing the likelihood of adverse effects. Furthermore, AI supports early disease detection by recognizing subtle patterns in patient data before clinical symptoms appear, promoting preventive care and timely intervention. In clinical trials, AI optimizes patient recruitment, improves trial design, predicts potential risks, monitors safety in real time, and analyses large datasets efficiently, enhancing the reliability, efficiency, and ethical conduct of drug development. By automating data processing and providing actionable insights, AI accelerates diagnosis, enhances treatment precision, reduces errors, and improves overall patient outcomes. Despite significant challenges, including data privacy concerns, ethical considerations, high implementation costs, and the need for skilled personnel, AI has demonstrated remarkable potential in transforming healthcare delivery. Its integration into personalized medicine promises a future where the right treatment is delivered to the right patient at the right time, reducing adverse effects, improving efficacy, and ultimately shaping a more precise, efficient, and patient-centered healthcare system.

Keywords: Personalized medicine, artificial intelligence, drug development

FORMULATION AND EVALUATION OF SALICYLIC ACID AND NIACINAMIDE CONTAINING HYDROGEL FOR ANTIACNE ACTION

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Abstract

Acne vulgaris is a common long-term inflammatory skin condition that affects teens and adults. It is often linked to too much oil production, follicular hyperkeratinization, microbial colonization, and inflammation. The goal of this study is to create and test a topical hydrogel with salicylic acid and niacinamide that works well as an anti-acne treatment. Salicylic acid is a well-known keratolytic agent that helps with exfoliation and unclogging pores. Niacinamide, on the other hand, has anti-inflammatory, sebum-regulating, and skin-barrier-restoring properties. Their combination is thought to work together to help treat acne. The hydrogel was made with the right gelling agents and tweaked to get the best physicochemical properties. We looked at things like the hydrogel's appearance, pH, viscosity, spreadability, drug content uniformity, in vitro drug release, and stability. We also did studies on how well the product works with skin to make sure it is safe to use on the skin. The results showed that the hydrogel had a good pH, spread well, evenly distributed the drug, and released the drug over time, making it safe to use on the skin. The combination hydrogel showed promise for better anti-acne action because it is not greasy and is easy to use, which makes it more likely that patients will follow the treatment. So, the salicylic acid and niacinamide hydrogel that was made could be a good and safe way to treat acne vulgaris on the skin.

Keywords: *Acne vulgaris*, Salicylic acid, Niacinamide, Hydrogel, Topical drug delivery, and Anti-acne therapy

DEVELOPMENT AND VALIDATION OF RP-HPLC METHOD OF POLMACOXIBTrupthi^{1*}, Smriti Sahu², K. Nagarajan³

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Polmacoxib, chemically named 4-[3-(3-fluorophenyl)-4,5-dihydro-5,5-dimethyl-4-oxo-2-furanyl] benzenesulfonamide, has the molecular formula C₁₈H₁₆FNO₄S and a molecular weight of 361.39 g/mol. Polmacoxib, originally known as CG100649, is a selective cyclooxygenase-2 (COX-2) inhibitor classified as a nonsteroidal anti-inflammatory drug (NSAID). In addition to COX-2 inhibition, it demonstrates strong inhibitory activity against carbonic anhydrase isoforms I and II, which is attributed to the presence of its aryl sulfonamide group, resembling the structural features of celecoxib and valdecoxib.

Polmacoxib differs from other NSAIDs because it works through two mechanisms: it suppresses COX-2 activity and binds strongly to carbonic anhydrase (CA). CA plays a vital role in maintaining the body's pH balance by converting carbon dioxide and bicarbonate. When COX-2 and CA are both present, polmacoxib's strong affinity for CA can lower its effectiveness in COX-2 inhibition. Early research has examined how varying levels of CA influence the COX-2 inhibitory potential of polmacoxib. Cases of lower intestinal perforation linked to selective COX-2 inhibitors have been documented, although they are exceptionally rare. CG100649 has poor solubility in water, and the distinct lattice energies of its polymorphs contribute to differences in solubility and dissolution rates. By using HPLC validation parameters of Polmacoxib like - Linearity, Robustness, Precision, Accuracy and Ruggedness will be performed.

This project is to perform fast and accurate RP-HPLC method of Polmacoxib. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations done by C18 column (3.9×300mm) with 10µm particle size.

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

DESIGN EXPERT SUPPORTED OPTIMIZATION OF GREEN SYNTHESIS OF SILVER NANOPARTICLES USING MEDICINAL PLANT EXTRACT

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Abstract

Nanotechnology is a highly versatile field with applications covering many areas, such as chemistry, cosmetics, pharmaceuticals, medicine and biomedical sciences, food technology, and environmental science, etc. Silver nanoparticles (AgNPs) can be produced using a variety of techniques, with plant extract-based synthesis methods being among the most widely used. Design-Expert is a statistical software, and it offers comparative tests, screening, characterization, optimization, robust parameter design, mixture designs, and combined designs. Design-Expert provides test matrices for screening up to 50 factors. In the present study, plant-based material was used for the synthesis of AgNPs, and optimization of the synthesis process was carried out by Design-Expert software. Synthesised AgNPs were characterised by using standard and advanced parameters such as Zeta sizer, Zeta Potential DSC, FTIR, etc. The developed AgNPs were optimised and characterised successfully. Docking studies were performed using AI-based software.

Keywords: Design expert software, silver nanoparticles, Optimization

ARTIFICIAL INTELLIGENCE IN OPTIMIZATION OF NOVEL DRUG DELIVERY SYSTEMS

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ABSTRACT

The development of novel drug delivery systems (NDDS) traditionally relies on extensive experimental trials to optimize formulation and process parameters, often resulting in increased time, cost, and resource consumption. Artificial intelligence (AI) has emerged as a transformative tool in pharmaceuticals, enabling predictive and data-driven formulation development. AI techniques such as machine learning, artificial neural networks, and deep learning models can analyse complex datasets to establish relationships between formulation variables and critical quality attributes. In NDDS, AI has been successfully applied to optimize parameters, including particle size, entrapment efficiency, drug release kinetics, and stability of systems such as liposomes, nanoparticles, and transdermal carriers. By reducing trial-and-error approaches, AI facilitates faster formulation screening, improved product performance, and enhanced reproducibility. Moreover, AI-based optimization supports scalability and quality-by-design principles, thereby bridging the gap between academic research and industrial manufacturing requirements. This poster highlights the role of artificial intelligence in optimizing novel drug delivery systems, discusses its applications in pharmaceuticals, and emphasizes its potential to revolutionize formulation development by transforming conventional experimental methods into predictive and efficient scientific processes.

Keywords: NDDS, Artificial Intelligence, Nanoparticles, Liposomes.

SYNTHESIS OF ANTI-INFLAMMATORY AGENTS BEARING N-SUBSTITUTED PHENYL AZETIDINE NUCLEUS

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Abstract

Inflammation is a normal physiological response that causes injured tissue to heal. An inflammatory process starts when chemicals are released by the damaged tissue. Anti-inflammatory agents bearing an N-substituted phenyl azetidine nucleus are a structural class where a four-membered azetidine ring carries an anilide-type (N-phenyl) substituent and additional groups that tune anti-inflammatory activity. Many of these azetidinone derivatives act as potent inhibitors of inflammation, sometimes displaying activity comparable to or higher than standard drugs like diclofenac, indomethacin, or phenylbutazone. They are often investigated for their ability to inhibit cyclooxygenase (COX-1/COX-2) enzymes and to act as antioxidants.

N-Substituted phenyl azetidine derivatives exhibit promising anti-inflammatory properties, often evaluated through in vitro and in vivo assays rather than computational modelling. Experimental data from synthesis and biological screening highlight their efficacy in reducing inflammation markers like edema or cytokine levels, positioning them as potential therapeutic leads. Compounds such as 4-(4-substituted phenyl)azetidin-2-ones with para-halogen or nitro groups demonstrated high anti-inflammatory activity in carrageenan-induced paw edema models, outperforming or matching standards like dexamethasone.

Keywords: Inflammation, azetidinone, cyclooxygenase, computational modelling, biological screening.

AI-DRIVEN NANOMEDICINE FOR TARGETED CANCER THERAPY

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Corresponding author: keshriayush572@gmail.com**ABSTRACT**

AI-driven nanomedicine represents a transformative approach in targeted cancer therapy by integrating artificial intelligence with nanoscale drug delivery systems to enhance precision, efficacy, and safety. Conventional cancer treatments often suffer from poor tumor selectivity, systemic toxicity, and variable patient responses. AI algorithms, including machine learning and deep learning models, enable the rational design and optimization of nanocarriers by analyzing large biological datasets related to tumor genomics, proteomics, and microenvironment characteristics. These models assist in selecting optimal nanoparticle size, shape, surface chemistry, and ligand functionalization to achieve site-specific targeting and controlled drug release. AI also supports real-time imaging, prediction of nanoparticle–tumor interactions, and personalized treatment planning by identifying patient-specific biomarkers. Smart nanomedicines, such as stimuli-responsive nanoparticles, can be guided by AI to release therapeutic agents in response to pH, enzymes, or temperature within the tumor microenvironment. Furthermore, AI improves preclinical screening, reduces trial-and-error experimentation, and accelerates clinical translation while minimizing adverse effects. Despite challenges related to data quality, regulatory approval, and ethical concerns, AI-driven nanomedicine holds significant promise in advancing precision oncology. This interdisciplinary strategy is expected to improve therapeutic outcomes, reduce toxicity, and pave the way for personalized cancer treatment in the near future.

Keywords: AI-driven Nanomedicine, Drug delivery systems, Machine Learning, Nanoparticles, Precision oncology, Targeted cancer therapy.

DEVELOPMENT AND VALIDATION OF A STABILITY-INDICATING RP-HPLC METHOD OF BISACODYL

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ABSTRACT

A novel reversed-phase high-performance liquid chromatography (RP-HPLC) method was developed and validated for the quantitative determination of bisacodyl, a diphenylmethane laxative used in constipation treatment, in pharmaceutical formulations such as tablets and suppositories. The method employed a C18 column with a mobile phase comprising methanol-acetonitrile-water acidified with 2% acetic acid in a ratio of 20:50:30, UV detection at 263 nm, and demonstrated excellent linearity, precision, accuracy, and specificity, including resolution of degradation products like monoacetyl bisacodyl and desacetyl bisacodyl. Forced degradation studies under acidic, basic, oxidative, thermal, and photolytic conditions confirmed method robustness, with degradation products well-separated from the analyte peak. This RP-HPLC approach offers a rapid, cost-effective alternative to compendial methods, suitable for routine quality control and stability testing in bisacodyl formulations. By using HPLC validation parameters of Bisacodyl, such as Linearity, Robustness, Precision, Accuracy, and Ruggedness, will be performed. This project is to perform a fast and accurate RP-HPLC method for Bisacodyl. For this, we have planned a fast and accurate RP-HPLC method by using Waters model 2489, Software Empower Pro as an instrument. Chromatographic separations were done by a C18 column (3.9×300mm) with 10µm particle size.

Keywords: Bisacodyl, RP-HPLC, monoacetyl bisacodyl, desacetyl bisacodyl.

STIMULI-RESPONSIVE SOLID LIPID NANOPARTICLES FOR TRANSDERMAL DELIVERY IN HYPERTENSION MANAGEMENT

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Abstract

This report reviews the current landscape of hypertension management with a focus on the development of stimuli-responsive solid lipid nanoparticles (SLNs) for transdermal drug delivery. Hypertension remains a leading cause of cardiovascular morbidity and mortality worldwide, with traditional therapies facing challenges such as poor patient adherence, fluctuating plasma drug levels, and systemic side effects. Advances in nanotechnology, particularly the design of smart, stimuli-responsive SLNs that respond to physiological and environmental cues, offer promising avenues for improving therapeutic outcomes. These innovative carriers enable controlled, on-demand drug release, potentially enhancing bioavailability, reducing adverse effects, and allowing for personalized, non-invasive treatment strategies. The integration of these systems with digital health technologies, wearable devices, and AI-based monitoring further enhances prospects for adaptive, patient-centered hypertension management. Despite promising preclinical findings, challenges including large-scale manufacturing, stability, safety, regulatory approval, and clinical validation remain to be addressed. Future efforts should focus on scalable production methods, multi-stimuli responsive systems, clinical trials, and smart wearable integration to transform hypertension therapy into an effective, personalized, and minimally invasive approach.

Keywords: Hypertension, solid lipid nanoparticles, Transdermal delivery, Stimuli-responsive systems, Smart drug delivery.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN WOUND MANAGEMENT

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Abstract

Wound care is being rapidly transformed by Artificial Intelligence (AI) and sensor technologies, especially in the creation and upgrading of wound dressings. Wound care, which has historically relied on empirical information and manual evaluation, is increasingly moving toward data-driven, real-time methods made possible by artificial intelligence (AI), machine learning (ML), and sensor-embedded smart dressings. These developments are particularly important for the treatment of chronic wounds, such as pressure injuries and diabetic foot ulcers, when prompt and accurate therapies might avoid serious consequences. Key wound characteristics, including temperature, pH, moisture, and exudate levels, can be continually monitored by AI-powered smart dressings with sensors. AI is becoming a disruptive force in the design and development of wound dressings, going beyond clinical monitoring. Researchers can model dressing performance, including fluid handling, adhesion, and mechanical conformability, before a physical prototype by combining machine learning (ML) with finite element (FE) and computational fluid dynamics (CFD) modeling. Laboratory testing is further streamlined by AI-driven automation, which increases productivity, repeatability, and affordability. Prospects for patient-specific wound care include 3D printing and AI-enabled customized dressings. AI-powered solutions have the potential to revolutionize the development of wound dressings and enhance patient outcomes, despite obstacles pertaining to regulation, data protection, and interdisciplinary collaboration.

Keywords: Wound dressing, Wound care, Sensors, Artificial intelligence (AI), Machine learning (ML).

DEVELOPMENT OF AN HERBAL PIPERINE-LOADED NANOGEL FOR TOPICAL ANTIFUNGAL APPLICATIONS

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Abstract

Introduction: Fungal skin infections are common dermatological conditions that require prolonged topical therapy. Piperine, a bioactive alkaloid obtained from *Piper nigrum*, possesses significant antifungal, anti-inflammatory, and penetration-enhancing properties. However, its topical application is limited due to poor aqueous solubility, low skin permeability, and instability. Nanogel-based drug delivery systems offer a promising approach to overcome these limitations by enhancing skin penetration and providing controlled drug release.

Aim: The present study aims to develop and evaluate a piperine-loaded nanogel for enhanced topical antifungal activity.

Materials and Methods: Piperine-loaded nanogels were prepared using suitable polymers such as chitosan/Carbopol through techniques like ionic gelation or emulsion-based methods. The formulation was optimized and characterized for particle size, polydispersity index, zeta potential, drug entrapment efficiency, and morphology using dynamic light scattering and electron microscopy. Physicochemical compatibility between piperine and polymers was evaluated using FTIR and DSC. The optimized nanogel was incorporated into a topical gel base and evaluated for pH, viscosity, spreadability, in-vitro drug release, and ex-vivo skin permeation studies.

Results: The developed piperine-loaded nanogel exhibited a nanoscale particle size, high drug entrapment efficiency, and sustained drug release behaviour. Ex-vivo studies demonstrated enhanced skin permeation and retention of piperine compared to conventional gel formulations. In-vitro antifungal studies against *Candida albicans* and *Aspergillus* species showed significantly improved antifungal activity. Skin irritation studies indicated good biocompatibility and safety.

Conclusion: Piperine-loaded nanogel represents a promising, safe, and effective topical delivery system for antifungal therapy, offering improved skin penetration, prolonged drug release, and enhanced therapeutic efficacy.

Keywords: Piperine, Nanogel, Antifungal activity, Topical drug delivery, Skin permeation

**BRIDGING ACADEMIA AND INDUSTRY THROUGH ARTIFICIAL INTELLIGENCE –
BASED SLEEP ANALYSIS FOR PREVENTIVE DISEASE RISK ASSESSMENT.**

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Abstract

Sleep is a critical determinant of physiological and neurological health and has emerged as a valuable biomarker for early disease risk assessment. However, traditional healthcare methods often underutilize sleep-related data, which limits their use in preventative measures. Recent developments in artificial intelligence (AI) have made it possible for sleep foundation models to integrate and interpret large-scale, multi-model sleep data. This review examines the growing role of AI-based sleep analysis and its applicability in bridging academic research and industry applications for preventive disease risk assessment, with a particular focus on Sleep FM. The review synthesizes current evidence on AI-driven analysis of sleep parameters, including sleep duration, sleep architecture, circadian rhythm variability, and heart rate variability, obtained from wearable devices and digital sleep-monitoring technologies. It discusses the contributions of academic research in model development, validation, and interpretability, alongside industry-led efforts in technology deployment, digital health platforms, and preventive healthcare solutions. Polysomnography – considered the gold standard in sleep studies is a common means of collecting sleep data that uses sensors to record brain activity, heart function, respiratory signals and eye movements, among other aspects. Furthermore, key challenges related to data quality, generalizability, and ethical considerations are highlighted. Overall, by promoting productive cooperation between academia and industry, AI-based sleep foundation models like Sleep FM offer a promising path for improving preventive and predictive healthcare.

Keywords: Polysomnography, Artificial Intelligence, Sleep FM, Sleep Analysis, Digital Health, Preventive Healthcare.

NEUROPROTECTIVE POTENTIAL OF FERULIC ACID DERIVATIVE IN CHEMICALLY INDUCED DEMENTIA

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Abstract

Dementia is a progressive neurodegenerative disorder characterized by cognitive decline, memory impairment, and behavioral disturbances, with oxidative stress, neuroinflammation, and cholinergic dysfunction playing key pathogenic roles. Despite available therapies, effective disease-modifying agents remain limited. Ferulic acid, a naturally occurring phenolic compound, has attracted considerable attention due to its potent antioxidant, anti-inflammatory, and neuroprotective properties. The present study aims to evaluate the neuroprotective potential of a synthesized ferulic acid derivative in a chemically induced dementia model. Dementia is induced in experimental animals using a well-established chemical agent such as aluminum chloride or scopolamine to mimic cognitive deficits and neurochemical alterations observed in Alzheimer's disease. The neuroprotective efficacy of the ferulic acid derivative is assessed through behavioral paradigms including memory and learning tests, along with biochemical estimation of oxidative stress markers, cholinergic enzyme activity, and inflammatory mediators. Histopathological examination of brain regions associated with cognition further supports the biochemical and behavioral findings. The study hypothesizes that the ferulic acid derivative attenuates cognitive dysfunction by reducing oxidative stress, preserving neuronal integrity, and modulating neurotransmitter imbalance. Overall, this investigation provides experimental evidence supporting the therapeutic potential of ferulic acid derivatives as promising neuroprotective agents for the management of chemically induced dementia and related neurodegenerative disorders.

Keywords: Ferulic acid derivative, Dementia, Neuroprotection, Oxidative stress, Cognitive impairment, Neurodegeneration

OXIDATIVE STRESS PATHWAYS AS EMERGING DRUG TARGETS

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Corresponding author: akshaysatoshi@gmail.com**Abstract**

Oxidative stress arises from an imbalance between the production of reactive oxygen species (ROS) and the antioxidant defense system, leading to cellular and molecular damage. Excessive ROS can oxidize lipids, proteins, and nucleic acids, contributing to the pathogenesis of several chronic diseases, including cancer, neurodegenerative disorders, cardiovascular diseases, and diabetes. Recent research has identified key oxidative stress-related signaling pathways, such as Nrf2–Keap1, NF- κ B, MAPK, and mitochondrial dysfunction pathways, as promising therapeutic targets. Modulation of these pathways can restore redox homeostasis and reduce disease progression. Drugs targeting antioxidant enzymes, ROS-generating enzymes, and redox-sensitive transcription factors are gaining attention due to their disease-modifying potential rather than symptomatic relief. Natural antioxidants, small-molecule inhibitors, and gene-based therapies are being explored to selectively regulate oxidative stress pathways. This abstract highlights the mechanistic role of oxidative stress in disease development and emphasizes emerging drug targets within oxidative stress signaling networks. Targeting these pathways represents a strategic approach for the development of novel and effective therapeutics in modern drug discovery.

Keywords: Oxidative stress, Reactive oxygen species, Antioxidants, Drug targets, Redox signaling

SYNTHESIS AND ANTIMICROBIAL ACTIVITY OF THIOPHENE DERIVATIVE (2-AMINO 4-PHENYLTHIOPHENE 3- CARBOXYLATE) AGAINST AMPICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS.

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Abstract

Antimicrobial resistance has emerged as a serious global health concern, particularly due to the increasing resistance of *Staphylococcus aureus* to commonly used antibiotics such as ampicillin. Thiophene derivatives represent an important class of heterocyclic compounds known for their diverse biological activities, including antimicrobial properties. This abstract is based on previously published research studies focusing on the synthesis and antimicrobial evaluation of 2-amino-4-phenylthiophene-3-carboxylate derivatives. Reported literature indicates that these compounds were synthesized using established chemical methods and characterized by standard analytical techniques. Their antibacterial activity was evaluated against resistant bacterial strains using agar diffusion and minimum inhibitory concentration (MIC) methods. The findings suggest that several thiophene derivatives exhibited significant antibacterial activity against ampicillin-resistant *Staphylococcus aureus*, comparable to that of standard antibiotics. These results highlight the potential of thiophene-based compounds as promising lead molecules for the development of new antimicrobial agents. Further experimental and clinical studies are required to confirm their therapeutic effectiveness.

Keywords: Thiophene derivatives; Antimicrobial resistance; *Staphylococcus aureus*; Ampicillin resistance.

APPLICATION OF ARTIFICIAL INTELLIGENCE IN REGULATORY INTELLIGENCE AND COMPLIANCE MONITORING OF ASU DRUGS

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Abstract

The global commercialization of Ayurveda, Siddha, and Unani (ASU) drugs is governed by rapidly evolving regulatory requirements across multiple jurisdictions. Continuous monitoring of regulatory updates, compliance obligations, and policy changes is essential; however, conventional regulatory intelligence systems are largely manual, fragmented, and reactive. This study examines the application of artificial intelligence (AI) in strengthening regulatory intelligence and compliance monitoring frameworks for ASU drugs. An analytical approach was adopted to evaluate AI-driven technologies such as natural language processing, machine learning, and automated data analytics for tracking and interpreting regulatory updates issued by key authorities, including the Ministry of AYUSH (India), the US Food and Drug Administration, the European regulatory system, and the World Health Organization. Core regulatory domains assessed include quality standards, safety requirements, manufacturing compliance, labeling regulations, and post-marketing surveillance. The analysis demonstrates that AI-enabled regulatory intelligence systems enable real-time identification of regulatory changes, automated categorization based on relevance, and early assessment of compliance impact. These capabilities facilitate proactive compliance planning, reduce regulatory risk, and support strategic decision-making for global market access of ASU drugs. Challenges related to data heterogeneity, contextual interpretation of regulatory language, and integration of traditional knowledge-based evidence are also discussed. The study concludes that artificial intelligence has significant potential to transform regulatory intelligence from a reactive function into a predictive and strategic compliance tool. Adoption of AI-based regulatory monitoring systems can accelerate global commercialization of ASU drugs while ensuring regulatory robustness, thereby supporting sustainable innovation within the AYUSH ecosystem.

Keywords: Artificial intelligence, regulatory intelligence, compliance monitoring, ASU drugs, AYUSH, global regulations

FORMULATION AND DEVELOPMENT OF A NANO-COCHLEATE GEL FOR ENHANCED ANTIFUNGAL DRUG DELIVERY

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Abstract

Insufficient drug permeation, short periods of absorption at the infection point, and decreasing medicinal efficiency of traditional preparations are common limitations of topically antifungal therapies. Long-term treatment, low acceptance by patients, along with lesser-than-ideal clinical results can all be related to these difficulties. A modern lipid-based drug delivery strategy that can enhance the stability of medications, prevention, as well as controlled release, is nanocochleates. The processing techniques for creating gels containing nano-cochleate for the enhancement of topical antifungal medication are the main focus of this research. A calcium-triggered self-assembly process is used for developing nanocochleates, which are enduring, multiple-layered systems that successfully trap anti-fungal medicines. If integrated into a gel matrix, a topical substance with suitable application qualities is created that is friendly for patients. Size of particles, drug trapping, pH, viscosity, Spreadability, and in vitro drug release constitute significant assessment factors that aid the determination of the composition's stability, efficacy, and therapeutic efficacy. Anti-fungal action, showing enhanced medication storage and prolonged absorption at the infection area, is a crucial measure of efficacy. All things considered, the nano-cochleate-derived gels promise greater patient adherence, extended pharmacological action, and greater antifungal activity, making them a potential approach for innovative topical drug administration. These compositions hold great promise for the manufacturing of topical antifungal treatments of the future.

Keywords: Nanocochleates, Drug Delivery System, Topical Gel, Sustained Release, Antifungal Therapy, calcium-triggered

AI IN CLINICAL TRIAL DESIGN AND EXECUTION: REDUCING COST, TIME AND FAILURE RATES

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Abstract

Clinical trials remain the most resource-intensive and failure-prone stage of pharmaceutical development, accounting for nearly 60-70% of total R&D spending and significantly contributing to longer lead times and late-stage attrition. Despite major advances in biomedical research, conventional clinical trial designs continue to rely on static protocols, limited patient diversity, and ineffective recruitment strategies. Artificial Intelligence (AI) has become a transformative enabler capable of redefining clinical trial design and execution through data-driven, adaptive, and patient-centered methodologies. This work explores the integration of advanced AI techniques, including machine learning, deep learning, natural language processing, and real-world data analysis, throughout the clinical trial lifecycle. AI-driven predictive models enable intelligent protocol design by simulating trial outcomes, optimizing endpoints, and identifying high-risk failure parameters before trial initiation. During patient recruitment and stratification, AI leverages electronic health records, genomic profiles, and digital biomarkers to improve recruitment speed, increase cohort diversity, and reduce screening failure rates. Additionally, AI-powered adaptive trial designs enable real-time modifications based on provisional data, significantly improving decision-making efficiency and statistical power. AI-based monitoring systems using wearable devices and remote data capture improve patient compliance, safety monitoring, and data quality while reducing site load and operational costs. Importantly, the incorporation of explainable AI (XAI) frameworks supports regulatory transparency and promotes trust between investigators, sponsors, and regulators. fosters trust among investigators, sponsors, and regulatory authorities. Case examples from recent industry-academia collaborations demonstrate measurable reductions in trial duration, operational costs, and late-stage failure rates. industry-academic collaborations demonstrate measurable reductions in trial duration, operational costs, and late-stage failure rates. This poster highlights AI as an essential bridge between academic innovation and industrial clinical development, highlighting its role in creating faster, more efficient, and more inclusive clinical trials. The findings highlight the need for cross-sector collaboration, regulatory-ready AI frameworks, and workforce development to fully realize the potential of AI in reshaping the future of clinical research.

Keywords: Artificial Intelligence, Clinical Trial Design, Machine Learning, Patient Recruitment, Adaptive Trials, Real-World Data, Pharmaceutical Innovation

PHYTOCHEMICAL CHARACTERIZATION AND ANTIOXIDANT ASSESSMENT OF AQUEOUS AND ETHANOLIC EXTRACTS OF *CASSIA FISTULA* BARK

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Abstract

Medicinal plants have historically formed the foundation of traditional healthcare systems such as Ayurveda, Siddha, and Unani, providing safe, accessible, and cost-effective remedies. In recent decades, concerns over synthetic drugs and the growing challenge of antimicrobial resistance have intensified global interest in plant-based therapies. *Cassia fistula* L., commonly known as the “Golden Shower Tree,” is both culturally significant and therapeutically valuable. Its bark, leaves, flowers, and fruit pulp contain a diverse array of phytochemicals, including flavonoids, anthraquinones, tannins, glycosides, and phenolic compounds, that underpin its antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, and laxative properties. Advanced analytical techniques such as HPLC, GC–MS, LC–MS, FTIR, and NMR have enabled precise profiling of these bioactive constituents, thereby strengthening the scientific validation of traditional knowledge. Antioxidant assays, including DPPH, ABTS, FRAP, and hydroxyl radical scavenging, further confirm the plant’s ability to neutralize free radicals, highlighting its relevance in managing oxidative stress and related chronic diseases. This study underscores the importance of phytochemical characterization and antioxidant evaluation of *Cassia fistula* extracts, with the aim of identifying potent bioactive molecules for pharmaceutical and nutraceutical development. By integrating traditional wisdom with modern scientific approaches, *Cassia fistula* emerges as a promising natural therapeutic agent to address pressing health challenges such as chronic illnesses and microbial resistance.

Keywords: *Cassia fistula*, Golden Shower Tree, Phytochemical characterization, Antioxidant activity, Flavonoids, Phenolic compounds, DPPH assay, ABTS assay, FR

THE ENTERIC CONTRIBUTION TO KIDNEY DISEASE PROGRESSION

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Abstract

Chronic kidney disease (CKD) is a condition where the kidneys don't work properly and get worse over time. One big risk factor for CKD is high blood pressure, which can be linked to an unhealthy balance of gut bacteria (dysbiosis). In people with CKD, this imbalance leads to a buildup of harmful substances called uremic toxins, which makes the disease progress faster. Chronic kidney disease (CKD) will progress to end-stage without treatment, but the decline of renal function may not be linear. Approximately 20 million people in the United States are currently affected by CKD, with half a million of these presenting with the most severe form, end-stage renal disease (ESRD). The only treatments for ESRD are dialysis or transplantation. The yearly mortality of patients on dialysis can be as high as 20%, and transplantation is limited by organ shortage. Risk factors for progression of kidney disease include hypertension, proteinuria, male sex, obesity, diabetes mellitus, hyperlipidemia, smoking, high-protein diets, phosphate retention, and metabolic acidosis. Recent experimental evidence suggests that dietary manipulations, such as reductions in protein and/or phosphate intake, can halt or attenuate the progression of chronic renal insufficiency in experimental animal models. Therefore, the exciting possibility exists that the natural history of some renal diseases may be altered by changes in the diet. We review current information regarding the role of manipulations of dietary protein, phosphorus, or lipid content on the progression. One promising treatment is using probiotics, which are beneficial microbe's probiotics can slow down kidney failure and lower inflammation.

Keywords: Chronic kidney disease, Kidney failure, Glomerular filtration rate, Gut bacteria

NUTRACEUTICALS: A GROWING MARKET FOR NUTRITION AND HEALTH

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Abstract

Nutraceutical is a hybrid of Nutrition and Pharmaceutical. Nutraceuticals, in broad terms, are foods or parts of food playing a significant role in modifying and maintaining normal physiological action that maintains healthy human beings. In recent years, there has been a growing interest in nutraceuticals, which provide health benefits and are an alternative to modern medicine. Nutraceutical-rich vegetables and fruits are an important component of a healthy diet. The principal reasons for the growth of the Nutraceutical market worldwide are the current population and the health trends. Nutraceutical is a hybrid of Nutrition and Pharmaceutical. Nutraceuticals, in broad terms, are foods or parts of food playing a significant role in modifying and maintaining normal physiological action that maintain healthy human beings. In recent years, there is a growing interest in nutraceuticals, which provide health benefits and are an alternative to modern medicine. Nutraceutical-rich vegetables and fruits are an important component of a healthy diet. The principal reasons for the growth of the Nutraceutical market worldwide are the current population and the health trends. The nutraceutical market is seeing tidal growth mainly in the United States, India, and European countries. Faster access to this market is possible through business partnership models, effective regulatory compliance, and by evaluating key trends and consumer reference.

Keywords: Nutraceuticals, Nutrition, Health Benefits, Hybrid, Tidal, Trends.

**AI AND MACHINE LEARNING IN PHARMACEUTICAL
FORMULATION OPTIMIZATION: A QUALITY BY DESIGN (QBD) APPROACH**

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Abstract

Pharmaceutical formulation development is a complex multivariable process traditionally based on trial-and-error experimentation. This approach is time-consuming, costly, and often fails to fully capture the relationship between critical material attributes (CMAs), critical process parameters (CPPs), and critical quality attributes (CQAs). The integration of Artificial Intelligence (AI) and Machine Learning (ML) with the Quality by Design (QbD) framework provides a modern, data-driven strategy to accelerate formulation development while ensuring consistent product quality. This presentation highlights the role of AI/ML tools in formulation optimization and process prediction under the QbD paradigm. ML models such as Artificial Neural Networks, Random Forest, Support Vector Machines, and Bayesian optimization can analyze formulation and process datasets to model non-linear relationships between variables (e.g., excipient ratio, binder concentration, mixing speed) and product performance (e.g., dissolution, hardness, assay, stability). These predictive models support design space establishment, risk assessment, and control strategy development aligned with ICH Q8–Q11 guidelines. AI-driven formulation screening reduces experimental runs, improves prediction accuracy for CQAs, and enhances batch-to-batch reproducibility. Overall, AI/ML combined with QbD offers a promising pathway for efficient, robust, and smart pharmaceutical product development.

Keywords: Artificial Intelligence, Machine Learning, Quality by Design, Formulation Optimization, Design Space, CQAs

ARTIFICIAL INTELLIGENCE-ASSISTED DRUG DESIGN AND OPTIMIZATION: A PHARMACEUTICAL CHEMISTRY PERSPECTIVE

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Abstract

Artificial intelligence (AI) is rapidly transforming pharmaceutical chemistry by enabling data-driven drug design and optimization across the drug discovery pipeline. Traditional medicinal chemistry approaches, while scientifically robust, are often time-intensive and resource-demanding, limiting translational efficiency. AI-assisted methodologies, including machine learning, deep learning, and cheminformatics, are increasingly integrated to accelerate molecular design, lead optimization, and preclinical decision-making. These tools enable accurate prediction of structure–activity relationships (QSAR), binding affinities, physicochemical properties, and ADMET profiles, thereby reducing attrition rates in drug development. From a pharmaceutical chemistry perspective, AI bridges the gap between academic research and industrial drug development by converting large experimental and chemical datasets into actionable molecular insights. AI-driven de novo molecular design and multi-objective optimization strategies support rational scaffold modification to enhance potency, selectivity, and developability. Moreover, integration of AI with high-throughput screening and computational modeling improves lead prioritization and optimization efficiency. This poster highlights recent advances in AI-assisted drug design with emphasis on lead identification and optimization, while addressing key challenges related to data quality, model interpretability, and regulatory acceptance. The convergence of artificial intelligence with pharmaceutical chemistry is redefining conventional drug discovery paradigms and equipping future pharmaceutical chemists with computationally augmented, industry-relevant strategies essential for sustainable and translational drug innovation.

Keywords: Artificial Intelligence, Pharmaceutical Chemistry, Drug Design, Lead Optimization, QSAR, ADMET Prediction, Medicinal Chemistry

FORMULATION AND CHARACTERIZATION OF NARINGIN – NANO GEL FOR SUSTAINED DRUG DELIVERY FOR DIABETIC WOUNDS

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Abstract

The creation of topical administration devices to promote drug penetration via the skin has drawn more interest in recent years. Medications with questionable oral administration are frequently utilized for Diabetic wound. Diabetes causes poor circulation and an increased risk of nerve damage and infection, which makes diabetic ulcers a serious complication. Ulcers are open sores (also referred to as wounds) on your skin that don't heal. Naringin (4',5,7-trihydroxy flavanone 7-rhamnoglucoside) is a major and active flavanone glycoside, isolated from the grape and citrus fruit species, which has been shown to have several pharmacological properties such as neuroprotective, hepatoprotective, antimicrobial, cardioprotective, anti-inflammatory, antioxidant, and renoprotective effects.

Keywords: Naringin, Nano Gel Drug Delivery, Diabetic wound, flavanone glycoside.

DEVELOPMENT OF AN INVASIVE DIAGNOSTIC PLATFORM FOR EARLY DETECTION OF FEMALE GENITAL TUBERCULOSIS (FGTB)

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Abstract

Although the control of tuberculosis programs has improved, the issue of female genital tuberculosis (FGTB) is a silent and major cause of female infertility, especially in areas of tuberculosis endemicity. Due to the indistinct nature of clinical manifestation and the absence of an effective early diagnosis method, FGTB is often underdiagnosed, leading to late diagnosis and irreversible reproductive harm. The existing diagnostic techniques, such as histopathology, culture, polymerase chain reaction, and laparoscopy, cannot work well with detecting the disease at early stages because they are not sensitive, the turnaround time is long, it is invasive, and is very expensive. In this research, it is suggested to create an invasive diagnostic platform that can identify FGTB in its early stages through the specific immunological biomarkers that relate to infection with *Mycobacterium tuberculosis*. The presented system is a strip-based immunodiagnostic system that would identify specific antigens or antibodies, which are found in endometrial samples that have been collected using the least invasive methods. The platform will enhance the precision of diagnosis and shorten the diagnosis time significantly by combining the biomarker specificity and a quick detection format. Immediate, cost-effective, and correct diagnosis facilitates prompt treatment, retards the disease spread, maintains reproductive health, improves fertility and supplements diagnostics in resource-scarce, tuberculosis-infested environments.

Keywords: Female genital tuberculosis (FGTB), histopathology, culture, polymerase chain reaction, laparoscopy

FORMULATION AND EVALUATION OF SUGAR COATED MULTI-HERBAL TABLETS (ANTHELMINTIC)

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Abstract

Helminthic infections remain a major public health concern worldwide, particularly in developing regions where access to effective chemotherapy is limited. Increasing reports of drug resistance and undesirable side effects associated with conventional synthetic anthelmintic agents have intensified the search for safer, plant-based therapeutic alternatives. In this study, an attempt was made to develop and evaluate sugar-coated herbal tablets incorporating *Carica papaya* leaf extract for potential anthelmintic use. Tablet formulations were prepared by the wet granulation method, and five batches were formulated using different binding agents, including acacia solution at varying concentrations (1%, 1.5%, and 2%), starch solution (1.5%), and sodium alginate solution (1%). Pre-compression evaluation revealed good flowability and compressibility of the granules. Post-compression quality control tests, such as hardness, thickness, weight uniformity, friability, and disintegration time, were performed and found to be within acceptable pharmacopeial limits. Visual inspection showed that formulations F1, F3, and F5 exhibited a light greenish-white appearance, whereas F2 and F4 appeared relatively darker. The disintegration time for all formulations ranged between 45 and 49 minutes. Overall, the findings indicate that sugar-coated herbal tablets containing *Carica papaya* leaf extract can be successfully formulated with satisfactory physicochemical and mechanical properties. The developed dosage form demonstrates potential as a natural alternative for anthelmintic therapy.

Keywords: *Carica papaya*, Helminthic infection, Herbal anthelmintic, Sugar-coated tablets, Wet granulation technique

AI IN DRUG FORMULATION AND DEVELOPMENT: A REVIEW ON THE ROLE OF AI IN NEW DRUG DISCOVERY

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Abstract

Artificial Intelligence (AI) and its subfield, Machine Learning (ML) focus on enabling machines to perform intelligent tasks without explicit programming. In recent years, AI has gained significant importance in pharmaceutical research, particularly in drug formulation, development, and new drug discovery. Conventional drug discovery is a complex, expensive, and time-consuming process that often requires more than a decade of continuous research and involves a high failure rate due to trial-and-error experimentation. AI plays a crucial role in information synthesis by analyzing large volumes of biological and clinically relevant data to support drug development and optimization. In new drug discovery, AI assists in target identification, virtual screening, lead optimization, and prediction of pharmacokinetic and toxicological properties, including ADMET. Machine learning algorithms can analyze gene expression profiles, protein–protein interaction networks, and genomic and proteomic data to identify potential drug targets involved in disease pathways. AI also contributes to drug formulation and development by supporting excipient selection, optimization of formulation variables, prediction of drug release behaviour, and stability assessment. The application of Artificial Intelligence in pharmaceutical sciences improves accuracy, reduces time and cost, and increases the success rate of new drug discovery and formulation development. Despite challenges such as data quality and implementation cost, AI represents a powerful and promising tool for future pharmaceutical research and innovation.

Keywords: Artificial intelligence, drug formulation, new drug discovery, machine learning, pharmaceutical research

THE FUTURE OF ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL SCIENCESRanjeet Kumar¹, Mudit Kumar^{2*}¹Department of Pharmacology, Faculty of Pharmacy, Uttar Pradesh University of Medical Sciences, Saifai, Etawah 206130, UP, India.^{2*}Assistant Professor, Department of Pharmacology, Faculty of Pharmacy, Uttar Pradesh University of Medical Sciences, Saifai, Etawah 206130, UP, India**Corresponding Author: muditcology@gmail.com****Abstract**

Artificial Intelligence (AI) is drastically changing the pharmaceutical industry by changing clinical decision-making, medication development, production, and discovery. Accelerated target identification, lead optimization, toxicity prediction, and customized treatment plans have been made possible by the integration of cutting-edge computer approaches, including machine learning, deep learning, natural language processing, and predictive analytics. Even with these developments, there is still a big gap between academic AI research and its actual application in the pharmaceutical sector. Differences in research priorities, data accessibility, legal limitations, scalability issues, and workforce readiness are the causes of this gap. The changing role of AI in contemporary pharmaceutical sciences is examined in this review, which also critically analyzes the obstacles to successful transfer from academic discovery to industry application. The development of interdisciplinary skills, standardized data ecosystems, collaborative frameworks, and regulatory harmonization is highlighted as an important facilitator of successful integration. The article also covers new industry-academia collaborations, real-world case studies, and governmental initiatives that show how AI-driven solutions can improve patient outcomes, increase efficiency, and lower development costs. AI has the potential to create a more flexible, data-driven, and patient-focused pharmaceutical industry by connecting academic creativity with business needs. To fully realize AI's potential and guarantee its ethical and sustainable adoption throughout the pharmaceutical value chain, stakeholders must strategically align.

Keywords: Artificial Intelligence (AI), Pharmaceutical Sciences, Drug Development, Translational Research, Patient-Centric Healthcare

AI-POWERED DESIGN OF PROTEIN THERAPEUTICS

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Protein therapeutics have transformed modern medicine by enabling highly specific and potent interventions for a wide range of diseases, including cancer, autoimmune disorders, and infectious diseases. However, traditional protein drug discovery is time-consuming, expensive, and limited by experimental trial-and-error approaches. The integration of Artificial Intelligence (AI) into protein therapeutics design has emerged as a powerful solution to these challenges. AI-powered methods leverage machine learning, deep learning, and large biological datasets to predict protein structure, stability, binding affinity, immunogenicity, and pharmacokinetic properties with high accuracy. Advanced algorithms such as neural networks and generative models enable the rational design of novel proteins and optimization of existing biologics, significantly reducing development timelines and costs. AI-driven platforms also facilitate in silico screening of vast protein sequence spaces, identification of therapeutic targets, and prediction of protein–protein interactions. Furthermore, the combination of AI with structural biology tools, such as cryo-electron microscopy and molecular dynamics simulations, enhances the precision of protein engineering. Despite challenges related to data quality, interpretability, and regulatory acceptance, AI-powered protein therapeutics hold immense promise for accelerating drug discovery and enabling personalized medicine. This approach represents a paradigm shift toward faster, smarter, and more efficient development of next-generation biologics.

Keywords: Artificial Intelligence, Protein Therapeutics, Machine Learning, Drug Discovery, Protein Engineering, Biologics

ROLE OF NANOCARRIERS IN SITE-SPECIFIC DRUG DELIVERY: ADVANCING PHARMACEUTICAL RESEARCH THROUGH INTELLIGENT INNOVATION

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Abstract

Nanocarrier-based site-specific drug delivery systems have emerged as a groundbreaking approach in pharmaceutical research by overcoming the long-standing challenges of nonspecific drug distribution, systemic toxicity, and suboptimal therapeutic efficacy associated with conventional drug administration. This abstract highlights the integration of advanced nanocarrier platforms—such as liposomes, dendrimers, solid lipid nanoparticles, polymeric nanoparticles, and nanocrystal-lipid hybrid system with intelligent computational technologies for precision therapy and for improved solubilization and bioavailability. Artificial Intelligence (AI) and Machine Learning (ML) are emerging as transformative tools for optimizing nano-vehicle design, formulation design parameters, and bio-interactions. AI-driven predictive modeling enables accurate estimation of parameters such as particle integrity, drug entrapment efficiency, and pharmacokinetic profiles, while ML algorithms facilitate the analysis of large-scale biological datasets to guide tailored surface modifications and receptor-mediated delivery strategies. The convergence of nanotechnology with intelligent innovation and cutting-edge breakthroughs fosters faster formulation development, reduced experimental trial cycles, and enhanced translational potential for personalized therapeutics. This study underscores the role of AI-guided nanocarriers as the next frontier in drug delivery research, marking a pivotal step toward intelligent, adaptive, and customized pharmaceutical systems for patient-specific treatment or an individualized drug delivery system.

Keywords: Nanocarriers, Site-Specific Delivery, Artificial Intelligence, Machine Learning, Personalized Medicine

ROLE OF ARTIFICIAL INTELLIGENCE IN ENHANCING BIOAVAILABILITY OF POORLY WATER-SOLUBLE DRUGS

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Abstract

Poor aqueous solubility is a major challenge in pharmaceutical development as it limits oral bioavailability and therapeutic effectiveness of many drugs. Traditional formulation approaches such as solid dispersions, lipid-based systems, nanoparticles, and inclusion complexes often involve extensive trial-and-error experiments. Artificial Intelligence (AI) provides a data-driven and predictive approach to overcome these limitations by analyzing large datasets related to physicochemical properties, formulation variables, and in-vitro performance. AI techniques such as machine learning and artificial neural networks help in the rational selection of suitable drug delivery systems, excipients, and processing parameters, while also predicting solubility enhancement, dissolution behavior, stability, and drug–excipient compatibility. Integration of AI with Quality by Design (QbD) principles further supports identification of critical quality attributes and process parameters, leading to robust and reproducible formulations. Although challenges such as data availability and regulatory acceptance remain, AI-based strategies offer a promising and efficient solution for improving the bioavailability of poorly water-soluble drugs and bridging the gap between academic research and industrial pharmaceutical development.

Keywords: Artificial Intelligence, Bioavailability, Poorly Water-Soluble Drugs, Machine Learning, Drug Delivery Systems

EXPLORING THE IMPACT OF WIRELESS RADIATION ON PHYTOCHEMICAL STABILITY AND THERAPEUTIC EFFICACY OF HERBAL FORMULATIONS”

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Abstract

The wireless radiation produced by daily use of electronic gadgets like cell phones, Wi-Fi routers, and Bluetooth systems has become an inevitable environmental contact. Herbal preparations, especially liquid ones such as the Amla (*Emblica officinalis*) juice, are abundant in labile bioactive compounds like ascorbic acid and polyphenols, which are also very easy to degrade through oxidation. The current report reviews and analyzes the available scientific evidence on the possible effects of non-ionizing radiofrequency electromagnetic fields (RF-EMF) on the stability and treatment quality of herbal Amla juice. The available literature involving plants, extracts, and biological systems has shown that RF-EMF exposure can cause oxidative stress, change as well as antioxidant enzyme activity, and adjust secondary metabolite patterns under specific exposure conditions. These effects are recorded more at the usual frequencies like 2.4 GHz (Wi-Fi) and 900-1800 MHz (mobile communication), especially when used in a continuous or nonstop mode. Nevertheless, there is still little and inconclusive direct experimental evidence regarding completed herbal formulations such as the packaged Amla juice.

This research identifies the major pathways through which the wireless radiation has the potential to modify the phytochemical stability, which include reactive oxygen species production, dielectric dispersion with aqueous matrices, and possible synergies with thermal and environmental stressors. The effect of formulation composition and packaging material on the RF penetration in modulation is also addressed. In general, temperature, oxygen, and light are the most dominant factors influencing the stability of Amla juice, but wireless radiation can also be viewed as an added factor in the worst-case circumstances. The results highlight the necessity of properly designed, managed stability research in explaining the practical importance of wireless radiation on the quality and shelf life of herbal products.

Keywords: Wireless radiation, environmental stressors

AI DRIVEN DISCOVERY OF BIOACTIVE COMPOUNDS FROM MEDICINAL PLANTS: BRIDGING PHARMACOGNOSY RESEARCH WITH FUTURE PHARMACEUTICAL INNOVATION

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Abstract

Medicinal plants remain an important source of therapeutic agents, but conventional natural product drug discovery is often slow, costly, and labor intensive. Artificial Intelligence is increasingly transforming pharmacognosy by enabling rapid analysis of complex phytochemical, biological, and ethnopharmacological data. AI driven approaches such as machine learning, virtual screening, QSAR modeling, and metabolomics facilitate prioritization of medicinal plants, prediction of biological activity, and identification of potential lead compounds at an early stage. These tools also support dereplication, reduce experimental redundancy, and improve decision making in bioassay guided studies. Integration of traditional knowledge with computational models enhances target selection and improves success rates in drug discovery. AI based methodologies help bridge the gap between academic research and pharmaceutical industry expectations by reducing time, cost, and failure during early development phases. Overall, AI driven discovery promotes systematic, efficient, and sustainable utilization of medicinal plant resources, strengthening the role of pharmacognosy in future pharmaceutical innovation.

Keywords: Artificial Intelligence, Pharmacognosy, Medicinal Plants, Bioactive Compounds, Machine Learning, Natural Product Drug Discovery

TARGET-BASED MOLECULAR DOCKING STUDY OF QUERCETIN FOR INFLAMMATION, ANGIOGENESIS, AND TISSUE REMODELING IN WOUND HEALING

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Abstract

Wounds result from skin injuries that disrupt underlying soft tissues, and wound healing is a complex process involving tissue repair and remodeling. Plant-based therapies have long been used for wound management. Based on ethnobotanical evidence and literature review, *Moringa oleifera*, *Ocimum sanctum*, and *Azadirachta indica* were selected for the study. Preliminary physicochemical and phytochemical evaluations were conducted following standard protocols. The antioxidant potential of ethanolic leaf extracts was assessed using DPPH and FRAP assays, confirming strong antioxidant activity. Polyherbal formulations containing ethanolic extracts of the selected plants were developed for wound treatment, exploiting their anti-inflammatory and antibacterial properties. The formulations demonstrated rich phenolic and flavonoid content and showed good compatibility with Carbopol 940. Among the formulations, F1 and F3 exhibited superior performance. Anti-inflammatory activity was evaluated using the oleogel paw edema model, while wound-healing efficacy was assessed through wound contraction, tensile strength, and hydroxyproline content. Additionally, in silico molecular docking support

Keywords: Wound healing; Quercetin; Molecular docking; Flavonoids; Inflammation; Angiogenesis; Extracellular matrix remodeling.

SUSTAINABLE GREEN SYNTHESIS OF BENZIMIDAZOLE DERIVATIVES: A CRITICAL INTERPRETATION OF PROGRESS, MECHANISMS, AND PHARMACOLOGICAL INTERSECTIONS

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Abstract

The benzimidazole nucleus remains essential in drug development because it is a flexible scaffold in medicinal chemistry. Synthetic procedures are moving toward sustainable methods due to environmental requirement. This paper describes new green methods such as photochemical activation, mechanochemical synthesis, and the utilization of magnetically recoverable or biodegradable catalysts.

Beyond approach, we assess the underlying mechanistic frameworks critically, pointing out areas where practical success may be accompanied by a lack of empirical confirmation. Additionally, the study investigates the pharmacological characteristics of derivatives produced through these alternate methods, with an emphasis on antibacterial and anticancer uses. We highlight the potential—as well as the present constraints—of these developing synthetic approaches in creating next-generation therapeutic medicines by addressing the nexus of green chemistry and bioactivity.

Keywords: benzimidazole derivatives, sustainable green synthesis, critical interpretation, mechanochemical approaches

ASSESSMENT AND EVALUATION OF SEVERITY LEVEL OF PARKINSON'S DISEASE PATIENTS USING MDS-UPDRS AT TERTIARY CARE HOSPITAL

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Abstract

Parkinson's disease (PD) is a progressive and complex neurodegenerative disorder marked by dopaminergic neuronal loss and a broad spectrum of motor and non-motor symptoms (NMS), resulting in substantial functional impairment. The Movement Disorder Society-Unified Parkinson's Disease Rating Scale (MDS-UPDRS) enables comprehensive assessment of disease severity across symptom domains. This six-month cross-sectional study included 97 patients with PD. Demographic and clinical data were collected using a patient profile form. Motor and non-motor symptoms were evaluated using MDS-UPDRS Parts I and II. As scores were non-normally distributed, non-parametric analyses were applied. Wilcoxon signed-rank tests assessed paired differences, and Spearman's rank correlation examined associations between MDS-UPDRS scores and disease characteristics. All participants reported at least one NMS. The most prevalent NMS were cognitive impairment, anxiety, apathy, and fatigue. Tremor was the most frequent motor symptom, followed by speech difficulties. The mean total MDS-UPDRS score was 58.9. No significant difference emerged between Part I and Part II scores ($p = 0.508$), although a strong positive correlation was observed ($r = 0.966$, $p = 0.001$). Disease duration showed a moderate positive correlation with total score ($r = 0.367$, $p = 0.001$). Findings support MDS-UPDRS as a reliable tool capturing heterogeneous PD burden across symptom domains.

Keywords: Motor symptoms, Disease severity, Parkinson's disease, NMS, MDS-UPDRS

PHARMACOLOGICAL ASSESSMENT OF WOODFORDIA FRUCTICOSA

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Woodfordia fruticosa, commonly known as “Dhavari,” is a medicinal shrub widely used in traditional Ayurvedic and folk medicine for its diverse therapeutic properties. Recent pharmacological investigations have demonstrated its significant potential in promoting wound healing through multiple mechanisms. The plant is rich in bioactive constituents such as flavonoids, tannins, phenolic acids, and ellagitannins, which contribute to its antioxidant, anti-inflammatory, antimicrobial, and astringent activities—key factors in tissue repair. Experimental studies on animal models have shown that extracts of *W. fruticosa* accelerate epithelialization, increase wound contraction rate, enhance collagen synthesis, and improve tensile strength of the healed tissue. The presence of polyphenolic compounds aids in free radical scavenging, thereby protecting newly formed tissues from oxidative stress. Furthermore, the antimicrobial properties of the extract help prevent secondary infections, facilitating faster healing. Collectively, these findings support the ethnomedicinal use of *Woodfordia fruticosa* in the management of wounds and highlight its potential as a natural source for developing novel wound-healing formulations. Further clinical investigations are warranted to validate its efficacy and safety in human subjects.

Keywords: *Woodfordia fruticosa*, wound healing, flavonoids, antioxidant, antimicrobial, tissue regeneration

SYNERGISTIC POTENTIAL OF NATURAL DRUGS IN ROTENONE-INDUCED PARKINSON'S DISEASE: INSIGHTS FROM MURINE MODELS

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Abstract

Parkinson's disease (PD) is a chronic, progressive neurodegenerative disorder marked by the selective loss of dopaminergic neurons, leading to motor and non-motor impairments. Oxidative stress, mitochondrial dysfunction, neuroinflammation, and protein aggregation are central to PD pathogenesis. Rotenone-induced murine models closely replicate these pathological features and are therefore extensively used in preclinical research. This review focuses on the rationale and emerging evidence for evaluating the synergistic effects of natural drugs in rotenone-induced Parkinson's disease models. Natural compounds, owing to their multi-target actions and favorable safety profiles, have gained attention as potential neuroprotective agents. The combined use of natural drugs may enhance therapeutic efficacy by simultaneously modulating oxidative stress, inflammatory pathways, mitochondrial integrity, and dopaminergic neurotransmission. This review summarizes current preclinical findings on combination strategies using natural agents, highlights their mechanisms of action, and discusses their impact on behavioral, biochemical, and molecular outcomes in murine PD models. Understanding such synergistic interactions may aid in the development of effective, multi-modal therapeutic approaches for PD and support their future translational potential.

Keywords: Parkinson's disease; Rotenone; Natural drugs; Synergistic effects; Murine model; Neuroprotection; Oxidative stress

VALIDATION OF ANALYTICAL METHOD FOR ESTIMATION OF DEFERASIROX IN PHARMACEUTICAL FORMULATIONS

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Abstract

Objective: An analytical method was developed and validated to ensure accurate, precise, and reproducible estimation of deferasirox.

Methodology: A spectrophotometric method was selected. Maximum absorbance wavelength was determined at 248nm, calibration curves were constructed, and linearity was established. Accuracy was assessed through recovery studies, precision was evaluated by repeatability and intermediate precision, and specificity was confirmed in the presence of excipients. Robustness was checked by deliberate variations in method parameters.

Validation Parameters: Validation was performed according to International Council for Harmonisation (ICH) guidelines. The method was performed on various parameters like system suitability, system precision, method precision, linearity and robustness. Sensitivity was demonstrated by calculating the limit of detection (LOD) and limit of quantification (LOQ). Stability studies were conducted to confirm reliability under different conditions.

Results: The method was found to be simple, rapid, and cost-effective. High accuracy and reproducibility were achieved, with no interference from excipients. Consistent results were obtained when applied to marketed formulations. The retention time was about 4-4.5 minutes.

Keywords: Deferasirox, Chromatography, Reverse-Phase-High-Performance-Liquid-Chromatography, Accuracy, Precision.

ROLE OF ARTIFICIAL INTELLIGENCE IN BRIDGING ACADEMIA AND INDUSTRY FOR THE FUTURE OF PHARMACEUTICAL SCIENCES

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Abstract

Artificial Intelligence (AI) is playing an increasingly important role in transforming pharmaceutical sciences by improving research efficiency, accuracy, and innovation. The pharmaceutical industry faces challenges such as high drug development costs, long research timelines, and low success rates in clinical trials. AI-driven technologies help overcome these challenges by enabling rapid data analysis, predictive modeling, and automation of complex processes.

This poster focuses on the applications of AI in drug discovery, clinical research, pharmacovigilance, personalized medicine, and smart healthcare systems. Machine learning tools assist in identifying potential drug candidates, predicting drug–target interactions, optimizing clinical trial design, and monitoring adverse drug reactions, leading to improved patient safety and treatment outcomes.

AI also acts as a bridge between academia and industry by translating academic research into practical industrial applications. Collaboration between academic institutions and pharmaceutical industries is essential to address challenges related to data security, ethical concerns, regulatory approval, and skill development.

This study highlights emerging trends and future opportunities of AI in pharmaceutical sciences, emphasizing interdisciplinary collaboration to advance innovation and improve global healthcare outcomes.

Keywords: Artificial Intelligence, Pharmaceutical Sciences, Drug Discovery, Clinical Research, Academia–Industry Collaboration

HERBOSOME-INTEGRATED THERMORESPONSIVE HYDROGEL: A NOVEL PHYTOPHARMACEUTICAL TOPICAL SYSTEM FOR ATOPIC DERMATITIS MANAGEMENT

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Abstract

Atopic dermatitis (AD) is a chronic inflammatory skin disorder characterized by impaired skin barrier function, microbiota imbalance, and immune dysregulation. Conventional corticosteroid therapies carry risks of local and systemic adverse effects. This study presents a novel herbosome-integrated thermoresponsive hydrogel delivering synergistic phytoconstituents for targeted management of AD. The herbosome formulation enhances the solubility, stability, and skin-penetration efficiency of bioactive herbal components through phospholipid-based nanocarrier technology. Incorporation into a poloxamer-based thermoresponsive hydrogel allows on-site gelation at physiological temperature, thereby ensuring sustained drug release and superior patient compliance. Preliminary physicochemical characterization exhibits ideal viscosity, gelation temperature, entrapment efficiency, and spreadability appropriate for dermatological application. Antioxidant and anti-inflammatory assays validate the therapeutic potential of the formulation with improved safety compared to steroids. This work provides a promising phytopharmaceutical alternative for effective and non-invasive AD therapy with strong clinical translation and commercialization potential.

Keywords: Atopic dermatitis, Herbosome, Antioxidant, and anti-inflammatory

RECENT & ADVANCEMENTS ON METHOD DEVELOPMENT AND VALIDATION

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Abstract

In pharmaceuticals, analytical measures everything hinges on how we develop and validate our testing methods. If our methods are not developed carefully on a technical and strong scientific basis, we cannot assure the consistency and accuracy of the measurement results needed to get new medicines approved with quality standards. This review takes a deep dive into the strategies we use and the hurdles we face while building these analytical frameworks. It shines a light on the heavy hitters of the lab, like HPLC, GC, and LC–MS, as well as UV–visible spectrophotometry. The article walks through actual process of making a method work including "nuts and bolts" of optimization like preparing samples, tweaking chromatographic settings, optimum detection modes and aspects like ICH guidelines, with brief discussion on essentials of validation such as Accuracy and Precision, Limit of Detection, Limit of Quantitation, Robustness etc. Finally, the review looks at where the field is headed next and exploring how automation is speeding. Whether we are a researcher in the lab or a regulatory expert, our effort is to provide a practical, straightforward guide to the modern world of pharmaceutical analysis for areas on which further developments are feasible.

Keywords: HPLC, GC, LC-MS

BEYOND NOOTROPICS: PIRACETAM-BASED NMDA MODULATION FOR NEUROPATHIC PAIN THERAPY

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Abstract

Chronic neuropathic pain continues to be a major clinical challenge due to central sensitization and the limited efficacy of conventional analgesics. N-Methyl-D-aspartate receptor hyperactivity is involved in the amplification of nociceptive signaling within the spinal cord. Piracetam, a nootropic drug with an excellent safety profile, has recently attracted attention as an agent capable of modulating glutamatergic neurotransmission and membrane fluidity. This poster focuses on emerging evidence that supports the repositioning of Piracetam and its structurally optimized racetam analogues as potential NMDA-targeted analgesics. In silico molecular docking studies indicated favorable interactions of Piracetam derivatives with the channel vestibule of the NMDA receptor, similar to well-known antagonists. The initial in vivo studies in rodent neuropathy models have shown reduced hyperalgesia and allodynia indicative of modulation of wind-up phenomena. These findings contribute to an innovative therapeutic direction to overcome opioid tolerance, associated side effects, and non-responsiveness in cancer-induced and chemotherapy-induced neuropathic pain. It remains essential to continue enhancing structure–activity relationships, receptor subtype selectivity, and translational outcomes to achieve safer and more effective NMDA-modulating analgesics.

Keywords: NMDA, Piracetam and Neuropathy pain

BRIDGING SOLUBILITY–PERMEABILITY GAPS IN BCS CLASS IV DRUGS: THE EMERGING ROLE OF CO-CRYSTALLIZATION AND ARTIFICIAL INTELLIGENCE

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According to the World Health Organization, Gastrointestinal (GI) infections represent a substantial global health challenge, with an estimated 4.45 billion incident cases of enteric infections reported in 2021 alone and diarrheal diseases causing about 1.17 million deaths worldwide according to recent global burden studies. Many drugs used to treat these infections belong to BCS Class IV, characterized by low aqueous solubility and poor intestinal permeability, which leads to inconsistent absorption, reduced bioavailability, and suboptimal therapeutic efficacy. These limitations often necessitate frequent or high dosing, increasing side effects and reducing patient compliance. To address these challenges, pharmaceutical co-crystallization has emerged as a novel solid-state modification approach, where an API is combined with pharmaceutically acceptable co-formers through non-covalent interactions to form co-crystals that improve solubility and dissolution without altering the API's chemical structure. Integration of Artificial Intelligence (AI) in co-crystal design further enhances this approach by predicting optimal co-formers, modelling crystal stability, and estimating dissolution behavior, thereby reducing experimental time and cost. Together, AI-assisted co-crystallization accelerates formulation development, enhances drug performance, and supports more effective oral therapies. Overall, this novel formulation approach has the potential to enhance therapeutic efficacy, improve patient compliance, and offer an effective oral treatment platform for a wide range of gastrointestinal infections.

Keywords: World Health Organization, Artificial Intelligence, Formulation Development

FORMULATION AND EVALUATION OF FILM-FORMING SPRAY OF BOSWELLIA EXTRACT.

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Abstract

Boswellia serrata extract, renowned for its anti-inflammatory and wound healing properties, presents challenges in topical delivery due to poor adhesion and rapid wash-off. This study aimed to formulate and evaluate a film-forming spray (FFS) to enhance its mucoadhesive potential for maximum release on skin. The FFS was developed using Boswellia extract (5% w/w) as the active, hydroxypropyl methylcellulose (HPMC, 3% w/w) and ethyl cellulose (2% w/w) as film-formers, polyvinylpyrrolidone (PVP K-30, 2% w/w) as plasticizer, and ethanol: water (70:30) as solvent system with dimethyl isosorbide as permeation enhancer. Nine formulations (F1-F9) were prepared via simple mixing and optimized using 3^2 factorial design based on polymer concentrations. Optimized F6 was evaluated for physicochemical parameters: pH (5.8 ± 0.1), viscosity (12.5 ± 0.4 cps), density (0.89 ± 0.02 g/mL), surface tension (28.2 ± 0.5 dynes/cm), spray pattern (uniform cone, 8 cm spray distance), and droplet size (45 ± 3 μ m). Film properties included drying time (45 ± 2 s), tensile strength (2.5 ± 0.2 N/mm²), % elongation ($25 \pm 1.5\%$), water vapor transmission rate (450 ± 15 g/m²/24h), and moisture vapor permeability (320 ± 10 g/m²/24h). Drug content was $98.2 \pm 1.1\%$, with no microbial growth. The FFS demonstrated ideal sprayability, rapid film formation, and mechanical robustness, indicating suitability for topical applications.

Keywords: Film Forming Spray, Boswellia, Topical Spray, Wound healing, anti- inflammatory.

T-TEST TO COMPARE EXPERIMENTAL CONDITIONS IN RESEARCH

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Abstract

In research, determining whether a treatment or intervention truly affects outcomes requires statistical evaluation. The t-test provides a method to assess whether observed differences between two conditions are significant or due to chance. The dependent-means t-test applies when the same participants experience both conditions, while the independent-means t-test is used for comparisons between separate groups. By comparing the means of a dependent variable across two levels of an independent variable, t-tests allow researchers to draw reliable conclusions about intervention effects.

Keywords: t-test, dependent-means, independent-means, experimental design, statistical significance, research methods

HARNESSING AI TO REVITALIZE NATURAL PRODUCT DISCOVERY: BRIDGING ACADEMIC DIVERSITY WITH INDUSTRIAL SCALE

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Abstract

Over half of all FDA-approved medications come from natural products (NPs), which continue to be an unparalleled source of chemical diversity. The "rediscovery" of known compounds and the labour-intensive, slow process of bioassay-guided isolation are two major obstacles in the conventional NP drug discovery pipeline. In order to address contemporary industrial demands, this talk examines how artificial intelligence (AI) functions as a transformative bridge, transforming NP research from a stochastic process into a predictive science. We examine the convergence of machine learning algorithms and high-resolution mass spectrometry and genome mining to facilitate rapid "dereplication" and "silent" biosynthetic gene cluster activation. By harnessing Deep Learning and Graph Neural Networks, researchers can forecast bioactivity and ADMET fingerprints of sophisticated scaffolds *in silico* prior to actual isolation. Such achievements respond to the pharmaceutical industry's mandate of greater speed and frugality in lead discovery by compressing years-long discovery timetables to mere months. Moreover, sustainable AI-optimised extraction techniques and synthetic biology also guarantee academic discoveries suitable for universal healthcare by harnessing machine learning algorithms. As we ponder forthcoming pharmaceutical trends in 2026, machine learning-infused natural product chemistry assumes a foundational role in facilitating next-generation personalised therapies.

Keywords: Natural Products (NPs); Artificial Intelligence (AI); Machine Learning; Drug Discovery; Dereplication; Genome Mining; Bioactivity Forecasting.

ROLE OF AI IN SPECTRAL ANALYSIS (NMR, IR, MS)

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Spectral analysis serves as a crucial method in chemistry for determining structures and conducting both qualitative and quantitative assessments of chemical substances through techniques such as NMR, IR, UV-Visible, and mass spectrometry. Nevertheless, the process of interpreting spectral information can be labor-intensive, intricate, and heavily reliant on the expertise of specialists, particularly when handling extensive datasets or overlapping signals. The incorporation of Artificial Intelligence (AI) has notably enhanced the effectiveness and precision of spectral analysis. AI-driven methods, encompassing machine learning and deep learning algorithms, facilitate the automated interpretation and recognition of patterns within spectral data. These models can rapidly analyse complex spectra, identify characteristic peaks, and correlate spectral features with molecular structures. AI-assisted spectral analysis reduces human error and enhances reproducibility, particularly in high-throughput analytical environments.

In NMR and mass spectrometry, AI models assist in peak assignment, noise reduction, and structure prediction. Similarly, in IR and UV–Visible spectroscopy, AI helps in compound classification and functional group identification. The application of AI also enables real-time data processing and supports faster decision-making in pharmaceutical, chemical, and environmental analysis.

In conclusion, Artificial Intelligence is transforming spectral analysis by enabling automated, accurate, and rapid interpretation of spectral data, thereby enhancing analytical efficiency and supporting advanced chemical research.

Keywords: Artificial Intelligence, Spectral Analysis, Structure Identification, Machine Learning

TRANSFORMING PHARMACEUTICAL RESEARCH THROUGH ARTIFICIAL INTELLIGENCE: THE NEED FOR STRONG ACADEMIA - INDUSTRY INTEGRATION

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Abstract

Background: Artificial Intelligence (AI) is rapidly transforming the pharmaceutical industry by accelerating drug discovery, optimizing formulation development, enhancing manufacturing efficiency, and strengthening post-market surveillance through predictive analytics and machine learning. By efficiently analysing complex datasets, AI addresses persistent challenges related to development timelines, costs, and low success rates. However, effective and structured collaboration between academia and industry is essential to ensure that AI-driven innovations are scientifically robust and clinically relevant.

Aim & Objectives: This study aims to highlight the role of AI in shaping the future of the pharmaceutical industry and to emphasize the importance of bridging the academia–industry gap. The objectives include evaluating AI applications across key pharmaceutical processes, identifying challenges in academic-to-industrial translation of AI innovations, and proposing collaborative strategies to enhance AI’s impact on pharmaceutical research and practice.

Methods and Results: A comprehensive literature review of peer-reviewed research articles and industry reports was conducted. The analysis indicates that AI technologies such as machine learning and deep learning significantly reduce early-stage drug discovery timelines and improve predictive accuracy in formulation development and clinical trial planning. However, gaps were identified in academic curricula regarding practical AI exposure. Strengthened academia–industry collaboration through internships, joint research, and co- designed curricula was found to enhance workforce readiness and real-world AI adoption.

Conclusion: AI has the potential to revolutionize pharmaceutical research and industry operations. Bridging academia and industry through strategic partnerships and adaptive education is crucial to fully realize this potential and ensure sustainable innovation.

Keywords: Artificial Intelligence; Pharmaceutical Industry; Drug Discovery; Academia– Industry Collaboration; Machine Learning

MOLECULAR MECHANISMS AND EMERGING THERAPEUTIC STRATEGIES IN ALZHEIMER'S DISEASE

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Abstract

Alzheimer's disease (AD) is a multifactorial neurodegenerative disorder and the leading cause of dementia worldwide, characterized by progressive cognitive decline and memory impairment. Pathologically, AD manifests with extracellular β amyloid ($A\beta$) plaque deposition and intracellular neurofibrillary tangles (NFTs) formed by hyper phosphorylated tau protein, accompanied by synaptic dysfunction, neuronal loss, and gliosis. The pathogenesis of AD is driven by complex interactions involving classical mechanisms—such as amyloid cascade, tau pathology, cholinergic deficits, glutamate excitotoxicity, and neuro inflammation as well as emerging processes including mitochondrial dysfunction, oxidative stress, cellular senescence, endoplasmic reticulum stress, ubiquitin proteasome system abnormalities, and microbiota–gut–brain axis disturbances. Genetic factors, notably APOE ϵ 4, PSEN1/2, and APP mutations, combined with modifiable lifestyle variables and comorbidities, further influence disease onset and progression. Traditional pharmacotherapy, including cholinesterase inhibitors (donepezil, rivastigmine, galantamine) and NMDA receptor antagonists (memantine), offers symptomatic relief but lacks disease-modifying efficacy. Recently, monoclonal antibodies targeting $A\beta$ species—aducanumab, lecanemab, and donanemab—have been FDA-approved, demonstrating potential to reduce amyloid burden. Contemporary research is shifting toward multi-target directed ligands (MTDLs), aiming to concurrently modulate $A\beta$ aggregation, tau hyperphosphorylation, metal ion dyshomeostasis, oxidative stress, and enzyme dysfunction.

Innovative therapeutic strategies also encompass selective and dual target inhibitors, allosteric modulators, proteolysis-targeting chimeras (PROTACs), protein-protein interaction modulators, stem cell therapies, and nanobiotechnological interventions. Moreover, leveraging radiopharmaceuticals for PET imaging enables early detection of AD pathology and has therapeutic implications in the design of precision-targeted interventions.

This synthesis underscores the necessity of an integrative approach addressing the multifaceted molecular and cellular mechanisms of AD. By delineating core pathogenic pathways and evaluating emerging therapeutic modalities, this work highlights promising strategies that may advance the development of effective disease modifying treatments, improve early diagnostic capabilities, and inform precision medicine for individuals affected by Alzheimer's disease.

Keywords- Alzheimer's disease, amyloid- β , tau protein, neuroinflammation, therapeutic strategies, dementia.

INTRACTABLE EPILEPSY, MOLECULAR MECHANISM FOR GENE

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Intractable epilepsy, also known as drug-resistant epilepsy, affects approximately 30% of individuals with epilepsy and represents a major clinical and therapeutic challenge. Increasing evidence indicates that genetic factors play a crucial role in the pathogenesis, prognosis, and treatment response of intractable epilepsy. Advances in genomic technologies, including next-generation sequencing, have enabled the identification of numerous epilepsy-associated genes, many of which are involved in ion channel function, synaptic transmission, neuronal development, and metabolic pathways. Mutations in genes such as *SCN1A*, *SCN2A*, *SCN8A*, *KCNQ2*, *DEPDC5*, *PCDH19*, and *STXBPI* have been strongly associated with severe and treatment-resistant epilepsy syndromes. Understanding the genetic basis of intractable epilepsy has important implications for early diagnosis, precision medicine, and the development of targeted therapies. These abstract highlights current knowledge of key genes implicated in intractable epilepsy and emphasizes the potential of genetic insights to improve clinical management and outcomes for affected individuals.

Keywords: Drug-resistant epilepsy, Epilepsy genetics, Ion channel genes, *SCN1A*, *KCNQ2*

ACCELERATING LEAD OPTIMIZATION: INTEGRATING AI AND COMPUTATIONAL CHEMISTRY TO BRIDGE ACADEMIC RESEARCH AND INDUSTRIAL STANDARDS

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Abstract

The high attrition rates and extensive time for lead optimization have really made the transition of a potential drug candidate from academic laboratories into the industrial pipelines a big dream. Resource-intensive calculations of Molecular Dynamics (MD) and Density Functional Theory (DFT) remain key bottlenecks in traditional computational chemistry. By integrating Artificial Intelligence (AI) and Machine Learning (ML) to overcome these bottlenecks, the speaker aims to directly address how this can help bridge academic innovation with industrial imperatives. By incorporating advanced machine learning algorithms, namely Random Forests and Deep Neural Networks, it is now possible to predict with unprecedented accuracy binding affinities, structural stability, and ADMET (Absorption, Distribution, Metabolism, Excretion and Toxicity) profiles in a fraction of the time that was previously required. This oral presentation presents how AI-driven predictive modeling reduces the "trial-and-error" cycle associated with the synthesis of new chemical entities. We will discuss how small molecules utilize these tools for the optimization of the pharmacokinetic profile to meet the uncompromising safety and efficacy standards that the global pharmaceutical industry requires from its products in 2026. Finally, a symbiotic approach, whereby AI-enhanced computational tools successfully complement traditional medicinal chemistry, is presented as a key strategy for the future development of cost-effective, high-quality therapeutics.

Keywords: Lead Optimization; Industry-Academia Bridge; Machine Learning; Computational chemistry; Artificial Intelligence (AI); Drug Discovery.

ARTIFICIAL INTELLIGENCE DRIVEN ANALYSIS AND CHARACTERIZATION OF MEDICAL COMPOUNDS

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Abstract

Artificial Intelligence (AI) is rapidly transforming the analysis and characterization of medical compounds by enhancing accuracy, efficiency, and predictive power in drug discovery and development. Traditional experimental techniques for compound analysis-such as spectroscopy, chromatography, and biological assays-are often time-consuming, expensive, and limited in handling complex datasets. AI overcomes these challenges by integrating machine learning, deep learning, and data-driven modeling to interpret large volumes of chemical and biological data with high precision. AI-based algorithms assist in predicting molecular structure, physicochemical properties, bioavailability, toxicity, and therapeutic potential of medical compounds at early stages. Techniques such as pattern recognition and neural networks enable faster characterization of compounds by analyzing spectral data, imaging results, and molecular interactions. Furthermore, AI accelerates structure-activity relationship (SAR) analysis, helping researchers optimize drug candidates while reducing experimental failures. The role of AI also extends to personalized medicine, where compound behavior can be predicted based on patient-specific biological data. Overall, AI serves as a powerful tool that complements experimental methods, reduces cost and time, and improves reliability in medical compound analysis and characterization. Its integration marks a significant advancement toward more efficient, precise, and innovative pharmaceutical research.

Keywords: Artificial Intelligence (AI); Chromatography; Spectroscopy, Structure Activity Relationship (SAR); Molecular Interaction, Molecular Structure; Toxicity; Spectral data.

HARNESSING MACHINE LEARNING FOR REAL-TIME DETECTION OF MEDICATION THERAPY PROBLEMS

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Abstract

Medication therapy problems (MTPs) are the most serious health issues in the medical field. They may arise from drug interaction and choosing the wrong drug or their dose. Detecting MTPs in real-time using machine learning can help us know the drug safety, along with their mechanism. Machine learning algorithms use data from health care, including electronic health records, prescriptions, test results, and outcomes of patient reports. Machine learning algorithms constantly evaluate this data in real time to find possible MTPs. Several techniques are employed to assist in the identification of adverse signals, including supervised learning, deep learning, and natural language processing. Machine learning in clinical decision support systems is an important part of personalized medication, as it considers patient-specific factors like genetic profiles, kidney and liver function, and past medication history. These technologies can help doctors and pharmacists in lowering the risk of drug side effects and improving the quality of patient care by sending alerts in real time.

Keywords: Algorithms, Deep learning, Health care, Medication, Real-time

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL DEVELOPMENT AND DRUG DISCOVERY: PROGRESS AND PROSPECTS

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Abstract

Drug discovery and pharmaceutical development are increasingly using artificial intelligence (AI) as a tool. Compared to conventional methods, it enables researchers to evaluate vast and complicated datasets more rapidly and precisely. AI is used in drug research to design pharmacological compounds, find new targets, and forecast their toxicity and biological activity. This shortens the time and expense needed to find new medications. AI helps with formulation design, process optimization, quality assurance, and medication performance and stability prediction in pharmaceutical development. During product development, machine learning models can learn from trial data and assist scientists in making more informed decisions.

Additionally, by enhancing patient selection, forecasting treatment outcomes, and assisting with tailored medicine, AI is increasingly contributing to clinical research. Despite these benefits, there are still issues with data quality, model transparency, regulatory acceptability, and the requirement for qualified personnel when using AI in pharmaceuticals. Data security and ethical problems are also significant challenges.

All things considered, AI has a great potential to revolutionize the pharmaceutical sector by speeding up, improving the efficiency, and increasing the dependability of drug discovery and development. AI is anticipated to have a significant impact on the direction of pharmaceutical research and healthcare in the future thanks to ongoing technological advancements, improved data integration, and unambiguous regulatory guidance.

Keywords: Artificial Intelligence, Drug Discovery, Pharmaceutical Development, Machine Learning

ROLE OF ARTIFICIAL INTELLIGENCE IN DRUG DISCOVERY

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Artificial Intelligence (AI) has emerged as a transformative tool in drug discovery, significantly reducing the time, cost, and complexity associated with traditional pharmaceutical research. From a pharmacy perspective, AI applications span multiple stages of drug development, including target identification, lead discovery, optimization, preclinical evaluation, and clinical trial design. Machine learning and deep learning algorithms enable efficient analysis of large chemical and biological datasets, allowing accurate prediction of drug–target interactions, pharmacokinetic behavior, and toxicity profiles. AI also supports drug repurposing and personalized medicine by integrating genomic, proteomic, and clinical data, thereby improving therapeutic outcomes and patient safety. In addition, AI-driven tools assist in formulation development and decision-making processes, enhancing efficiency in pharmaceutical research and development. Despite its advantages, challenges such as data reliability, ethical concerns, regulatory acceptance, and integration into existing workflows persist. These abstract highlights the growing role of artificial intelligence in drug discovery from a pharmacy viewpoint, emphasizing its potential to revolutionize pharmaceutical sciences and improve healthcare outcomes.

Keywords: Artificial Intelligence; Drug Discovery; Pharmacy Perspective; Machine Learning; Pharmaceutical Sciences; Drug Development

AI-DRIVEN INNOVATIONS IN SMART NANOCARRIERS FOR DRUG AND GENE DELIVERY

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Abstract

The integration of artificial intelligence (AI) with nanomedicine has opened new possibilities for the development of smart multifunctional nanocarriers (SMNs) for drug and gene delivery. Conventional nanocarrier design often faces challenges related to formulation complexity, biological variability, and limited predictability of therapeutic outcomes. AI-based tools offer effective solutions by enabling data-driven optimization of nanocarrier composition, drug loading efficiency, release behavior, and biological performance. The role of AI in improving targeting accuracy, enhancing biocompatibility, and predicting interactions with biological barriers is discussed. Special emphasis is placed on AI-assisted development of polymeric, lipid-based, and inorganic nanoparticles for applications in cancer therapy and hematological disorders. Emerging preclinical and clinical studies demonstrating the potential of AI-guided nanocarriers in personalized medicine are also reviewed. Despite promising advancements, challenges related to data quality, regulatory acceptance, and large-scale translation remain significant. Overall, the convergence of AI and nanotechnology represents a promising strategy for advancing precision therapeutics and improving the safety and effectiveness of next-generation drug and gene delivery systems.

Keywords: Artificial intelligence, nanocarriers, smart drug delivery, gene delivery, machine learning

ANALYTICAL METHODS FOR ESTIMATION OF ELAGOLIX IN PHARMACEUTICAL FORMULATIONS

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Abstract

Objective: This review aims to critically analyze and summarize reported reverse-phase high-performance liquid chromatography (RP-HPLC) methods for the quantitative estimation and stability assessment of elagolix, as published in reputed peer-reviewed journals

Methodology: A spectrophotometric method was employed. The wavelength of maximum absorbance was determined at 275nm, calibration curves were constructed, and linearity was established across the required concentration range. Accuracy was assessed through recovery studies, precision was evaluated by repeatability and intermediate precision, and specificity was confirmed in the presence of excipients

Validation Parameters: Validation was performed according to International Council for Harmonisation (ICH) guidelines. The method was performed on various parameters like system suitability, system precision, method precision, linearity and robustness. Sensitivity was demonstrated by calculating the limit of detection (LOD) and limit of quantification (LOQ).

Results: The method was found to be simple, rapid, and cost-effective. High accuracy and reproducibility were achieved, with no interference from excipients. Consistent results were obtained when applied to marketed formulations.

Keywords: Elagolix, Chromatography, Reverse-Phase-High-Performance-Liquid-Chromatography, Gonadotropin-Releasing-Hormone, Validation.

AI IN PREDICTING SIDE EFFECTS

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Abstract

Adverse drug reactions are a major cause of therapeutic failure, increased healthcare burden, and patient morbidity. Conventional methods for identifying drug side effects largely depend on clinical trials and post-marketing surveillance, which are expensive, time-consuming, and often unable to detect rare or delayed reactions. Artificial intelligence has emerged as an effective approach for early prediction of potential side effects by analyzing large and complex biomedical datasets. AI models utilize clinical records, genomic information, real-world evidence, and chemical structure databases to identify hidden patterns associated with drug toxicity. Machine learning and deep learning techniques can forecast drug–drug interactions, organ-specific toxicity, and patient-related risk factors, enabling safer decision-making during drug development. This technology supports academia–industry collaboration, where academic researchers develop predictive algorithms and the pharmaceutical industry provides large-scale validated data for implementation.

The adoption of AI in pharmacovigilance reduces late-stage drug failures, optimizes development costs, and promotes personalized medicine. Thus, AI- based prediction of side effects represents a transformative tool that strengthens the bridge between academic innovation and industrial application, ensuring safer and more efficient pharmaceutical care.

Keywords: Artificial Intelligence, Pharmacovigilance, Machine Learning, Side Effect Prediction, Drug safety.

ARTIFICIAL INTELLIGENCE IN HUMAN HEALTH: APPLICATIONS, OPPORTUNITIES, AND CHALLENGES

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Abstract

Artificial intelligence (AI) is rapidly transforming human health by enabling data-driven approaches to disease prevention, diagnosis, treatment, and healthcare management. Advances in machine learning, deep learning, and natural language processing have facilitated the analysis of complex biomedical data, including medical imaging, electronic health records, genomic information, and real-time physiological signals. AI applications now span a wide range of healthcare domains, such as early disease detection, clinical decision support, personalized medicine, drug discovery, and remote patient monitoring. Despite its significant potential, the integration of AI into healthcare systems presents several challenges, including data privacy and security concerns, algorithmic bias, lack of transparency, regulatory uncertainties, and ethical considerations related to accountability and patient trust. This review provides a comprehensive overview of current AI applications in human health, highlights emerging opportunities for improving healthcare quality and accessibility, and critically examines the technical, ethical, and regulatory challenges that must be addressed for responsible and equitable implementation. Harnessing AI effectively requires interdisciplinary collaboration, robust validation, and thoughtful governance to ensure that technological innovation translates into meaningful health outcomes for individuals and populations.

Keywords: Artificial intelligence; Human health; Machine learning; Healthcare applications; Personalized medicine; Ethical challenges; Digital health

RAPID-ONSET PEPPERMINT POWDER NASAL SPRAY: A NOVEL, FAST- ACTING RELIEF SOLUTION

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Abstract

Peppermint (*Mentha piperita*) has been traditionally used for respiratory comfort due to its aromatic, cooling, and soothing properties. Peppermint powder-based nasal spray offers a fast-acting, non-sedative option for nasal congestion, irritation, and breathing discomfort. This poster reviews the composition, mechanism of action, onset time, and potential benefits of a Peppermint Powder Nasal Spray formulation. Peppermint powder nasal spray formulated with 1.5% peppermint powder and 98.5% hydroxypropyl methylcellulose (HPMC) represents an innovative approach in *non-pharmacologic nasal relief*. This formulation aims to provide fast onset of action (reported effect within 2 minutes), enhanced mucosal adherence via HPMC, and symptomatic relief through peppermint's cooling and vasoconstrictive properties. Emerging evidence suggests potential benefits in nasal congestion relief, mucosal hydration, and subjective comfort enhancement. This poster reviews formulation rationale, mechanism of action, clinical utility, safety considerations, and directions for future research.

Keywords: Peppermint Powder, Nasal Spray, Menthol, HPMC, Nasal Congestion, Herbal Decongestant

CITRUS MAXIMA OIL-LOADED MICROSPHERES: CHARACTERIZATION AND EVALUATION OF ANTI-INFLAMMATORY ACTIVITY *IN VITRO* AND *IN VIVO*

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Abstract

Citrus maxima (Burm). Merr. (*C. maxima*) Peel oil is traditionally used as a stress reliever. Its cardioprotective, hepatoprotective, anti-inflammatory and anti-microbial properties make it a versatile remedy. This study aimed to formulate and evaluate *Citrus maxima* microspheres for *in vitro* and *in vivo* anti-inflammatory activity. *Citrus maxima* peel oil is extracted, and chemically profiled. Microspheres of oil and chitosan polymer with an emulsion chemical crosslinking approach were prepared, evaluated using SEM (Scanning Electron Microscopy), infrared spectroscopy, thermogravimetric assay, XRD (X Ray Diffraction), etc. *In vitro* anti-inflammatory activity was determined by the method of inhibition of protein denaturation and membrane stabilization. *In vivo* anti-inflammatory activity was determined in the carrageenan-induced paw edema model in rats. Results from the phytochemical study identified limonene, β -myrcene, α -pinene, auraptene, and linalool as major components of the oil. Of the various formulations, F1 exhibited relatively higher values for yield, drug content, and encapsulation efficiency with a higher swelling index. The *in vitro* release profile of oil from the formula with a higher yield was sustained for 8 h, and the diffusion followed the Higuchi diffusion equation ($R^2 = 0.9859$). The microspheres demonstrated strong inhibition of protein denaturing and membrane lysis *in vitro*. *In vivo* results showed that *Citrus maxima* oil-loaded microspheres inhibited paw edema effectively compared to the control group, which was similar to the standard medication. The result indicated that chitosan microsphere formulation could potentially increase the delivery and anti-inflammatory effect of *Citrus maxima* peel oil, thus deserving to be further explored as an alternative natural anti-inflammatory agent.

Keywords: *Citrus maxima*, chitosan microspheres, anti-inflammatory activity, GC-MS, carrageenan-induced paw edema

INNOVATIVE MICROSPONGE-BASED ORAL DELIVERY SYSTEMS: BRIDGING ACADEMIC RESEARCH AND CLINICAL APPLICATIONS

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Abstract

Oral delivery of poorly soluble therapeutics presents a persistent challenge in achieving optimal bioavailability and therapeutic efficacy. Microsponge-based drug delivery systems have emerged as a promising strategy due to their highly porous structure, controlled-release potential, and ability to enhance solubilization of active pharmaceutical ingredients. This work explores the design principles, formulation considerations, and optimization strategies of microsponge systems, highlighting their translational relevance from academic research to clinical applications. Key aspects, including polymer selection, drug-to-polymer ratio, crosslinking approaches, and characterization techniques, are discussed to illustrate how microsponge platforms can improve oral absorption and pharmacokinetic performance. In alignment with the conference theme, this perspective emphasizes the role of innovative drug delivery platforms in bridging fundamental pharmaceutical research with future clinical and translational needs. By bridging scientific insights with therapeutic potential, this review underscores the value of microsponge systems in enhancing patient compliance, optimizing drug delivery, and shaping the future of oral therapeutics.

Keywords: Microsponge, Oral Drug Delivery, Bioavailability Enhancement, Controlled Release, Formulation Strategies, Translational Research.

CALCANEUS BONE DEFORMITIES: CLINICAL CHALLENGES AND PRACTICAL MANAGEMENT

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Abstract

Calcaneus (heel bone) deformities are complex conditions that can be difficult to diagnose and manage. These deformities may develop due to birth-related abnormalities, injuries, long-term stress, or age-related changes. Based on real-life clinical experience, this abstract explains the challenges involved in understanding and treating calcaneus bone deformities.

Patients with calcaneal deformities often present with pain, difficulty in walking, altered foot shape, and reduced quality of life. The appearance and severity of these deformities can vary greatly from person to person, making diagnosis and treatment planning challenging. Careful clinical examination combined with imaging techniques such as X-rays, CT scans, MRI, and three-dimensional imaging helps in identifying the exact nature of the deformity and its impact on surrounding structures.

Treatment approaches depend on factors such as patient age, overall health, level of activity, and severity of the deformity. In some cases, conservative management may help, while in others, surgical correction is required. Surgical options include bone realignment procedures and joint fusion, which aim to reduce pain, restore foot shape, and improve function. Proper surgical planning, accurate execution, and structured rehabilitation are essential for successful outcomes.

In conclusion, calcaneus bone deformities require a detailed and patient-centered approach. Real-life clinical experience highlights the importance of accurate diagnosis, individualized treatment planning, and careful follow-up to achieve better functional recovery and improved quality of life for patients.

Keywords: Calcaneus (heel bone), deformities, Treatment

DEVELOPMENT AND VALIDATION OF HPLC METHOD FOR FINERENONE IN BULK AND FORMULATION

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Abstract

The present study focuses on the development and validation of a simple, precise, and accurate high-performance liquid chromatographic (HPLC) method for the quantitative estimation of Finerenone in bulk drug and its pharmaceutical formulations. Chromatographic separation was achieved using a C18 reverse-phase column with a mobile phase consisting of acetonitrile and water in an optimized ratio under isocratic conditions. The detection wavelength was selected based on the maximum absorbance (λ_{max}) of Finerenone using a UV detector. The method was validated according to International Council for Harmonisation (ICH) guidelines for parameters such as linearity, accuracy, precision, specificity, limit of detection (LOD), limit of quantification (LOQ), and robustness. The calibration curve exhibited excellent linearity within the specified concentration range, with a correlation coefficient (r^2) greater than 0.999. The results demonstrated high recovery values, indicating the accuracy and reproducibility of the proposed method. The low values of LOD and LOQ confirm the sensitivity of the method. The validated method was successfully applied for routine quality control analysis of Finerenone in bulk drug and marketed formulations. Overall, the developed HPLC method is rapid, reliable, and suitable for the routine analytical determination of Finerenone in pharmaceutical research and industrial applications.

Keywords: Finerenone, RPHPLC, LOD, LOQ

FORMULATION AND EVALUATION OF METFORMIN-LOADED TRANSDERMAL PATCH FOR THE TREATMENT OF DIABETES

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Abstract

Metformin, an oral antidiabetic agent, is gaining increasing potential therapeutic indications due to its pleiotropic activity and favorable effects on various pathological conditions, including prediabetes, T1DM, and GDM. Studies have shown that metformin is safe and well-tolerated, and may have cardioprotective and nephroprotective effects. The study aims to develop and evaluate a Metformin-loaded transdermal patch for diabetes treatment. The study investigates the identification and characterization of drugs, including their color, odor, pH, taste, and texture. It identifies Metformin, a drug with a solubility of 1mg/ml in various solvents and a lipophilic nature. The absorption maxima of Metformin were determined using UV scans and calibration curves. The transdermal patch evaluation included thickness, weight variation, hardness, tensile strength, folding endurance, moisture uptake, and drug content. The physiochemical properties of the prepared formulation were also discussed. In vitro drug permeation and diffusion were conducted using Franz diffusion cell, with the maximum permeation found in the F5 patch. The stability studies of the optimized formulation were conducted according to ICH Q1A (R2) guidelines. The results showed optimum drug release up to 24 hours, with smaller pores in the matrix derived from patches tending to fuse readily in the skin. Polymer content resulted as a barrier for drug release, allowing controlled release and decreased drug leakage.

Keywords: Metformin; Transdermal Patch; ICH Q1A (R2) guidelines; Polymer content; Skin.

ARTIFICIAL INTELLIGENCE IN NEUROPHARMACOLOGICAL DRUG DISCOVERY

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Abstract

Artificial Intelligence (AI) has emerged as a transformative tool in neuropharmacological drug discovery, addressing the complexity, high cost, and low success rates associated with developing brain-targeting therapeutics. The human brain presents unique challenges due to its intricate neural networks, diverse receptor systems, and the restrictive blood–brain barrier. AI-driven approaches, including machine learning, deep learning, and neural networks, enable rapid analysis of large-scale biological, chemical, and clinical datasets to identify novel drug candidates with improved accuracy. These models enhance target identification, predict drug–target interactions, optimize lead compounds, and assess pharmacokinetic and toxicity profiles at early stages of development. AI techniques such as molecular docking, virtual screening, and predictive modelling significantly reduce experimental time and costs while increasing the probability of clinical success. Furthermore, AI supports precision neuropharmacology by integrating genomics and patient-specific data to design personalized therapeutic strategies for neurological and psychiatric disorders. This poster highlights the role of AI in accelerating neuropharmacological research, discusses current applications, and explores future prospects of AI-assisted drug discovery in advancing effective and safer treatments for central nervous system disorders.

Keywords: Artificial Intelligence, neuropharmacological, drug discovery

EMERGING TRANSDERMAL DRUG DELIVERY TECHNOLOGIES FOR IMPROVED MANAGEMENT OF DERMATOPHYTOSIS

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Abstract

Dermatophytosis is a common superficial fungal infection that affects the skin, hair and, nails caused by keratinophilic fungi. Even with the availability of topical and systemic antifungal therapies, treatment failure rate is rising due to poor drug penetration and the protection barrier of the stratum corneum which delay the healing time of the disease. Although, Systemic therapies are highly effective but they are associated with side effects and may show reduced efficacy. These challenges illustrate the need for better treatment which are effective, safe and easy to use. Recent advances in microparticle-based drug delivery systems, including lipid- based carriers, polymeric microparticles and hybrid nanocarriers, enhance antifungal therapy by improving drug stability, reducing degradation and providing deeper and longer lasting tissue penetration. Additionally, physical enhancement techniques such as microneedles and iontophoresis alone or in a combination are being explored alongside microparticle drug delivery systems to disturb the skin barrier to target delivery to infected tissues. By targeting drug action directly at the site of infection and lowering the systemic doses these advanced formulations hold promise not only in boosting therapeutic efficacy but also in minimizing adverse effects and improving patient adherence. Collectively, these innovations represent a significant and transformative step forward in the effective management of dermatophytosis.

Keywords: Dermatophytosis, drug delivery systems, microneedles and iontophoresis

COVID: PATHOPHYSIOLOGY, CLINICAL MANIFESTATIONS, AND THERAPEUTIC CHALLENGES

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Abstract

The COVID-19 pandemic has led to the emergence of a chronic condition known as Long COVID or Post-Acute Sequelae of SARS-CoV-2 Infection (PASC). This condition affects a significant proportion of individuals even after mild or asymptomatic infection. Long COVID is characterized by persistent symptoms such as fatigue, cognitive impairment, dyspnea, and neuropsychiatric disorders lasting weeks to months. The underlying pathophysiology involves immune dysregulation, persistent viral reservoirs, endothelial dysfunction, and chronic inflammation. This presentation discusses the clinical spectrum of Long COVID, proposed molecular mechanisms, diagnostic challenges, and current management strategies. Understanding Long COVID is essential for developing targeted therapies and improving post-pandemic healthcare outcomes.

Keywords: COVID-19, SARS-CoV-2 Infection

COVID: PATHOPHYSIOLOGY, CLINICAL MANIFESTATIONS, AND THERAPEUTIC CHALLENGES

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Abstract

The COVID-19 pandemic has led to the emergence of a chronic condition known as Long COVID or Post-Acute Sequelae of SARS-CoV-2 Infection (PASC). This condition affects a significant proportion of individuals even after mild or asymptomatic infection. Long COVID is characterized by persistent symptoms such as fatigue, cognitive impairment, dyspnea, and neuropsychiatric disorders lasting weeks to months. The underlying pathophysiology involves immune dysregulation, persistent viral reservoirs, endothelial dysfunction, and chronic inflammation. This presentation discusses the clinical spectrum of Long COVID, proposed molecular mechanisms, diagnostic challenges, and current management strategies. Understanding Long COVID is essential for developing targeted therapies and improving post-pandemic healthcare outcomes.

Keywords: COVID-19, SARS-CoV-2 Infection

SOLID SMEDDS AS AN INTELLIGENT ORAL DRUG DELIVERY PLATFORM: BRIDGING EXPERIMENTAL RESEARCH AND FUTURE PHARMACEUTICAL APPLICATION

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Abstract

Poor aqueous solubility of many orally administered drugs remains a critical challenge in pharmaceutical development, often resulting in low and variable bioavailability. Self-microemulsifying drug delivery systems (SMEDDS) represent a promising lipid-based strategy to enhance solubilization and dissolution of such compounds. However, conventional liquid SMEDDS are associated with limitations related to stability, handling, and dosage form flexibility.

The present work proposes the development of a solid self-microemulsifying drug delivery system (solid SMEDDS) as an intelligent and future-ready oral drug delivery platform. A systematic formulation approach is planned, involving the selection of suitable lipid excipients for liquid SMEDDS followed by conversion into a solid form using an appropriate solid carrier. The proposed system will be evaluated for self-emulsification efficiency, droplet formation upon dilution, reconstitution behavior, and physical characteristics relevant to solid dosage forms.

This study aims to bridge experimental pharmaceutics with emerging pharmaceutical technologies by adopting a platform-based and data-guided formulation strategy. The proposed solid SMEDDS platform is expected to support improved oral delivery of poorly soluble drugs and demonstrate compatibility with intelligent and AI-assisted formulation optimization frameworks envisioned in future pharmaceutical research.

Keywords: Solid SMEDDS, Oral drug delivery, Solubility enhancement, Lipid-based formulations, Platform technology, Pharmaceutical development, Dosage form optimization.

FORMULATION AND EVALUATION OF DICYCLOMINE HYDROCHLORIDE TRANSDERMAL PATCH FOR PERIOD PAIN RELIEF

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Abstract

Dysmenorrhea, commonly known as period pain, affects a large proportion of women and significantly impacts quality of life and daily activities. Dicyclomine hydrochloride, an antispasmodic agent, is widely used for relieving smooth muscle spasms associated with menstrual pain; however, its oral administration is often associated with gastrointestinal side effects and variable bioavailability due to first-pass metabolism. The present study aims to develop and evaluate a transdermal patch of dicyclomine hydrochloride as an alternative drug delivery system for effective and sustained relief from period pain.

Transdermal patches of dicyclomine hydrochloride were prepared using the solvent casting method with suitable film-forming polymers and plasticizers to achieve optimal mechanical strength and flexibility. The formulated patches were evaluated for physicochemical parameters including thickness, weight uniformity, folding endurance, drug content uniformity, and surface pH. In vitro drug release and ex vivo permeation studies were conducted using suitable diffusion models to assess the release behavior and permeation potential of the drug through the skin.

The optimized transdermal patch demonstrated uniform drug distribution, good physicochemical properties, and sustained drug release over an extended period. The transdermal delivery system bypasses hepatic first-pass metabolism, potentially reduces dosing frequency, and minimizes systemic side effects associated with oral therapy. Overall, the developed dicyclomine hydrochloride transdermal patch shows promise as a patient-friendly, non-invasive, and effective approach for the management of dysmenorrhea. This formulation may improve patient compliance and provide consistent pain relief during the menstrual cycle.

Keywords: Transdermal patch, dysmenorrhea, dicyclomine hydrochloride

FORMULATION AND EVALUATION OF NANOCOCHLEATES GEL OF BCS -IV DRUG FOR TOPICAL TREATMENT OF ANTIFUNGAL INFECTION

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Abstract

Due to the nanocochleate formulation's superior structural stability, huge drug-loading capacity, and capacity to enhance skin penetration of poorly water-soluble pharmaceuticals, there has been a recent surge in interest in contemporary topical drug delivery techniques. By creating tightly packed multilamellar structures, these nanoparticle-based drug delivery systems can protect their loaded medications from environmental harm. They are created by attaching negatively charged phospholipid vesicles to divalent metals. When it comes to antifungal therapies, nano cochelate drug delivery systems have been viewed as a useful novel platform for enhancing skin penetration of topically administered antifungal medications with limited water solubility and poor retention in diseased skin layers. This paper presents recent developments in the formulation and characterization of antifungal nano cochelate gels, emphasizing their enhanced therapeutic efficacy on various fungal infections, improved drug entrapment efficiency and release qualities, and greater skin penetrating ability. Research consistently demonstrates that nanocochelate based antifungal gels perform better than topically applied existing medications because to their high stability in terms of skin localization, decreased dose frequency needs, and increased patient compliance levels. Particle size, zeta potential, drug entrapment efficiency, and morphological analyses were used to characterize the produced nano cochleates...

Keywords: Antifungal BCS-IV class drug, Nano cochleates, Topical treatment

APPLICATION OF ARTIFICIAL INTELLIGENCE IN PARENTERAL PHARMACEUTICAL MANUFACTURING: SMART MANUFACTURING TANKS

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Abstract

Artificial Intelligence (AI) is increasingly transforming pharmaceutical manufacturing by enabling enhanced process control, quality assurance, and operational efficiency. In parenteral drug manufacturing, mixing and holding tanks play a critical role in ensuring product sterility, homogeneity, and compliance with stringent regulatory standards. The integration of AI technologies—including machine learning, predictive analytics, and real-time data monitoring—has significantly improved tank operation and management. AI-driven systems can analyze multivariate process data from sensors to optimize mixing parameters, temperature control, and fill volumes while minimizing human intervention. Additionally, AI facilitates predictive maintenance of manufacturing tanks by detecting early signs of equipment wear, contamination risks, or process deviations, thereby reducing downtime and batch failures. Advanced anomaly detection and digital twin models further support real-time decision-making and regulatory compliance in aseptic environments. Overall, the adoption of AI in parenteral manufacturing tanks enhances product quality, improves manufacturing efficiency, ensures patient safety, and supports the pharmaceutical industry's transition toward smart and autonomous manufacturing systems.

Keywords: Artificial Intelligence, machine learning, predictive analytics

PHARMACOGENOMICS IN PAIN MANAGEMENT: TOWARDS PRECISION MEDICINE AND REDUCED ADVERSE EVENTS

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Abstract

Pain management with opioid medications shows significant differences among patients in how well they work and their safety. This often leads to ineffective pain relief or negative reactions when using the standard "one-size-fits-all" dosing. Pharmacogenomics offers a way to tailor opioid treatment by considering genetic differences that affect how drugs are processed, transported, and how they respond at the receptor level. This poster emphasizes the importance of key genes involved in opioid pharmacokinetics (PK) and pharmacodynamics (PD), such as CYP2D6 and CYP3A4 (responsible for drug metabolism), ABCB1 (which handles drug transport across the blood-brain barrier), and OPRM1 (related to μ -opioid receptor binding and signaling). Variations in these genes can significantly change how prodrugs are activated, how quickly active drugs are cleared, how much drug reaches the central nervous system, and how sensitive receptors are. This can influence both treatment success and the risk of side effects. For instance, patients with CYP2D6 poor metabolism might find codeine less effective, while ultra-rapid metabolizers face a higher risk of side effects. Strategies like pre-emptive genotyping, clinical decision support systems, and adjusting doses based on genetics help create personalized opioid treatment plans. Overall, pharmacogenomics moves pain management away from general prescribing to a more precise, mechanism-based approach. This improves pain control, reduces the risk of adverse events, and enhances patient safety and health outcomes.

Keywords: Pharmacogenomics, Pain management, Opioids, CYP2D6, ABCB1, OPRM1, Precision medicine, Personalized therapy, Pharmacokinetics, Pharmacodynamics

IMPACT OF AI IN DRUG DEVELOPMENT, HEALTHCARE AND CLINICAL TRIALS

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Abstract

The application of artificial intelligence (AI) in drug development, clinical research, and healthcare represents a transformative advance in healthcare in general. AI-based technologies offer invaluable opportunities for analyzing vast data sets and identifying actionable patterns as they revolutionize various aspects of the healthcare ecosystem. This review aimed to provide an overview of current research on the application of AI-based on approaches in drug development to identifying potential therapeutic agents and accelerate the path from discovery to marketing approval. In clinical research, AI-powered analytics optimize study design, reduce sample size, patient recruitment, and time required for data analysis, while increasing the statistical relevance and validity of results. In addition, the clinical practice empowers healthcare providers & personalized treatment with recommendations and predictive analytics, leading to patient care that is significantly more efficient to a greater extent. Although challenges remain such as ethical considerations and regulatory frameworks, the potential benefits of using AI in medical innovation and improving patient outcomes are significant. Emphasis should be placed on the importance of continued research, collaboration, and responsible application of artificial intelligence in healthcare.

Keywords: artificial intelligence, drug development, clinical research, machine learning, deep learning

DRUG DISCOVERY BY GREEN PHYTOCHEMICAL

Priya Rani*

HRIT University

Corresponding author: sharmapriya46574@gmail.com**Abstract**

The growing demand for safer, cost-effective, and environmentally sustainable therapeutic agents has accelerated interest in green phytochemical-based drug discovery. Phytochemicals derived from medicinal plants, including alkaloids, flavonoids, terpenoids, phenolics, and glycosides, represent a rich source of structurally diverse bioactive compounds with significant pharmacological potential. Green drug discovery approaches emphasize eco-friendly extraction, biocompatibility, reduced chemical waste, and improved safety profiles. Advances in high-throughput screening, metabolomics, computational modeling, and nanotechnology have enhanced the identification, optimization, and delivery of phytochemical lead compounds. These strategies enable the modulation of multiple molecular targets, offering advantages in the treatment of complex diseases such as cancer, neurodegenerative disorders, and metabolic syndromes. Furthermore, green phytochemical research supports sustainable healthcare by integrating traditional medicinal knowledge with modern drug development pipelines. Despite challenges related to bioavailability, standardization, and large-scale production, phytochemical-based drug discovery continues to emerge as a promising paradigm for the development of novel, effective, and environmentally responsible therapeutics.

Keywords: Phytochemicals, Green drug discovery, Medicinal plants, Bioactive compounds, Sustainable therapeutics, Natural product research, Eco-friendly drug development

A REVIEW OF BIOLOGICAL ACTIVITIES OF PIPERAZINE DERIVATIVES

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Piperazine is a nitrogen-containing heterocyclic compound with six members that contains two nitrogens and four carbons in a cyclic configuration, with nitrogens at the first and fourth positions of the cyclic ring. A saturated heterocyclic compound is a piperazine moiety. It's used in the creation of rational drugs. This molecule may be present in a range of well-known medications, antipsychotics, antihistaminics, antibacterials, antifungals, antivirals, anti-cancer, anti-microbial, and anti-inflammatories. The piperazine molecule is also used in medicinal and phytochemical chemistry. Benzylpiperazine, Phenylpiperazine, (1-(3-trifluorophenyl piperazine), (1-(3-chlorophenyl piperazine), Methoxyphenyl piperazine are several piperazine variants. This compound is the most common ingredient in competitive medicines, and it has mild stimulant and euphoric effects. This study looked at certain piperazine derivatives and how they could be. Buspirone is used as an anxiolytic, while vortioxetine is an antidepressant and clozapine is an antipsychotic. It is possible to remove it from black piper plants (family Piperaceae).

Keywords: Piperazine derivatives, Synthesis, Antimicrobial activity, Chemistry of piperazine

REVIEW ON MEDICINAL PLANTS USED IN TREATMENT OF DIABETIC WOUND

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Abstract

Diabetic Wounds are one of the critical complications of diabetes, diabetes is now considered as a global epidemic, where Asia and India are at the epicenter due to high population rapid modernization, lifestyle and genetic disposition. Any disruption in clotting process will leads a simple wound caused either by external or internal factor to turn it into a chronic wound, diabetes interferes with the clotting mechanism in a very complex manner and even a simple wound due to cuts or burns may remain unhealed. Thus, a non-healing wound results to fatal conditions like gangrene, and at last amputation. Use of herbal oral administration and topical drugs applications had shown significant progress in reducing the total number of non-healing wound. Many studies have suggested the use of combined herbal oral dosage forms e.g. Pills (vati), Churna, Bhasma and Gutika with topical treatments like Ghrita, taila and Lepa etc. as bidirectional approaches for treatment of diabetes as well as its complication. The combined use of herbal dosage form with oral hypoglycemic agent showed the significant success in increasing the rate of wound healing and lowers the number of simple diabetic wound.

Keywords: Diabetes, Diabetic wound, Herbal drug, Ghrita, and Talia

STUDIES ON PYRAZOLE DERIVATIVES AS EGFR INHIBITORS: ANTICANCER AGENTS

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Abstract

Introduction: Pyrazole-based heterocycles have become interesting scaffolds in the search for anticancer drugs because of their diverse biological activities and structural versatility. The epidermal growth factor receptor (EGFR) is one of the molecular targets found to be crucial in regulating cell survival, proliferation, and differentiation. EGFR is a desirable target for small-molecule inhibitors since its overexpression or mutation is closely linked to tumor growth in a variety of cancers. The present work focuses on the design and development of pyrazole derivatives as potential EGFR inhibitors with enhanced anticancer activity.

Methods: Molecular modelling techniques and structure-activity relationship (SAR) studies were used to develop novel pyrazole derivatives. Standard organic synthesis methods were used to produce the compounds, and spectroscopic methods (^1H NMR, ^{13}C NMR, and MS) were used to analyze the compounds. The MTT assay was used to evaluate *in vitro* cytotoxicity against certain cancer cell lines. EGFR inhibitory activity was assessed using enzyme inhibition assays, and molecular docking studies were conducted to predict binding interactions within the EGFR active site.

Results: Significant cytotoxicity was shown by a number of synthetic pyrazole derivatives, with IC₅₀ values comparable to standard drugs. The potency of compounds with electron- withdrawing substituents was improved. Assay for EGFR enzyme inhibition demonstrated significant inhibitory effects, with key derivatives showing high binding affinities. Docking results, which showed stable interactions with the hinge region and crucial amino acid residues in responsible for EGFR inhibition, supported results from experiments.

Conclusion: The synthesized pyrazole derivatives showed promising anticancer potential as EGFR inhibitors. Their favorable cytotoxic and enzyme inhibitory profiles suggest that pyrazole scaffolds hold considerable promise for further optimization and development as targeted anticancer agents.

Keywords: Pyrazole derivatives, EGFR inhibitors, Anticancer activity, Molecular docking, SAR studies

SYNTHESIS, ANTICANCER ACTIVITY AND DOCKING STUDIES OF NOVEL HYDROQUINONE-CHALCONE-PYRAZOLINE HYBRID DERIVATIVES

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Abstract

Cancer results from uncontrolled cell division caused by deregulation of the biological mechanisms controlling the cell cycle. The sustained increases in cancer incidence and mortality over the last pounds with superior anticancer properties compared to current chemotherapeutic drugs. Hydroquinone represents a simple phenolic base structure found as secondary metabolites in various natural products in bioorganic and medicinal chemistry. These compounds exhibit a wide range of biological activities, including antineoplastic, anti-inflammatory, antimicrobial and antioxidant properties. Several hydroquinones have demonstrated antitumor activity against breast, colon, lung, and cervical cancers, among others. Chalcones are structures of both natural and synthetic origin that exhibit various pharmacologic activities, including antineoplastic, antioxidant, anti-inflammatory, antiviral, antimalarial, antimicrobial and antitubercular properties. Studies on their anticancer properties have shown that they interact with various target proteins involved in proliferative processes. Pyrazoline is a five-membered heterocycle containing two nitrogen atoms and holds great pharmacological interest. This versatile scaffold is used to develop new anticancer agents, and many clinically used anticancer drugs contain this group. Specifically, pyrazoline derivatives have been involved in antineoplastic processes through inhibition of VEGFR-2, EGFR, and tubulin polymerization deregulation.

Keywords: Cancer, Bioorganic chemistry, Pharmacological activities, Apoptosis, VEGFR-2 inhibition

ROLE OF NANOCARRIERS IN SITE-SPECIFIC DRUG DELIVERY: ADVANCING PHARMACEUTICAL RESEARCH THROUGH INTELLIGENT INNOVATION

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Abstract

Nanocarrier-based site-specific drug delivery systems have emerged as a groundbreaking approach in pharmaceutical research by overcoming the long-standing challenges of nonspecific drug distribution, systemic toxicity, and suboptimal therapeutic efficacy associated with conventional drug administration. This abstract highlights the integration of advanced nanocarrier platforms such as liposomes, dendrimers, solid lipid nanoparticles, polymeric nanoparticles, and nanocrystal-lipid hybrid systems with intelligent computational technologies for precision therapy and for improved solubilization and bioavailability. Artificial Intelligence (AI) and Machine Learning (ML) are emerging as transformative tools for optimizing nano-vehicle design, formulation design parameters, and bio-interactions. AI-driven predictive modeling enables accurate estimation of parameters such as particle integrity, drug entrapment efficiency, and pharmacokinetic profiles, while ML algorithms facilitate the analysis of large-scale biological datasets to guide tailored surface modifications and receptor-mediated delivery strategies. The convergence of nanotechnology with intelligent innovation and cutting-edge breakthroughs fosters faster formulation development, reduced experimental trial cycles, and enhanced translational potential for personalized therapeutics. This study underscores the role of AI-guided nanocarriers as the next frontier in drug delivery research, marking a pivotal step toward intelligent, adaptive, and customized pharmaceutical systems for patient-specific treatment or an individualized drug delivery system.

Keywords: Nanocarriers, Site-Specific Delivery, Artificial Intelligence, Machine Learning, Personalized Medicine

ENHANCE EFFICACY IN PSORIASIS TREATMENT: THE EMERGING ROLE OF NANO TOPICAL FORMULATION

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Abstract

Psoriasis is a life-threatening autoimmune inflammatory skin disease, triggered by T lymphocytes. Recently, the drugs most commonly used for the treatment of psoriasis include methotrexate (MTX), cyclosporine (CsA), acitretin, dexamethasone, and salicylic acid. However, conventional formulations due to poor absorptive capacity, inconsistent drug release characteristics, poor capability of selective targeting, poor retention of drug molecules in target tissue, and unintended skin reactions restrict the clinical efficacy of drugs. Advances in topical nanocarriers allow the development of prominent drug delivery platforms can be employed to address the critical issues associated with conventional formulations. Firstly, the pathogenesis and characteristics of psoriasis were summarized. Then, the types and benefits of topical therapy were introduced, such as the aspects of avoiding systemic toxic effects, first pass effect, and gastrointestinal reactions, with accelerating the onset time of the drugs and improving its efficacy, and were compared to systemic drugs. In the case of methotrexate, cyclosporin A, Janus kinase (JAK) inhibitors, and phosphodiesterase-4 (PDE-4) inhibitors, this review had a further discussion on the improvement and translation of these molecules from systemic therapy to topical therapy in clinical practice. To further augment the limitation of skin permeability, nanotechnology and novel topical drug delivery system including nanomedicines, hydrogels, ionic liquids, and microneedles, were elaborated for psoriasis management. Also, exploration of topical targeting pathogenic genes through small interfering RNA (siRNA) using nanoparticles and ionic liquids (ILs) is of great significance for long-term treatment in psoriasis. Taken together, the development of numerous topical delivery platforms is expected to achieve enhanced penetration and precise and efficient delivery of small molecule and RNA interference (RNAi) therapeutics in psoriasis with clinical translation prospects.

Keywords: Psoriasis, topical treatment, nanomedicines, hydrogel, ionic liquid, novel therapeutics.

REDEFINING CANCER TREATMENT: THE ROLE OF IMATINIB NANOPARTICLES IN PRECISION MEDICINE

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Abstract

Background: As one of the world's leading causes of death, cancer requires ongoing research to create safer and more effective treatment approaches. The treatment of chronic myeloid leukemia and gastrointestinal stromal tumors has greatly improved thanks to imatinib, a tyrosine kinase inhibitor that targets the BCR-ABL fusion protein and other tyrosine kinases. However, systemic toxicity, drug resistance, and issues with solubility and absorption are linked to traditional imatinib therapy.

Aims/Objectives: Reviewing recent developments in nanoparticle-based imatinib delivery systems for cancer treatment is the goal of this study. The goal is to assess how formulations enabled by nanotechnology can improve therapeutic efficacy while reducing side effects and resolving drug delivery issues.

Methods: This work reviews various nanoparticulate drug delivery systems used for imatinib, including liposomes, solid lipid nanoparticles, polymeric nanoparticles, dendrimers, and micelles. The production techniques, mechanisms of action, and tumor-targeting strategies, particularly those based on the enhanced permeability and retention (EPR) effect, are discussed.

Results: Nanoparticle-based imatinib formulations demonstrate improved solubility, prolonged drug residence time, enhanced tumor targeting, and reduced systemic toxicity. These delivery systems facilitate controlled drug release and improved accumulation of the drug at tumor sites, thereby reducing side effects and potentially overcoming resistance associated with conventional therapy.

Conclusion: Nanotechnology-based delivery of imatinib offers a promising approach to improve cancer treatment outcomes. Future research focusing on optimized nanoformulation strategies may further advance targeted and effective cancer therapy.

Keywords: Imatinib, Nanoparticle, Targeted cancer therapy, Bioavailability enhancement, Nanomedicine.

GREEN-SYNTHEZIZED BETEL LEAF SILVER NANOPARTICLES AS A NOVEL NANO-THERAPEUTIC APPROACH FOR IRRITABLE BOWEL SYNDROME.

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Abstract

Introduction: Irritable Bowel Syndrome (IBS) is a chronic functional gastrointestinal disorder characterized by abdominal pain, altered bowel habits, and reduced quality of life. Conventional therapies provide symptomatic relief but are often associated with limited efficacy and adverse effects. *Piper betle* (betel leaf) possesses antimicrobial, anti-inflammatory, and antioxidant properties, making it a promising herbal candidate for IBS management. Green synthesis of silver nanoparticles using plant extracts offers an eco-friendly and cost-effective approach with enhanced biological activity. This study explores the development and evaluation of betel leaf-mediated silver nanoparticles as a novel nano-therapeutic strategy for IBS.

Aim: To synthesize and evaluate betel leaf-mediated silver nanoparticles using a green synthesis approach and assess their potential as a nano-therapeutic system for the management of Irritable Bowel Syndrome.

Materials and Methods: Fresh betel leaves were used to prepare an aqueous extract, which served as a reducing and stabilizing agent for the green synthesis of silver nanoparticles using silver nitrate solution. The synthesized nanoparticles were characterized for particle size, morphology, and stability using standard analytical techniques. The formulation was further evaluated for physicochemical properties and in-vitro performance to assess its suitability for therapeutic application in IBS.

Results: Betel leaf extract successfully mediated the synthesis of stable silver nanoparticles with nanoscale dimensions. The nanoparticles exhibited good physicochemical stability and uniform distribution. In-vitro evaluation indicated enhanced functional properties, suggesting improved therapeutic potential compared to conventional formulations.

Conclusion: Green-synthesized betel leaf silver nanoparticles represent a promising and sustainable nano-therapeutic approach for IBS management. The integration of herbal bioactives with nanotechnology enhances stability and therapeutic effectiveness, highlighting its potential as a novel alternative to conventional IBS treatments.

Keywords: Irritable Bowel Syndrome; Betel Leaf; Silver Nanoparticles; Green Synthesis; Nano-Therapeutics.

ROLE OF IMPAIRED MUCOSAL REPAIR MECHANISMS IN AGE-RELATED GASTRIC ULCER AND PHARMACOLOGICAL STRATEGIES FOR RESTORATION

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Abstract

Gastric ulcer remains a significant clinical problem in the elderly population, with aging itself emerging as an independent risk factor for impaired mucosal healing and increased ulcer recurrence. The integrity of the gastric mucosa depends on coordinated repair mechanisms, including epithelial restitution, angiogenesis, growth factor signaling, prostaglandin synthesis, and antioxidant defense systems. Aging is associated with dysregulation of these protective processes, characterized by reduced epithelial cell proliferation, diminished angiogenic response, impaired growth factor signaling, mitochondrial dysfunction, and exaggerated oxidative and inflammatory stress. These age-related alterations compromise mucosal repair, thereby increasing susceptibility to ulcer formation and delayed healing. This review critically examines the cellular and molecular mechanisms underlying impaired gastric mucosal repair in aging and highlights how these changes contribute to the pathogenesis of age-related gastric ulcer. Furthermore, current and emerging pharmacological strategies aimed at restoring mucosal integrity are discussed, including acid-suppressive agents, prostaglandin analogues, cytoprotective drugs, antioxidants, growth factor-based therapies, and novel pathway-targeted interventions. A comprehensive understanding of age-dependent changes in mucosal repair may facilitate the development of targeted pharmacological approaches to improve ulcer prevention and healing outcomes in elderly patients.

Keywords: Gastric ulcer, aging, prostaglandin synthesis, cytoprotective drugs

NANOPARTICLE-LOADED TRANSDERMAL PATCHES OF A BCS CLASS-II DRUG: FORMULATION, CHARACTERIZATION, AND DERMATOKINETIC STUDIES BY RP-HPLC

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Abstract

Depression, a prevalent psychiatric disorder, is frequently managed with duloxetine, a BCS class II drug. However, its oral administration is linked to significant adverse effects, including gastrointestinal (GI) complications and the formation of carcinogenic compounds like α -naphthol. This research focuses on formulating and characterizing nanoparticle-loaded transdermal patches of duloxetine to bypass GI degradation, enhance solubility, and achieve controlled drug release, thereby improving bioavailability and minimizing side effects. Nanoparticles were synthesized using the emulsion solvent evaporation method, with PLGA and chitosan as polymers. The optimized nanoparticles exhibited an average particle size of 122.11 nm, a zeta potential of -17.2 mV, and an encapsulation efficiency of 66.95%. In-vitro drug release studies revealed a sustained release profile, with 77.65% of the drug released over 24 hours. These nanoparticles were incorporated into transdermal patches using the solvent casting technique. The patches showed excellent physicochemical properties, including a folding endurance of over 300 folds, a weight variation of less than 5%, and a moisture content of 2.3%. Ex-vivo permeation studies demonstrated a 4-fold increase in drug permeation from the nanoparticle-loaded patches compared to the pure drug. Dermatokinetic studies using RP-HPLC revealed that the nanoparticle-loaded patches significantly enhanced the bioavailability of duloxetine, with a 1.96-fold increase in brain bioavailability compared to conventional administration. These findings suggest that this novel transdermal delivery system can improve the therapeutic efficacy of duloxetine while reducing its adverse effects.

Keywords: Duloxetine, Nanoparticles, Transdermal Patches, RP-HPLC, BCS Class-II, Drug Delivery, Dermatokinetics.

ROLE OF QUERCETIN IN THE ANTIHYPERLIPIDEMIC EFFECT OF ALHAGI PSEUDALHAGI

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Abstract

Alhagi pseudalhagi (camel thorn) is a medicinal plant rich in bioactive phytochemicals, particularly flavonoids and other phenolic compounds, that contribute to its pharmacological potential. Although studies on *A. pseudalhagi* primarily focus on antioxidant, anti-inflammatory, and antimicrobial activities, flavonoids such as quercetin are documented among its phenolic constituents in related *Alhagi* species and extracts, indicating their presence and potential biological actions. Quercetin, a plant-derived flavonol ubiquitous in many medicinal plants, has well-established lipid-lowering and cardioprotective effects, including the regulation of total cholesterol, triglycerides, and LDL-cholesterol levels in experimental models of hyperlipidemia. Mechanistic studies reveal that quercetin can alleviate dyslipidemia by modulating lipid metabolism pathways, reducing oxidative stress, improving liver function, and positively influencing gut microbiota composition linked to lipid homeostasis. These combined biochemical effects suggest that the flavonoid constituents of *A. pseudalhagi*, including quercetin or its glycosides, may contribute significantly to antihyperlipidemic activities observed in the traditional medicinal use of the plant. Therefore, quercetin represents a key phytochemical marker in exploring the antihyperlipidemic effect of *A. pseudalhagi*, warranting further experimental validation to elucidate its precise role and therapeutic potential in lipid metabolism disorders.

Keywords: anti-inflammatory, antimicrobial activities, antihyperlipidemic.

ROLE OF ARTIFICIAL INTELLIGENCE IN THE TREATMENT OF CHRONIC DISEASES

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Abstract

Chronic diseases, such as diabetes, cardiovascular disorders, and cancer, pose significant healthcare challenges worldwide. Artificial Intelligence (AI) is revolutionizing its management by enhancing early diagnosis, personalized treatment, and continuous monitoring. Key advancements include AI-driven predictive analytics, which enable early disease detection by analyzing vast datasets from electronic health records (EHRs), imaging, and genetic profiles. Machine learning (ML) algorithms assist in personalized medicine by identifying optimal drug regimens based on patient-specific factors. AI-powered chatbots and virtual assistants provide continuous support for disease management, improving patient adherence to treatment plans. Additionally, AI facilitates remote monitoring through wearable devices, reducing hospital visits and enabling real-time health tracking. In oncology, AI accelerates drug discovery and enhances radiology through image-based tumor detection. Challenges such as data privacy, algorithm bias, and integration with existing healthcare systems need to be addressed for widespread adoption. In conclusion, AI plays a transformative role in chronic disease treatment by improving diagnostic accuracy, optimizing therapies, and enhancing patient engagement, ultimately leading to better health outcomes and reduced healthcare burdens.

Keywords: Chronic diseases, diabetes, cardiovascular disorders, cancer

EXPLORATION OF HERBAL SUPPLEMENTS FOR THE MANAGEMENT OF DIABETES: A REVIEW

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Abstract

Diabetes mellitus is a common metabolic disorder resulting from insulin deficiency or resistance, and is caused by persistent hyperglycemia. Usual therapy has limitations in terms of side effects and diminishing efficacy leading to increased use of herbal supplements as alternative therapies. Bioactive molecules in medicinal plants including cinnamon, fenugreek, bitter melon, Aloe vera and ginseng and so on are believed to improve insulin sensitivity and enhance insulin secretion, decrease the absorption of carbohydrate as well as exert antioxidant/anti-inflammatory effects. Clinical studies suggest that the extract of these healers has moderate success in mitigating fasting blood glucose, HbA1c and lipid abnormalities. Various pharmaceutical formulations (tablets, capsules, powders, tinctures, syrups and topical preparations have been designed to maximize efficacy and adherence. Although there is encouraging evidence, the heterogeneity among studies, different qualities of extracts and brief trial periods warrant prudence. Further studies should focus on well-designed and large-scale clinical trials as well as the standardization of locations for herbal products in order to elucidate underlying mechanisms. The utilization of these modulating, herbal supplements as adjuvants in personalized diabetic intervention will promise to enhance the therapeutic effects and lower the international burden of diabetes.

Keywords: Diabetes mellitus, HbA1c, Bioactive, cinnamon, fenugreek

**AMBROXOL ADMINISTRATION IN SUB-CHRONIC DOSES SHOWS DISEASE
MODIFYING EFFECTS VIA GCASE- α -SYNUCLEIN- MITOCHONDRIAL PATHWAY
IN RODENT MODEL OF PARKINSON'S DISEASE**

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Abstract

Disease-modifying agents are an unmet medical need for Parkinson's disease (PD). Drugs are under clinical trial to halt their progression, such as ambroxol, due to its glucocerebrosidase (GCase)-stimulating activity. However, the neurorestorative effect of ambroxol is not yet investigated in any of the well-established PD models in vivo. Ambroxol was administered as 400 mg/kg orally twice a day from D-28 to D-70 after the unilateral intrastriatal injection of 6-hydroxydopamine (6-OHDA) in male rats. Ambroxol restored TH and DAT levels on D-71 as the markers of dopaminergic cells and extracellular DA concentration, respectively, indicating the recovery of the dopaminergic system. Factors involved in PD pathogenesis, such as GCase enzymatic and mitochondrial complex-I activity, were restored, and α -synuclein pathology was decreased by ambroxol. Behavioral functions were progressively recovered. Both the GCase-stimulating and α -synuclein pathology-diminishing effects of ambroxol may be responsible for the increment in mitochondrial function and restoration of the dopaminergic system. These may act as significant mechanisms for the disease-modifying potential of ambroxol.

Keywords: Ambroxol, 6-Hydroxydopamine, Parkinson's disease, Glucocerebrosidase, Disease-modifying agent

AI DRIVEN PRECISION MEDICINE: UNLOCKING GENOMIC INSIGHTS FOR PERSONALIZED THERAPEUTICS

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Abstract

Precision medicine stands at the frontier of healthcare transformation, where AI converges with genomic sciences to restructure personalized therapeutics. This work highlights how individual treatment strategies are designed based on variability in genes, environment, and lifestyle, enabling truly personalized treatment paradigms. By integrating machine learning algorithms with the datasets, we highlight the capacity to predict patient-specific drug responses, targeted and personalized therapies for remarkable accuracy. Our methodology highlights how we can transform sequencing data into actionable knowledge to produce relevant and accurate results. AI-driven precision medicine in practice is the primary industry and therapeutic shift that is visible in the trends. Generally used in data collection, data integration and data analysis, this helps to predict and evaluate results efficiently. Recent breakthrough highlights AI's ability to accelerate drug discovery and improve personalized and genomic therapy success rates, particularly with regard to HIV therapy. The path ahead mentions overcoming key challenges, highlighting their impact with regard to the existing scenarios. We then suggest the future directions for every domain. By correlating research with commercial scalability, authenticating algorithms in diverse populations and establishing robust data sharing, we can bridge the translational gap. This convergence transforms treatment in the genomic era.

Keywords: Precision medicine, AI, HIV therapy, healthcare transformation

INTEGRATION OF AI IN NOVEL DRUG DELIVERY SYSTEMS

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Abstract

The integration of Artificial Intelligence (AI) in Novel Drug Delivery Systems (NDDS) has emerged as a transformative approach to improve drug development efficiency, precision, and therapeutic outcomes. AI-based tools such as machine learning, deep learning, and data mining techniques enable the analysis of large and complex datasets related to drug properties, biological interactions, and patient-specific factors. In NDDS, AI assists in the rational design and optimization of drug carriers, including nanoparticles, liposomes, polymeric systems, and targeted delivery platforms. These techniques help predict drug release profiles, stability, bioavailability, and toxicity, thereby reducing experimental time, cost, and failure rates. AI-driven modeling and simulation enhance personalized medicine by enabling patient-specific dose optimization and targeted drug delivery. Furthermore, AI supports real-time monitoring and control of smart drug delivery systems through predictive analytics and feedback mechanisms. The application of AI in NDDS also accelerates formulation development, quality control, and regulatory decision-making. Despite challenges such as data quality, interpretability, and ethical concerns, the integration of AI with NDDS holds significant promise for advancing precision medicine and improving patient compliance and therapeutic efficacy. Overall, AI-driven NDDS represents a futuristic and innovative strategy in pharmaceutical research and development.

Keywords: Artificial Intelligence (AI), Novel Drug Delivery Systems (NDDS), Machine Learning, Targeted Drug Delivery, Nanotechnology, Personalized Medicine, Formulation Optimization, Smart Drug Delivery Systems.

NUTRIOSE AND EUDRAGIT COATED PELLETS FOR COLONIC BACTERIAL ENZYME DEPENDENT COLON TARGETED DRUG DELIVERY.

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Abstract

Oral delivery via various dosage forms is the most prevalent route of delivery because of better patient compliance and adaptability. Targeted drug delivery through the colon is a focus research area for local diseases of the colon because it enhances the effectiveness of therapeutics as well as allows for localized therapy, decreasing systemic toxicity. A targeted drug delivery system is a system where the dosage form is altered to release the drug in the target area or at the disease site. In colon targeted drug delivery system, the drug is targeted to the colon. The colon-targeted drug delivery system is applied in the treatment of many diseases associated with the colon, such as inflammatory bowel disease, Crohn's disease, colon cancer, etc. This drug targets the site of disease, reducing the demand for more dosages of the drug, thereby decreasing the frequency of dosages and the price of the drug. Colon targeted drug delivery system will also decrease the systemic side effects. Microbial triggered drug delivery system depends on the enzymes that are released by various microflora of the colon. Targeted delivery of drugs to the colon is especially beneficial in the therapy of Inflammatory Bowel Disease (IBD), such as ulcerative colitis and Crohn's disease. Oral drug delivery system innovations have greatly enhanced the bioavailability of drugs to the colon, but for a drug to become therapeutically effective when disease exists, considerations must be taken for the changed Gastrointestinal tract (GI tract) physiology associated with inflammation of the GI tract. Colon-targeted drug delivery system enhances poorly absorbable drug absorption because of the long retention time. Colonic delivery of drugs can enable access to novel therapeutic targets. Colonic drug delivery has the ability to increase drug bioavailability with a decrease in off-target effects. Drug delivery to the colon necessitates thoughtful formulation development.

Keywords: Drug delivery systems, Inflammatory bowel disease, Colon-specific drug delivery, pH-sensitive, Time-controlled, Microbially triggered, Colorectal cancer.

THE ROLE OF ARTIFICIAL INTELLIGENCE IN REDUCING THE TIME OF DRUG DEVELOPMENT: FROM LAB TO MARKET

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Abstract

The development of a drug involves various stages and activities that are very challenging, lengthy, and expensive, and it may take over ten years and a lot of money before a new drug can be brought to the market. Among the major obstacles are drug target identification, lead optimisation, enormous numbers of failures in the preclinical and clinical stages, and the length of regulatory approval processes. AI has been recognised as a revolutionary tool with the potential of drastically decreasing the time of drug development by increasing the effectiveness of the whole pharmaceutical pipeline. AI-powered methods like machine learning, deep learning, and sophisticated data analytics make it possible to swiftly and accurately process large and intricate datasets acquired in drug discovery and development. The use of these technologies results in the accelerated discovery of new drug targets, the prediction of drugtarget interactions, the virtual screening of compounds, and the optimization of lead molecules; thus, there is less reliance on the traditional, lengthy, trial, and, error laboratory experiments. In the preclinical and clinical stages, AI helps to predict safety more accurately, identify biomarkers, design adaptive trials, and monitor data in real time, which allows for higher success rates and shorter development cycles. In addition, AI, powered regulatory intelligence, and the use of robots help to accelerate the process of market approval by organising documentation and decision-making processes. In a nutshell, the utilisation of AI completely revolutionises the conventional drug development process to become a quicker, less expensive, and more efficient route from research to market.

Keywords: Artificial Intelligence, Drug Development, Drug Discovery, Machine Learning, Clinical Trials, Regulatory Science

THERAPEUTIC POTENTIAL OF FUCOIDAN IN ALLERGIC ASTHMA: TARGETING PI3K/AKT, MAPK, AND NRF2 SIGNALLING

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Abstract

Background: Immune dysregulation, Th2-dominant cytokine responses, airway hyperresponsiveness, mucus hypersecretion, and oxidative stress are all characteristics of allergic asthma, a chronic inflammatory airway disease. The sulfated polysaccharide fucoidan, which was extracted from brown seaweeds, has shown significant anti-inflammatory, immunomodulatory, and antioxidant qualities, indicating that it may be used as a treatment for allergic asthma.

Objective: The objective of this study was to investigate the protective effects of fucoidan in allergic asthma and to elucidate its molecular mechanisms with particular emphasis on the PI3K/AKT, MAPK, and Nrf2 signaling pathways.

Methods: Experimental models of allergen-induced allergic asthma were used to assess fucoidan's effects. Serum immunoglobulin E (IgE) levels, mucus production, inflammatory cell infiltration, and airway hyperresponsiveness were evaluated. To ascertain immunological modulation, cytokine profiles, such as interleukin (IL)-4, IL-5, IL-13, and interferon- γ (IFN- γ), were examined. Molecular and biochemical methods were used to investigate activation of the PI3K/AKT and MAPK (ERK, JNK, and p38) pathways as well as Nrf2-mediated antioxidant signaling.

Results: Fucoidan treatment markedly decreased serum IgE levels and considerably reduced mucus hypersecretion, eosinophilic infiltration, and airway hyperresponsiveness. Fucoidan restored the Th1/Th2 immunological balance while inhibiting the production of Th2 cytokines (IL-4, IL-5, and IL-13). Fucoidan reduced the release of inflammatory mediators by blocking the activation of the PI3K/AKT and MAPK signaling pathways. Furthermore, fucoidan increased the expression of antioxidant enzymes and reduced oxidative stress-induced airway damage by activating the Nrf2 pathway.

Conclusion: Through coordinated immune response modulation, reduction of PI3K/AKT and MAPK-mediated inflammatory signaling, and activation of Nrf2-dependent antioxidant defenses, fucoidan has strong protective benefits against allergic asthma. These results encourage more translational and clinical research on fucoidan as a potential natural treatment option for allergic asthma.

Keywords: asthma, hyperresponsiveness, mucus hypersecretion, oxidative stress

PREDICTING DISSOLUTION BEFORE IT EXISTS: HOW MACHINE LEARNING IS REWRITING QUALITY BY DESIGN IN PHARMACEUTICS

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Abstract

Background: Dissolution testing is one of the most critical quality attributes in oral solid dosage forms since it has a critical impact on bioavailability, batch consistency, and regulatory acceptance. In this respect, conventional dissolution development is often based on experimental trial-and-error, clearly in seeming conflict with the predictive and systematic principles of QbD.

Overview: The presentation is aimed at the evaluation of the role of machine learning in the forecast of the dissolution profile and at assessing its potential to alter QbD-based pharmaceutical formulation and process development.

Methodology: Regression algorithms, along with artificial neural networks and ensemble methods, represent the most applied machine learning models, taking into account different formulation and process variables for excipient composition, particle size, compression force, and dissolution conditions. Modeling performance is evaluated by predictive accuracy, robustness, and interpretability in a QbD context.

Key Findings: ML-based models demonstrate superior capability in the prediction of dissolution behavior compared to traditional statistical methods. These models allow for the early identification of CMAs and CPPs, thereby reducing experimental burden and enhancing formulation robustness.

Implications for Quality by Design: The use of machine learning with QbD will also promote proactive risk assessment, optimization of design spaces, and real-time decisions. Machine learning will integrate as it combines formulation science and data analysis with quality testing and assurance.

Conclusion: This development in the application of machine learning for dissolution predictions marks a major shift in the field of pharmaceuticals with respect to the scientific basis of the QbD concept. It promises to take the development of drugs in the future by speeding up development processes as well as lowering costs.

Keywords: Machine Learning, Dissolution Profile, Quality by Design, Pharmaceuticals, Predictive Modeling

AI-DRIVEN LEAD OPTIMIZATION: TRANSFORMING PHARMACEUTICAL DRUG DISCOVERY

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Abstract

Lead optimization is a crucial stage in the process of drug development, where promising molecules are refined to improve their ADMET properties. Traditionally, this process has been time-consuming, costly, and prone to late-stage failures. However, in recent years, artificial intelligence and machine learning algorithms have helped in reducing the time taken for such processes and have increased the probability of finding correct candidates and optimizing them. ML employs algorithmic frameworks to analyze datasets, identify latent patterns, and construct predictive models through iterative optimization processes. Deep Learning ensembles, CNN, or GNN can accurately determine several molecular interactions. A combination of ML and AI models allows the design of drugs with optimal molecular structures in view of pharmacokinetic properties. AI-assisted lead optimization represents a successful convergence of computational research and industrial application, bridging the gap between academia and industry imperatives in modern drug development.

Keywords: Lead optimization, machine learning algorithms, artificial intelligence, ADMET properties.

FORMULATION AND EVALUATION OF A STABILITY-OPTIMIZED GASTRORETENTIVE FLOATING TABLET OF LEVODOPA.

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Abstract

Levodopa is the primary therapeutic agent used in the treatment of Parkinson's disease; however, its effectiveness is restricted due to a short biological half-life, limited absorption in the upper gastrointestinal tract, and instability under gastric conditions. To address these challenges, the present work focused on the development and evaluation of a stability-optimized gastroretentive floating tablet of levodopa aimed at prolonging gastric residence time and enhancing drug availability. Floating tablet formulations were developed using hydrophilic polymers, including hydroxypropyl methylcellulose and sodium alginate, combined with effervescent agents to impart buoyancy. Stabilizing excipients were incorporated to protect levodopa from oxidative and acidic degradation. The prepared tablets were evaluated for flow properties, tablet hardness, buoyancy characteristics, swelling index, in vitro drug release behavior, and stability under accelerated storage conditions. The optimized formulation demonstrated satisfactory physical properties, minimal floating lag time, sustained buoyancy for more than 12 hours, and controlled drug release through a diffusion-controlled mechanism. Stability assessment showed improved resistance to degradation compared with conventional formulations. The prolonged gastric retention and sustained release profile indicate enhanced drug availability at the absorption site. Overall, the study suggests that a stability-optimized gastroretentive floating delivery system represents an effective strategy to overcome the biopharmaceutical limitations of levodopa and may improve therapeutic performance in Parkinson's disease management.

Keywords: Parkinson's disease, gastroretentive floating tablet, levodopa

**RP-HPLC ANALYTICAL METHOD DEVELOPMENT AND VALIDATION FOR
EMPAGLIFLOZIN IN BULK AND PHARMACETICAL DOSAGE FORM.**

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Abstract

A rapid, sensitive, and specific reverse-phase high-performance liquid chromatography (RP-HPLC) method was developed and validated for the simultaneous estimation of Empagliflozin in pharmaceutical formulations. The chromatographic separation was achieved using a C18 column (250 mm × 4.6 mm, 5 µm) with mobile phase consisting of acetonitrile 95% and water 0.5% (95:05 v/v) at a flow rate of 0.5mL/min. Detection was carried out at 254 nm with retention times of 4.75 and 6.77 minutes for Empagliflozin respectively. The method demonstrated linearity over concentration ranges of 5 – 30 ppm for both drugs with correlation coefficients >0.999. The developed method was validated according to ICH guidelines for accuracy, precision, specificity, linearity, robustness, and stability. Recovery studies showed mean recoveries of 0.99.67% for both analytes. The method showed good precision with RSD values

Keywords: Empagliflozin, RP-HPLC, method development, validation.

FORMULATION & EVALUATION OF FLOATING TABLETS PREPARED FROM LEAF EXTRACT OF PLANT *CARRISSA SPINARUM* TARGETING PEPTIC ULCER

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Abstract

Most oral drug administration strategies require improved drug retention in the gastrointestinal tract (GIT) to increase bioavailability. One method of improving gastrointestinal retention of the medication is to distribute it as a floating drug delivery system (FDDS), which lowers its density relative to the stomach fluids. Every region of India is home to this thorny plant *Carissa spinarum*. It has already been established that the leaf extract contains tissue-protective properties. Peptic ulcers are a prevalent gastrointestinal disorder that affects a large portion of people worldwide. There are numerous peptic ulcer therapy options available in the market. Since not every treatment is appropriate for every patient, more options are still required. Recent research has demonstrated the antioxidant properties of an extract made from *Carissa spinarum* leaves. In order to treat peptic ulcers, this study focuses on the formulation along with evaluation of floating tablets made from *Carissa spinarum* plant leaf extract.

Keywords: floating drug delivery system, *Carissa spinarum* leaf extract, peptic ulcers, Ulcer protective effects, Antioxidant effect

ASSESSMENT AND EVALUATION OF DEPRESSION SEVERITY INCLUDING NORTH INDIAN PHARMACY INDIVIDUALS THROUGH PHQ-9

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Abstract

Objective: To assess and evaluate the depression severity, including north indian pharmacy individuals in North India through PHQ-9.

Methods: After receiving approval from the Institutional Ethics Committees of the ISF College of Pharmacy, Moga. This observational and questionnaire-based study was carried out for a period of six months. The Patient Health Questionnaire (PHQ-9) was used for this research, developed by Dr. Robert L. Spitzer, with an educational grant from Pfizer, Inc.

Results: In the observation and questionnaire-based study, 355 participants were included, excluding the patients who chose not to participate. The majority of participants in this study were male (68%, 242 participants) compared to female (32%, 113 participants) in North Indian pharmacy colleges, where the PHQ-9 indicated that the depression severity was low, according to the non-significant ($p=0.001$) results.

Conclusion: Based on the important result of comparing the intensity of depression to their PHQ 9 scores, the current study concluded that most patients were found to have minor depression. Male responses outnumbered female participants in the current study, and the biggest participant group was in the UG category, followed by the PG category. Gender, age, course, description, state, social habits, and depression severity were among the many factors that were compared with the PHQ-9. It was found that many of these factors included the fact that people with depression face discrimination from society, that their depressive state cannot be changed, that they should not be allowed to attend regular classes, and that they are afraid of being near depression because it can be dangerous.

Keywords: Patient Health Questionnaire (PHQ-9), Depression, Pharmacy, North India, Depression severity.

ARTIFICIAL INTELLIGENCE AS A TRANSLATIONAL ENGINE IN PHARMA: CONVERGING ACADEMIC RESEARCH AND INDUSTRIAL EXECUTION

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Abstract

In order to foster technological advancement and exploration in the healthcare and scientific industries, an industry-academia alliance is essential. By combining the advantages of industry and academics, these partnerships can accelerate the creation of revolutionary methodologies, goods, and amenities. In India, many scientific and pharmaceutical organizations have collaborated with universities and institutions to achieve self-sufficiency and speed up empirical advancements from the research bench to commercial services, meeting vital societal requirements. Under this mutually profitable partnership, corporate and academic circles accelerate the transformation of philosophical findings into feasible alternatives while creating collaborative ideas for equitable and ecologically friendly socioeconomic growth. In order to teach students emerging area skills, educational institutions now incorporate artificial intelligence, machine learning technology, and automation systems into their curriculum. The pharmaceutical sector is undergoing a paradigm shift driven by the rapid integration of artificial intelligence across the drug discovery, development, and delivery continuum. While academia remains the cradle of scientific innovation and mechanistic understanding, the pharmaceutical industry is driven by imperatives of scalability, regulatory compliance, speed, and commercial viability. The growing disconnect between academic outputs and industrial expectations has slowed translational impact. This paper explores how AI can serve as a common language between academia and industry, fostering collaborative ecosystems and translational efficiency.

Keywords: Self-sufficiency, Industry-academia, Philosophical findings, Curriculum, Scalability

BIOSENSORS AS CATALYSTS OF INNOVATION IN HEALTHCARE DIAGNOSTICS AND PERSONALIZED MEDICINE

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Abstract

Biosensors represent one of the most transformative tools in modern healthcare, serving as key catalysts in the evolution of diagnostics and personalized medicine. Integrating biological elements with advanced transducers, biosensors deliver sensitive, real-time detection of biomarkers essential for early disease identification and individualized therapeutic monitoring. Recent innovations such as nanotechnology, wearable sensors, point-of-care platforms, and AI-driven analytics have expanded biosensor applications from traditional laboratory settings to in-home and continuous monitoring environments. In the context of personalized medicine, biosensors play a pivotal role by capturing patient-specific biological data, including genetic, proteomic, and metabolic information. This data-driven approach allows clinicians to tailor treatments based on individual variability, improving therapeutic efficacy while minimizing adverse effects. Despite challenges related to scalability, data security, and regulatory approval, ongoing research continues to expand its clinical applicability. Overall, biosensors act as powerful catalysts of innovation, bridging the gap between diagnostics and personalized medicine, and paving the way for more precise, efficient, and patient-centred healthcare systems.

Keywords: Biosensors; Healthcare Diagnostics; Personalized Medicine; Wearable Sensors; Nanotechnology; Point-of-Care Testing; Digital Health

**THE FUTURE OF PHARMACEUTICALS AND ARTIFICIAL INTELLIGENCE:
INTEGRATING ACADEMIC AND INDUSTRY IMPERATIVES.**

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Abstract

Artificial intelligence (AI) has emerged as a transformative tool in pharmaceutical technology, offering significant potential to reduce time and cost while enhancing the understanding of complex relationships between formulations, process parameters, and therapeutic outcomes. As a rapidly evolving subfield of computer science, AI employs techniques such as machine learning, deep learning, natural language processing, and automation to solve complex problems across healthcare and engineering domains. In the pharmaceutical sector, AI has notably accelerated drug discovery by enabling the analysis of large datasets and predicting drug–target interactions, thereby reducing failure rates and development timelines. AI-driven approaches also support the development of novel peptides from natural foods, aid in the management of rare diseases, and improve drug adherence and dosage optimization. Furthermore, AI plays a crucial role in clinical trial design through predictive analytics, patient recruitment, real-time outcome monitoring, and trial success prediction. In pharmaceutical manufacturing, the integration of AI with manufacturing execution systems and automated process control enhances quality assurance, predictive maintenance, inventory optimization, and overall operational efficiency. Despite these advancements, challenges such as data quality, model interpretability, ethical concerns, and regulatory acceptance remain barriers to widespread adoption. This review highlights the key applications, prospects, and challenges of AI in the pharmaceutical industry, emphasizing its potential to revolutionize drug development and personalized patient care while underscoring the need for robust ethical and regulatory frameworks to ensure safe and equitable implementation.

Keywords: computer science, machine learning, deep learning, inventory optimization.

DEVELOPMENT OF NANOLIPOSOMES FOR COX-2-MEDIATED ANTITUMOR THERAPY

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Abstract

Introduction: COX-2 overexpression and chronic inflammation are directly related to the development of cancer. Beyond its primary function in pain reduction, NSAIDs have demonstrated anticancer effects. The anti-proliferative and antioxidant qualities of flavonoids are well established.

Aim: The objective is to use a combination of computational and quality-by-design formulation techniques to build and optimise nanoliposomes that contain both an NSAID and a flavonoid.

Methodology: To determine the stability and affinity of COX-2 binding, we first ran molecular docking and molecular dynamics simulations. We developed and improved nanoliposomes using a Box-Behnken architecture, guided by these computational results. Important quality characteristics, such as particle size, encapsulation efficiency, and stability, were methodically assessed.

Evaluation: Cytotoxicity, synergistic interaction, apoptosis induction, ROS production, mitochondrial malfunction, and inhibition of cell migration and invasion were all examined in the optimised formulation. Both the gene and protein levels of COX-2 regulation were verified.

Conclusion: The work concludes that a synergistic, COX-2 targeted anticancer system can be produced by in-silico guided QbD optimization of flavonoid-NSAID nanoliposomes. There is a lot of promise for this system's application in cancer treatment.

Future Outcomes: In vivo pharmacokinetic and effectiveness investigations can validate tumour targeting and safety of the improved flavonoid-NSAID nanoliposome system. Targeting ligand surface functionalization could improve selectivity for cancers that overexpress COX-2. This platform's expansion to other anti-inflammatory phytochemical combinations, GMP validation, and scale-up could aid in clinical and translational development.

Keywords: NSAID repurposing, Flavonoids, COX-2 inhibition, Nanoliposomes, Quality by Design, In-silico modelling, Antitumor therapy

ACCELERATING TARGETED PROTEIN DEGRADATION: AI-DRIVEN STRATEGIES IN THE DESIGN AND OPTIMIZATION OF PROTACS

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Abstract

Background: Proteolysis Targeting Chimeras (PROTACs) represent a significant paradigm shift in drug discovery by offering a mechanism to selectively degrade disease-causing proteins rather than merely inhibiting them. By hijacking the ubiquitin-proteasome system (UPS), PROTACs facilitate the formation of a ternary complex between a target protein, an E3 ubiquitin ligase, and a heterobifunctional ligand. This leads to the ubiquitination and subsequent proteasomal degradation of the target. However, the development of these drugs is currently hindered by significant chemical complexities

Aim and objectives: The primary objective is to accelerate PROTAC development and overcome existing chemical and structural barriers. The specific aims include utilizing advanced computational approaches to: Predict ternary complex stability, optimize linker composition, identify novel E3 ligases and improve the prediction of profiles early in the design pipeline.

Methods and results: To achieve the objectives, deep learning algorithms and generative models, specifically protein language models and geometric deep learning, are applied to the design process. Additionally, AI-driven pharmacokinetic modelling is utilized for ADMET profiling.

Conclusion: AI-enabled rational design is poised to transform PROTAC discovery from a serendipitous process into a precise, high-throughput engineering discipline. This shift promises to unlock new therapeutic avenues for complex conditions, including oncology and neurodegenerative diseases.

Keywords: PROTACs, Targeted Protein Degradation (TPD), Artificial Intelligence, Drug Discovery, Machine Learning

MOLECULAR DOCKING-BASED EVALUATION OF NOVEL SYNTHETIC COMPOUNDS TARGETING THE JAK–STAT PATHWAY IN ULCERATIVE COLITIS

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Abstract

Aim: Ulcerative Colitis (UC) is a chronic inflammatory bowel disease characterized by dysregulated immune responses and excessive cytokine signaling. The Janus Kinase–Signal Transducer and Activator of Transcription (JAK–STAT) pathway plays a central role in the inflammatory cascade of UC, making it an important therapeutic target. The present study aims to design and evaluate novel synthetic compounds for their potential anti-ulcerative activity through selective inhibition of JAK–STAT pathway proteins using molecular docking studies.

Methodology: Molecular docking studies were performed using AutoDock Vina to predict the binding affinity and interaction patterns of the designed synthetic compounds with selected target proteins involved in the JAK–STAT pathway obtained from the Protein Data Bank. Protein and ligand structures were prepared using standard in-silico preprocessing steps, including energy minimization and hydrogen addition. A standard JAK inhibitor was used as a reference compound for comparative evaluation.

Results: Docking analysis revealed that most synthetic compounds exhibited stronger binding affinity than the standard JAK inhibitor. The reference inhibitor showed a binding affinity of -8.3 kcal/mol, while the best-performing compound demonstrated a higher binding affinity of -9.2 kcal/mol. Interaction studies indicated the formation of stable ligand–protein complexes involving key amino acid residues such as VAL, MET, and ALA through hydrogen bonding and π – π interactions, contributing to enhanced binding stability.

Conclusion: The results suggest that the designed synthetic compounds possess promising potential as JAK–STAT pathway inhibitors with anti-ulcerative activity and support further in-vitro and in-vivo evaluation.

Keywords: Ulcerative colitis, JAK–STAT pathway, molecular docking, synthetic compounds, anti-ulcerative activity

CHRONIC LIVER INJURY: PATHOPHYSIOLOGICAL MECHANISMS, CURRENT THERAPIES, AND EMERGING THERAPEUTIC STRATEGIES

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Abstract

Chronic liver injury represents a major global health burden due to its progressive nature, complex pathophysiology, and limited therapeutic options. Persistent hepatic insult arising from metabolic, infectious, toxic, autoimmune, or genetic factors leads to sustained inflammation, hepatocellular injury, fibrosis, and ultimately cirrhosis and hepatocellular carcinoma. Despite significant advances in understanding the molecular mechanisms underlying chronic liver injury, effective disease-modifying therapies remain scarce, particularly for fibrosis and advanced-stage liver disease. Current pharmacological approaches are largely etiology-specific and primarily aim at halting disease progression rather than reversing established damage. Emerging evidence highlights the central role of immune dysregulation, oxidative stress, mitochondrial dysfunction, altered signaling pathways, and aberrant wound-healing responses in driving chronic hepatic injury. This review provides a comprehensive overview of the pathophysiology of chronic liver injury, emphasizing key molecular and cellular mechanisms involved in disease progression. Furthermore, it critically evaluates existing pharmacological therapies, discusses emerging therapeutic strategies, and explores novel drug delivery approaches aimed at improving efficacy and safety. Current challenges, translational barriers, and future perspectives toward precision medicine and combination therapies are also addressed. By integrating mechanistic insights with clinical evidence, this review aims to provide a consolidated framework to guide future research and therapeutic development in chronic liver injury.

Keywords: Chronic liver injury, Hepatic fibrosis, Inflammation, Oxidative stress, Hepatic stellate cells, Antifibrotic therapy, Hepatoprotective agents, Molecular signaling pathways, Precision medicine

**IN SILICO INVESTIGATION AND UNCOVERING THE MECHANISM OF WOUND
HEALING ACTIVITY OF *CINNAMOMUM TAMALA*, *CURCUMA LONGA*, AND
*BAMBUSA VULGARIS***

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Abstract

With the help of the simulating molecular docking technique, various ligands have been determined with specific protein interaction, which helps to find the mechanism of phytochemicals using computational methods. These bioactive phytochemicals present in herbals have been used as promising frontiers in the treatment of acute and chronic wound healing. This review explores the synergistic effect of herbals in combinations, focusing on the mechanism of wound healing activity of *cinnameldihyde* obtained from *cinnamomum tamala*, *curcumine* obtained from *curcuma longa* and *isoorientine* obtained from *bambusa vulgaris*. In the Insilco studies of *curcumin*, *Isoorientin*, *Cinnamldihyde* showed better binding affinity for 6B8Y & 1CX2, 4PRV & 6F86, and 4XCU & 5IKR, respectively. The three combinations of plant drug have used in this study showed better binding affinity with protein by acting on multiple mechanism which shows a better synergistic effect in wound healing with tissue repair processes. Hope this study will encourage researchers to further study this three-plant drug combination to utilize in the wound healing activity.

Keywords: Molecular docking technique, bioactive phytochemicals, ligand-protein interaction, therapeutic efficacy, wound healing.

FORMULATION AND EVALUATION OF A HERBAL CREAM FOR ANTI-INFLAMMATORY ACTIVITY

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Abstract

Herbal medicines have received considerable attention in recent years due to their proven therapeutic efficacy, better patient compliance, and reduced risk of adverse effects when compared with synthetic drugs. Inflammatory conditions of the skin are commonly treated using conventional anti-inflammatory agents; however, prolonged use of such agents may lead to undesirable side effects. Therefore, there is a growing demand for safe and effective topical formulations derived from natural sources. The present study was undertaken to formulate and evaluate a herbal anti-inflammatory cream containing Aloe vera gel and Curcuma longa (curcumin) as active ingredients. Aloe vera is well known for its soothing, wound-healing, moisturizing, and anti-inflammatory properties, whereas curcumin possesses strong anti-inflammatory and antioxidant activity. The herbal cream was prepared using appropriate excipients by an oil-in-water emulsion technique to obtain a stable, smooth, and aesthetically acceptable topical formulation. The prepared formulation was evaluated for various physicochemical parameters such as appearance, homogeneity, pH, viscosity, spreadability, washability, and stability to ensure its suitability for topical application. The results of the evaluation studies revealed that the formulated cream exhibited an acceptable pH compatible with the skin, good viscosity, uniform consistency, and satisfactory spreadability, indicating ease of application. Stability studies showed no significant changes in physical appearance or pH, confirming the stability of the formulation. The anti-inflammatory activity of the herbal cream demonstrated promising results, suggesting a synergistic effect of Aloe vera and curcumin in reducing inflammation. Based on the findings, it can be concluded that the developed herbal anti-inflammatory cream has potential as a safe, effective, and natural alternative to conventional topical anti-inflammatory formulations for the management of inflammatory skin conditions.

Keywords: Aloe vera, Curcuma longa, Herbal cream, Anti-inflammatory activity, Topical formulation

LIPOSOMAL STRATEGIES FOR ENHANCED DELIVERY OF GLYCOSIDES

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Abstract

Glycosides are a diverse group of bioactive natural compounds exhibiting a wide range of pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and anticancer effects. Despite their significant therapeutic potential, clinical application of glycosides is often limited due to poor aqueous solubility, low bioavailability, rapid metabolism, and non-specific distribution. To overcome these limitations, the present research focuses on the development of liposomal lipid-based drug delivery systems for glycosides. Liposomes are biocompatible and biodegradable vesicular carriers capable of encapsulating both hydrophilic and hydrophobic drugs, offering enhanced stability, controlled release, and targeted delivery. The proposed work involves the formulation of glycoside-loaded liposomes using various preparation techniques such as thin film hydration and reverse phase evaporation, followed by optimization of formulation variables to achieve high encapsulation efficiency and stability. Comprehensive physicochemical characterization, in vitro release studies, cellular uptake evaluation, and in vivo pharmacokinetic and biodistribution studies are planned to assess the performance of the developed formulations. The study aims to improve therapeutic efficacy while minimizing systemic toxicity associated with conventional glycoside formulations. Successful development of liposomal glycoside delivery systems may provide an effective platform for enhanced drug delivery and open new avenues for the clinical application of glycosides in the management of chronic and complex diseases.

Keywords: Glycosides, Liposomes, Lipid-based drug delivery, Bioavailability enhancement, Targeted drug delivery

SENSEI GOGGLES: SMART VISION FOR THE BLIND

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Goggles for the blind presents a wearable, goggle-based system designed to empower visually impaired individuals with enhanced navigation and safety features. The device integrates digital alarming direction detection, temperature sensing, direction sensing, and heat sensing capabilities. Using advanced sensors and GPS technology, the goggles provide real-time audio feedback, alerting users to obstacles, temperature changes, and directional information. The direction sensor utilizes digital compass technology to guide users through unfamiliar environments, while the heat sensor detects potential hazards like fire or extreme temperatures. A temperature sensor provides ambient temperature readings, ensuring users are prepared for environmental conditions. The system is designed for comfort, affordability, and ease of use, aiming to significantly improve the quality of life for the visually impaired. This innovative solution has the potential to increase independence, confidence, and mobility for millions worldwide. The goggles' multi-sensor approach offers a holistic solution for navigation challenges, addressing obstacles, temperature fluctuations, and directional confusion. This innovative solution has the potential to increase independence, confidence, and mobility for millions worldwide. By combining multiple sensors and audio feedback, the goggles provide a reliable tool for daily navigation, enhancing overall well-being and safety. The device's wearable design and user-friendly interface make it an essential accessory for visually impaired individuals, enabling them to navigate complex environments with greater ease. The potential impact of these goggles extends beyond individual users, as they can also contribute to a more inclusive and accessible society. With further development and deployment, this technology could revolutionize the way visually impaired individuals interact with their surroundings, fostering greater autonomy and participation in daily life. The integration of advanced sensors and audio feedback in these goggles marks a significant step forward in assistive technology, offering new possibilities for those who need it most.

Keywords: Assistive Technology, Navigation, Safety, Wearable Device, Visually Impaired

RATIONAL DESIGN AND EVALUATION OF NOVEL IMIDAZO[1,2-A] PYRIDINE-BASED MOLECULES FOR ALZHEIMER'S THERAPY

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Abstract

Introduction: Alzheimer's disease (AD) is a neurodegenerative disorder characterized by a progressive decline in memory and cognition. The main cause of neurodegeneration is considered to be the accumulation of amyloid- β . BACE1 is a rational target in Alzheimer's disease (AD) drug development due to its role in amyloidogenic cleavage of APP in generating A β .

Methods: We designed a series of compounds containing an imidazo[1,2-a] pyridine moiety as inhibition of BACE1. The compound IMP 1-14 were synthesized by using different amine attached to the imidazo[1,2-a] pyridine moiety. Molecular docking exposed with protein (PDB: 4ACU) that the nitrogen atom of imidazo[1,2-a] pyridine was given π - π stacking with Tyr71 and Val69 and the amide linker hydrogen was involved in hydrogen bound interactions with Asp228 and Asp32 of the BACE1 active site.

Results: Based on the docking results, the retrieved molecules were synthesized for BACE1 inhibitor and characterized by IR, ^1H NMR ^{13}C NMR and Mass spectroscopic techniques. Evaluating the BACE1 inhibitory effects of the synthesized compounds revealed that introducing an imidazo[1,2-a] pyridine moiety resulted in a significant improvement in its BACE1 inhibitory potential.

Conclusion: In this study, compound IMP-7 and IMP-11 were the most potent against BACE1 with an IC_{50} value of 3.12 (± 0.71) and 4.41 (± 0.91), respectively, which was concomitant with the results of the *in-silico* docking study.

Keywords: Alzheimer's Disease, BACE1, Imidazo[1,2-a] pyridine moiety, Molecular Docking

OPTIMIZATION AND CHARACTERIZATION OF FLAX SEED MUCILAGE-BASED IMMEDIATE RELEASE TABLET FORMULATION

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Abstract

In tablet formulations, pharmaceutical excipients are essential, and natural sources are becoming more and more popular because of their accessibility, affordability, and safety. In senna-based immediate release tablets, flaxseed mucilage (FSM), a hydrocolloid high in polysaccharides, was assessed as a possible natural binder and disintegrant. Following its extraction, characterization, and determination of its physicochemical properties (pH 6.4, swelling index 53.84%), FSM was shown to be suitable for gastrointestinal disorders.

Different FSM concentrations were used to generate the formulations, which were then compared to starch as a standard binder. With a hardness of 7.2 kg/cm², a disintegration time of 5.1 minutes, and a total drug release of 99.81% within 60 minutes, the optimized formulation (F5), which contained 4% FSM and 10% starch, outperformed the other factorial design batches. These findings suggest that FSM not only had sufficient binding qualities but also made a substantial contribution to quick breakdown and effective drug release.

Similar results were obtained from comparison research with the commercially available senna tablet (Senasof), which demonstrated a hardness of 8.0 kg/cm², disintegration in 6 minutes, and 99.03% drug release at 60 minutes. This proves that FSM is a good natural substitute for artificial binders.

The study demonstrates that flaxseed mucilage can be effectively used as a natural excipient in immediate-release laxative pills because of its swelling capability and advantageous physicochemical profile. Its performance, which is on par with a commercial product, shows that it can either supplement or replace traditional binders and disintegrants in medicinal formulations.

Keywords: Flaxseed mucilage, natural excipients, senna, immediate release tablets, laxative.

CIRCULATING SECRETED FRIZZLED-RELATED PROTEIN 4 REFLECTS EARLY B-CELL DYSFUNCTION IN TYPE 2 DIABETES MELLITUS.

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is a progressive metabolic disorder characterized by insulin resistance and β -cell dysfunction. Early identification of biomarkers reflecting β -cell impairment is essential for preventing disease progression. Secreted frizzled-related protein 4 (SFRP4), a Wnt signaling antagonist, has been implicated in impaired insulin secretion and early metabolic stress; however, findings across studies remain inconsistent.

Methodology: A meta-analysis was conducted according to PRISMA 2020 guidelines and registered in PROSPERO (CRD420251060396). Electronic databases, including PubMed, Google Scholar, Cochrane Library, ScienceDirect, and ClinicalTrials.gov, were searched up to December 2025. Pooled standardized mean differences (SMDs) were calculated using a random-effects model. Sensitivity analyses were performed to explore heterogeneity.

Results: Nine observational studies published between 2015 and 2024 were included, comprising 631 individuals with T2DM and 466 normoglycemic controls. Circulating SFRP4 levels were significantly higher in T2DM compared with controls (SMD = 1.55; 95% CI: 0.73–2.37; $p < 0.0001$). Despite substantial heterogeneity ($I^2 = 96.9\%$), the direction of association was consistent. No strong publication bias was observed.

Conclusion: Circulating SFRP4 levels are consistently elevated across dysglycemia and may reflect early β -cell dysfunction. Further longitudinal studies are needed to establish its prognostic value.

Keywords: T2DM; SFRP4, β -cell dysfunction, Biomarker, Dysglycemia

ANALYTICAL METHOD DEVELOPMENT AND VALIDATION OF RELATED SUBSTANCES IN SELECTED DRUGS USING RP-UPLC

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Abstract

Background: Nivolumab and Ipilimumab are immune checkpoint inhibitors widely used in cancer immunotherapy. Accurate and reliable analytical methods are essential for their simultaneous estimation in pharmaceutical formulations to ensure safety, efficacy, and quality. **Methods:** A stability-indicating reversed-phase ultra-performance liquid chromatographic (RP-UPLC) method was developed using an X-Bridge ODS C18 column (2.1 × 50 mm, 1.7 µm). The optimized mobile phase consisted of phosphate buffer (pH 3.0) and acetonitrile (70:30 v/v), with a flow rate of 0.3 mL/min. Detection was performed at 225 nm with a run time of 4 minutes. The method was validated according to ICH Q2 (R1) guidelines. **Results:** The retention times were 1.258 min for Ipilimumab and 1.756 min for Nivolumab. System suitability parameters confirmed robustness with theoretical plates >4000 and tailing factor of 1.2. Linearity was established between 50–250 µg/mL (Ipilimumab) and 15–55 µg/mL (Nivolumab), with correlation coefficients (r^2) of 0.999. Accuracy was demonstrated by recoveries of 98.56% for Ipilimumab and 99.96% for Nivolumab. Precision results showed %RSD <2.0 for both repeatability and intermediate precision. Sensitivity studies revealed low detection limits (LOD: 3.72 µg/mL for Ipilimumab; 0.0242 µg/mL for Nivolumab) and quantification limits (LOQ: 7.40 µg/mL and 0.0202 µg/mL, respectively).

Conclusion:

The developed RP-UPLC method is simple, rapid, accurate, and sensitive. It is suitable for routine quality control, assay, and stability studies of Nivolumab and Ipilimumab in bulk drugs and pharmaceutical dosage forms.

Keywords: RP-UPLC, Nivolumab, Ipilimumab, Method Validation, Stability

**MOLECULAR DOCKING AND SYNTHESIS OF CHROMONE DERIVATIVES AS
POTENT 5 α REDUCTASE INHIBITORS FOR COMBATING THE
HYPERANDROGENISM IN PCOD**

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Abstract

Aim: Polycystic Ovarian Disease (PCOD) is a complex endocrine disorder characterized by hyperandrogenism leading to clinical symptoms such as hirsutism, acne, menstrual irregularities and infertility. One of the key enzymes involved in androgen metabolism is 5- α reductase which catalyzes the conversion of testosterone into the more potent dihydrotestosterone (DHT). Selective inhibition of 5- α reductase is therefore considered a promising therapeutic strategy for controlling hyperandrogenism in PCOD. The present study aims to design and evaluate chromone-based derivatives as potential 5- α reductase inhibitors using molecular docking studies.

Methodology: Molecular docking studies were carried out using Auto Dock Vina to analyze the binding affinity of the designed chromone derivatives with the active site of 5- α reductase. The three-dimensional structure of the enzyme was retrieved from the Protein Data Bank. A series of chromone-based ligands were docked into the active site and binding interactions were evaluated based on docking scores and key amino acid interactions. Finasteride was used as the reference standard drug.

Results: All designed chromone derivatives exhibited favorable binding affinities with docking scores ranging from -8.7 to -9.3 kcal/mol. Several derivatives showed stronger binding interactions than the standard drug. The most active compound demonstrated stable hydrogen bonding and π - π interactions within the enzyme active site.

Conclusion: The docking results suggest that chromone derivatives possess significant 5- α reductase inhibitory potential and may serve as promising lead compounds for the treatment of PCOD. Further synthesis, in-vitro evaluation, and biological validation are warranted.

Keywords: Polycystic Ovarian Disease (PCOD), 5 α Reductase, Molecular docking, Synthetic Compound, 5 α Reductase Inhibitors, In-Silico Study.

**RECENT ADVANCES AND COMPREHENSIVE INSIGHTS INTO GLYCEROSOMES:
A NOVEL VESICULAR PLATFORM FOR ENHANCED TOPICAL AND
TRANSDERMAL DRUG DELIVERY**

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Abstract

Glycerosomes are an advanced vesicular drug delivery system that enhances the stability and flexibility limitations of conventional liposomes by incorporating significant glycerol content into phospholipid bilayers. Glycerol acts as an edge activator, reducing bilayer defects and increasing vesicle flexibility without causing irritation or toxicity. These vesicles efficiently encapsulate both hydrophilic and hydrophobic drugs, with drug loading influenced by vesicle size, lamellarity, and phospholipid properties. Various preparation methods, such as thin film hydration, ultrasonication, and ethanol injection, allow control over vesicle characteristics and drug encapsulation.

Critical factors affecting glycerosome performance include glycerol concentration, phospholipid type, preparation technique, temperature, pH, and storage conditions. Characterization techniques like electron microscopy, dynamic light scattering, and skin permeation studies confirm vesicle integrity and drug delivery potential. Glycerosomes also modify skin plasticity and dielectric properties, further enhancing drug permeation.

Recent advances include optimized drug encapsulation, improved stability via cholesterol addition, targeted delivery through ligand conjugation, and stimuli-responsive controlled release. Combination therapies and scalable manufacturing methods have broadened glycerosome applications. Several glycerosome-based formulations are marketed for topical anti-inflammatory and antifungal treatments. This review highlights glycerosomes as a versatile and promising platform for effective, safe drug delivery, particularly in topical and transdermal therapies, and their therapeutic advantages.

Keywords: Glycerosomes, vesicular drug delivery, liposomes, drug encapsulation

BIPHASIC REGULATION OF FGF13 ACROSS INSULIN RESISTANCE AND HEPATIC STEATOSIS

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Abstract

Background: Type 2 Diabetes Mellitus (T2DM) and Non-Alcoholic Fatty Liver Disease (NAFLD) frequently coexist and share insulin resistance as a core pathogenic mechanism. Early T2DM is primarily driven by skeletal muscle insulin resistance, whereas NAFLD reflects progressive hepatic metabolic dysfunction. Fibroblast Growth Factor 13 (FGF13) is an intracellular FGF with emerging roles in metabolic regulation. However, human data linking FGF13 to insulin resistance and hepatic steatosis remain limited.

Objective: To evaluate serum FGF13 levels across the metabolic spectrum and explore its role as a crosstalk marker between insulin resistance and hepatic steatosis.

Methods: In this cross-sectional observational study, adults were categorized into four groups: healthy controls, T2DM, NAFLD, and T2DM + NAFLD. T2DM was diagnosed using ADA criteria, NAFLD by Fibro Scan, and insulin resistance by HOMA-IR. Serum FGF13 was quantified using ELISA. Hepatic steatosis severity was assessed using the CAP score. Statistical analyses included one-way ANOVA and correlation analysis.

Results: Serum FGF13 levels differed significantly across groups. FGF13 was reduced in isolated T2DM compared to healthy controls, but markedly elevated in NAFLD, and highest in T2DM + NAFLD. FGF13 showed a negative correlation with HOMA-IR and a positive association with CAP score.

Conclusion: FGF13 demonstrates a biphasic pattern, declining in early insulin resistance and rising sharply with hepatic steatosis, suggesting its potential as a stage-specific biomarker reflecting muscle–liver metabolic crosstalk.

Keywords: FGF13, Type 2 Diabetes Mellitus, NAFLD, Insulin Resistance, Hepatic Steatosis, HOMA-IR, CAP Score, Metabolic Crosstalk

**DESIGN, SYNTHESIS AND MOLECULAR DOCKING STUDIES OF NOVEL
PYRAZOLO [1,5- A] PYRIMIDINE DERIVATIVES AS PHOSPHODIESTERASE-4
INHIBITORS FOR TREATMENT OF RHEUMATOID ARTHRITIS.**

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune inflammatory disorder that causes joint pain, swelling, and progressive joint damage. Although several anti-rheumatoid drugs are available, their long-term use is often associated with side effects and limited effectiveness. Therefore, there is a need to develop safer and more effective therapeutic agents. Phosphodiesterase-4 (PDE-4) is an important enzyme involved in the regulation of inflammatory mediators, and inhibition of PDE-4 helps in reducing inflammation by increasing intracellular cyclic adenosine monophosphate levels.

Pyrazolo[1,5-a] pyrimidine is a fused heterocyclic system with reported anti-inflammatory activity. In the present study, a series of novel pyrazolo[1,5-a] pyrimidine derivatives were designed, synthesized, and evaluated as potential PDE-4 inhibitors for the treatment of Rheumatoid arthritis. The compounds were synthesized using a simple and feasible laboratory-scale synthetic method. Molecular docking studies were performed to evaluate the binding interactions of the designed compounds with the PDE-4 enzyme active site and to compare their binding affinity with standard anti-rheumatoid drugs.

The docking results showed favorable binding interactions with key amino acid residues of PDE-4, suggesting good inhibitory potential. These findings indicate that pyrazolo[1,5-a] pyrimidine derivatives may serve as promising lead compounds for the development of new PDE-4 inhibitors for Rheumatoid arthritis.

Keywords: Rheumatoid arthritis; Pyrazolo[1,5-a] pyrimidine; PDE-4 inhibitors; Synthesis; Molecular docking

THE FORMULATION STRATEGIES AND PHARMACEUTICAL POTENTIAL OF NANO-EMULSIONS

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Abstract

The integration of nanotechnology with phytotherapy has opened new avenues for the development of safer, more effective, and environmentally friendly drug delivery systems. Nano-emulsions i.e. thermodynamically stable dispersions of two immiscible liquids stabilized by surfactants i.e. have emerged as promising carriers for plant-derived bioactive compounds that often suffer from poor solubility, instability, and limited bioavailability. This review

comprehensively explores the formulation principles, preparation techniques, and characterization parameters of plant-based nano-emulsions. Emphasis is placed on the role of natural oils, surfactants, and co-surfactants in achieving nanoscale droplet sizes and enhanced stability. Furthermore, recent advancements in high-energy and low-energy emulsification methods, such as ultrasonication, micro-fluidization, and phase inversion, are discussed in relation to their impact on droplet size and encapsulation efficiency. The review also highlights the pharmacological applications of herbal nano-emulsions in delivering antioxidant, antimicrobial, anti-inflammatory, and anticancer agents with improved therapeutic performance. Safety, scalability, and regulatory considerations of plant extract nano-emulsions are critically analysed to assess their translational potential in pharmaceutical, cosmetic, and nutraceutical industries. Overall, the convergence of nanotechnology and herbal medicine represents a sustainable and green approach to modern drug delivery, offering enhanced efficacy and biocompatibility while minimizing synthetic chemical usage.

Keywords: Nanoemulsion, plant extract, phytochemicals, nanotechnology, drug delivery, bioavailability, green formulation.

FROM DATA TO DRUGS: APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN MODERN PHARMACEUTICAL RESEARCH

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Abstract

Artificial intelligence (AI) is rapidly reshaping pharmaceutical research by enabling data-driven analysis, automation, and predictive modeling across drug discovery and development. Conventional drug discovery processes are time-consuming, expensive, and characterized by high attrition rates, necessitating innovative computational approaches. The integration of artificial intelligence and machine learning techniques allows efficient analysis of large chemical and biological datasets, improving accuracy and reducing experimental burden. Machine learning, a core subset of AI, employs algorithms such as artificial neural networks, support vector machines, decision trees, and deep learning models to extract meaningful patterns from complex data. These algorithms facilitate molecular representation, feature extraction, and predictive modeling of bioactivity, toxicity, and pharmacokinetic properties. AI-driven workflows support the entire drug discovery pipeline, beginning with target identification and virtual screening, followed by preclinical evaluation of drug–target interactions, toxicity, and ADMET properties. Furthermore, AI enhances lead optimization, clinical trial design, and data-driven decision-making, thereby accelerating the translation of candidate molecules toward clinical application. Artificial intelligence also finds broad applications across the pharmaceutical value chain, including drug design, drug repurposing, formulation development, manufacturing optimization, quality assurance, clinical trial management, and pharmacovigilance. These applications improve efficiency, precision, and cost-effectiveness while minimizing failure rates. Importantly, AI serves as a critical bridge between academia and industry by enabling the translation of algorithm-driven academic research into scalable, validated, and regulatory-compliant industrial solutions. In conclusion, AI-driven drug discovery represents a paradigm shift in pharmaceutical research. By integrating machine learning with predictive modeling and translational workflows, artificial intelligence enhances innovation, accelerates development timelines, and strengthens collaboration between academic institutions and the pharmaceutical industry.

Keywords: Artificial Intelligence, Machine Learning, Drug Discovery, Predictive Modeling, Pharmaceutical Research, Academia–Industry Collaboration

SYNERGISTIC PHARMACODYNAMICS OF POLYHERBAL FORMULATIONS WITH STANDARD DRUGS

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Abstract

The use of polyherbal formulations alongside standard pharmacological agents is increasingly common in clinical practice, particularly in the management of chronic disorders. While standard drugs are often designed to act on single or limited molecular targets, polyherbal formulations exert multitarget effects through diverse bioactive constituents. This complementary nature provides a scientific basis for pharmacodynamic synergy, where combined therapy produces enhanced therapeutic outcomes compared to monotherapy.

This review examines the pharmacodynamic mechanisms underlying synergistic interactions between polyherbal formulations and standard drugs. Polyherbal combinations may potentiate drug action by improving receptor sensitivity, modulating intracellular signaling pathways, reducing oxidative stress, and supporting physiological homeostasis, while standard drugs exert targeted and predictable pharmacological effects. Such synergy can result in improved efficacy at lower drug doses, potentially reducing dose-related adverse effects and improving patient compliance.

The review also highlights the importance of distinguishing beneficial pharmacodynamic synergy from undesirable interactions, emphasizing the need for mechanistic evaluation, dose optimization, and rational combination strategies. Understanding the pharmacodynamic basis of polyherbal drug synergy is essential for the development of safer and more effective combination therapies. Overall, evidence-based integration of polyherbal formulations with standard drugs represents a promising approach to optimized pharmacotherapy and warrants further systematic experimental and clinical investigation.

Keywords: Polyherbal formulations, Pharmacodynamic synergy, Combination therapy, Mechanism of action, Rational pharmacotherapy

**MOLECULAR DOCKING AND SYNTHESIS OF 4-ARYL 1-AZANAPHTHALENE
DERIVATIVES AS POTENT CASPASE-1 INHIBITORS FOR ENHANCED ANTI
ACNE THERAPY**

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Abstract

Aim: Acne vulgaris is a chronic inflammatory skin condition in which Caspase-1 acts as a key regulator by converting pro-inflammatory cytokines (IL-1 β / IL-18) into their active forms. Selective inhibition of Caspase-1 can effectively control the inflammatory cascade associated with acne. The present study aimed to evaluate 4-aryl 1-azanaphthalene derivatives as potential anti-acne agents through selective Caspase-1 inhibition using molecular docking studies.

Methodology: Molecular docking studies were performed using AutoDock Vina version 1.1.2. Twenty-five 4-aryl 1-azanaphthalene derivatives were docked into the active site of Caspase-1. Binding interactions were analyzed based on docking scores. A standard nadifloxacin Caspase-1 inhibitor was used as the reference compound.

Results: All twenty-five derivatives exhibited good binding affinity towards the Caspase-1 active site, with docking scores ranging from -5.9 to -6.8 kcal/mol. Several derivatives showed better docking scores compared to the standard nadifloxacin (-6.0 kcal/mol). Among them, compound Q15 showed the highest binding affinity due to its lowest docking score.

Conclusion: The docking results indicate that 4-aryl 1-azanaphthalene derivatives possess promising Caspase-1 inhibitory activity and are feasible candidates for synthesis and further in-vitro evaluation as novel anti-acne agents.

Keywords: Acne vulgaris, Caspase-1, Molecular docking, 4-aryl 1-azanaphthalene, Anti-acne therapy, In-silico study, Cutibacterium acnes.

TRANSDERMAL DRUG DELIVERY SYSTEM

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Abstract

The Transdermal Drug Delivery System (TDDS) is a modern method of administering a drug through the skin into the systemic circulation. It offers an effective alternative to oral and injectable routes of drug administration. In this system, the drug is incorporated into a patch or formulation that is applied to the skin, allowing controlled and continuous drug release over a prolonged period. TDDS helps to avoid problems associated with oral drug delivery, such as gastrointestinal irritation, first-pass metabolism, and fluctuating drug levels in the blood. It improves patient compliance due to its painless, non-invasive nature and ease of use. This system is especially beneficial for drugs with short half-lives and those requiring sustained therapeutic action. A transdermal patch consists of several components, including a drug reservoir, adhesive layer, rate-controlling membrane, and backing layer. When applied to the skin, the drug diffuses across the stratum corneum and enters the bloodstream. The skin acts as a natural barrier; therefore, various techniques such as chemical permeation enhancers, microneedles, iontophoresis, and nanocarriers are used to improve drug penetration. Transdermal patches are widely used in the treatment of pain, hormonal therapy, cardiovascular diseases, and smoking cessation. Overall, the transdermal drug delivery system provides controlled drug release, enhanced safety, and improved therapeutic efficacy, making it a promising approach in modern pharmaceutical drug delivery.

Keywords: Transdermal patch, Controlled drug release, Skin Permeation, Penetration Enhancers, Patient Compliance, Polymer Matrix, Bioavailability.

AI-BASED MOLECULAR MODELLING TOOLS FOR DRUG DEVELOPMENT

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Artificial Intelligence is rapidly transforming molecular modelling in drug development, not by replacing scientists but by amplifying what they can achieve. AI-powered platforms for molecular docking, ADMET prediction, and formulation design now help researchers screen large libraries, predict properties, and refine candidates long before entering the lab, saving both time and resources. Tools such as GEINforce's GenDock and FormulationAI, alongside other global AI platforms, show that these systems are becoming reliable and increasingly validated through experimental feedback, benchmarking, and real-world case studies. Instead of trial-and-error, scientists can use AI as a smart co-pilot to design better molecules and more robust formulations, while still relying on their own judgment, ethics, and clinical understanding. Importantly, AI is creating new roles for people who can combine strong pharmaceutical knowledge with digital and analytical skills, from AI-literate formulation scientists to computational drug discovery specialists. The real opportunity is not to compete with AI, but to learn how to master these tools and work with them. This presentation will highlight how such platforms can be explored, critically evaluated, and responsibly integrated into future-ready drug development

Keywords: Artificial Intelligence, GenDock, FormulationAI, ADMET Prediction, Pharmaceutical Careers, Human–AI Collaboration, Molecular Modelling, Drug Discovery, Structure-Based Design.

HERBAL NEUROTHERAPEUTICS: EVALUATING ANTICONVULSANT EFFICACY IN EXPERIMENTAL ANIMALS

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Abstract

Convulsion is a prevalent neurological disorder characterized by recurrent seizures, often associated with significant side effects and drug resistance from conventional anticonvulsant therapies. Herbal extracts have emerged as promising alternatives due to their neuroprotective, antioxidant, and modulatory effects on neurotransmission. This review summarizes the anticonvulsant potential of various medicinal plants *Bacopa monnieri*, *Withania somnifera*, *Centella asiatica* evaluated in experimental animal models, including Pentyleneetetrazole (PTZ)-induced seizures, Maximal Electroshock Seizures (MES), and kindling models. Studies demonstrate that herbal extracts significantly reduce seizure frequency and duration, increase seizure threshold, and modulate GABAergic and glutamatergic pathways. Mechanisms of action are primarily attributed to enhancement of inhibitory neurotransmission, inhibition of excitatory signaling, ion channel regulation, and antioxidant activity. The findings highlight the therapeutic potential of herbal neurotherapeutics as safer and effective adjuncts or alternatives in anticonvulsant management, warranting further preclinical and clinical studies for standardization and dose optimization.

Keywords: Anticonvulsant, Seizures, Maximal Electroshock Seizures, preclinical, convulsion

ROLE OF THE CLINICAL PHARMACIST IN PREVENTING AND MANAGING CERVICAL CANCER

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Abstract

Introduction: Cervical cancer is the fourth most common cancer worldwide, with an estimated 660,000 new cases and 350 000 deaths. Persistent Human Papillomavirus (HPV) infection is the main cause of cervical cancer. There are six HPV vaccinations on the market and all have been demonstrated to be safe and effective in preventing HPV infection and cervical cancer. They offer protection against the high-risk HPV strains 16 and 18, which are responsible for the majority of cervical malignancies. Clinical pharmacists can play many roles in multidisciplinary healthcare teams to combat cervical cancer, including vaccination, screening, education, cold chain management of vaccines and reporting of adverse drug reactions to chemotherapy as well as adverse events following immunization.

Discussion: Over the years, the pharmacy profession has shown dynamic roles on a global scale. Currently, two HPV vaccines, the bivalent vaccine and the quadrivalent vaccine, are providing protection against high-risk HPV types 16 and 18, which are licensed. However, spontaneous reports, Adverse Event Following Immunization (AEFI) are important to generate signals for vaccine safety monitoring systems.

Conclusion: Clinical Pharmacists can more actively manage disease prevention through collaborative care agreements, boosting public awareness, therapeutic medication management, counseling and vigilant drug safety monitoring.

Keywords: Human Papilloma Virus (HPV), Chemotherapy, Adverse drug reaction (ADR), Adverse event following immunization (AEFI)

**DEVELOPMENT OF AN RP-HPLC METHOD FOR SIMULTANEOUS ESTIMATION
OF REMOGLIFLOZIN, METFORMIN AND TENELIGLIPTIN IN TABLETS
FORMULATION**

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Abstract

A cost-effective and reliable RP-HPLC method was developed and validated for the simultaneous estimation of Remogliflozin, Metformin and Teneligliptin in a pharmaceutical dosage form. Using an ECO-C18 5 μ column with a mobile phase consisting of Phosphate Buffer pH 3.5: ACN (Acetonitrile) 40:60 v/v, analysis was conducted at 222 nm with a flow rate of 1.0 mL/min. The validation method followed ICH guidelines, demonstrating linearity with LOQ values of 4.79 μ g/ml for Remogliflozin, 24.85 μ g/ml for Metformin and 0.56 μ g/ml for Teneligliptin. LOD values were determined as 1.43 μ g/mL for Remogliflozin, 7.53 μ g/ml for Metformin and 0.17 μ g/mL for Teneligliptin, with correlation coefficients of 0.99 for all compounds. %Recovery ranged from 99.73 % to 100.86% for Remogliflozin, 98.59 % to 100.90 % for Metformin and 100.11 to 100.89% for Teneligliptin, while relative standard deviation values for repeatability, interday precision, and intraday precision were all below 2%. The proposed method exhibited specificity, sensitivity, precision, accuracy, and robustness, making it suitable for routine analysis.

Keywords: Validation, Remogliflozin, Metformin, Teneligliptin

HEMORRHOIDAL DISEASE: EVOLVING CONCEPTS IN PATHOPHYSIOLOGY, DIAGNOSIS, AND PHARMACOLOGICAL MANAGEMENT

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Abstract

Hemorrhoidal disease, defined by the symptomatic enlargement and distal displacement of the normal anal cushions, is among the most prevalent and burdensome anorectal disorders worldwide. This comprehensive review consolidates current knowledge on hemorrhoidal disease, with emphasis on its contemporary pathophysiology, clinical classification, diagnostic considerations, and evolving management strategies. Traditional concepts that attributed the disease solely to varicose dilation of veins have been replaced by modern understanding, which highlights the combined roles of increased venous pressure, chronic straining, constipation, and progressive degeneration of the connective tissue supporting the anal cushions. The review underscores the clinical importance of differentiating internal hemorrhoids classified into Grades I–IV based on the degree of prolapse from external hemorrhoids, which differ in anatomical location, innervation, symptomatology, and therapeutic approach. Diagnostic evaluation relies primarily on clinical examination, supplemented by anoscopy when indicated. A broad spectrum of treatment modalities is discussed, ranging from conservative measures such as dietary modification, lifestyle changes, and pharmacological therapy, including oral venotonic agents like flavonoids and calcium dobesilate, to minimally invasive office-based procedures such as rubber band ligation, particularly effective for early-stage disease. This review aims to guide accurate diagnosis and individualized treatment selection, thereby optimizing clinical outcomes and enhancing patient quality of life.

Keywords: Anal cushions, Internal and external hemorrhoids, Clinical classification.

ROLE OF HERBAL MEDICINE AND NUTRACEUTICALS LIKE LICORICE AND ALOE VERA IN THE MANAGEMENT OF PEPTIC ULCER

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Abstract

Peptic ulcer disease continues to be a major gastrointestinal disease in the world, which is mostly related to *Helicobacter pylori* infection, nonsteroidal anti-inflammatory drugs (NSAIDs) usage, stress and eating habits. Although their efficacy has been demonstrated, the prolonged use of the traditional pharmacological treatment is generally limited by the appearance of side effects, drug resistances and recurrence of the symptoms. In this regard, herbal remedies and nutraceuticals are increasingly being considered as adjunct and/or alternative therapeutic modalities. Liquorice (*Glycyrrhiza glabra*) and Aloe vera are among the herbal agents used traditionally for digestive disorders and they have gastro-protective, anti-inflammatory, antioxidant and mucosal repair activities. Liquorice may heal ulcers by increasing mucus production, decreasing gastric juice secretion and stimulating the regeneration of the epithelium. Aloe vera helps in ulcer treatment with its cytoprotective properties and anti-inflammatory effects, as well as due to the promotion of tissue repair. This review emphasizes the contribution of these herbal nutraceuticals in the treatment of peptic ulcer disease by discussing their pharmacological intervention, therapeutic efficacy, and safety profiles. The combination of herbal medicine with contemporary nutraceutical strategies provides an affordable, cleaner, and more environmentally sound solution for ulcer treatment. The results indicate that Liquorice and Aloe vera may have tremendous potential as adjunct agents in peptic ulcer treatment, and hence, further clinical studies should be conducted in order to develop standardized formulations as well as evidence-based utilization.

Keywords: Peptic ulcer, gastrointestinal disease, NSAIDs

NOVEL DRUG APPROACHES: A REVIEW

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Abstract

The development of novel drug approaches has revolutionized modern therapeutics by improving the efficacy, safety, and patient compliance of medications. Traditional drug delivery systems often suffer from limitations such as poor bioavailability, rapid metabolism, and lack of target specificity. To overcome these challenges, novel drug delivery systems (NDDS) have been introduced, encompassing a wide range of advanced technologies such as nanoparticles, liposomes, microspheres, niosomes, dendrimers, and transdermal systems. These innovative systems enable controlled and sustained drug release, site-specific targeting, and protection of active pharmaceutical ingredients from degradation. Furthermore, novel drug approaches facilitate the delivery of drugs across biological barriers like the blood–brain barrier and intestinal mucosa, thereby enhancing therapeutic outcomes. Recent advancements in nanotechnology, polymer science, and biotechnology have further strengthened the potential of NDDS in personalized medicine and precision therapy. These approaches not only minimize adverse effects but also reduce dosing frequency and improve patient adherence. In conclusion, the novel drug approach represents a significant shift from conventional therapy toward more efficient, targeted, and patient-centered drug delivery, promising a new era in pharmaceutical research and development.

Keywords: Novel Drug Delivery System (NDDS), Targeted Drug Delivery, Controlled Release, Nanoparticles, Liposomes, Niosomes, Dendrimers, Transdermal Delivery, Bioavailability, Sustained Release.

ROLE OF ARTIFICIAL INTELLIGENCE IN DRUG DISCOVERY & DEVELOPMENT

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Abstract

Artificial Intelligence (AI) has emerged as a transformative tool in drug discovery and development, addressing the limitations of traditional methods that are time-consuming, costly, and labor-intensive. AI integrates advanced computational techniques such as machine learning, deep learning, and big data analytics to accelerate and optimize various stages of the drug development pipeline. In early drug discovery, AI aids in target identification and validation by analyzing large biological datasets, including genomics and proteomics data. It also enhances lead compound identification through virtual screening and structure-based drug design, significantly reducing the need for extensive laboratory experiments. During preclinical and clinical development, AI models help predict pharmacokinetic and pharmacodynamic properties, drug toxicity, and potential side effects, improving the safety and efficacy profiles of candidate drugs. Additionally, AI supports clinical trial design by enabling patient stratification, predicting trial outcomes, and improving recruitment efficiency. The integration of AI in drug repurposing has further accelerated the identification of new therapeutic uses for existing drugs. AI has the potential to revolutionize drug discovery and development by reducing costs, shortening development timelines, and increasing the success rate of new drugs, thereby contributing to more efficient and personalized healthcare solutions.

Keywords: Artificial Intelligence, Drug Discovery, Drug Development, Machine Learning, Clinical Trials, Pharmaceutical Research

ARTIFICIAL INTELLIGENCE-DRIVEN OPTIMIZATION OF SUSTAINED RELEASE TABLET FORMULATION

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Abstract

The creation of sustained release (SR) tablet formulations necessitates meticulous optimization of various formulation and process parameters to ensure consistent drug release profiles, stability, and patient adherence. Traditional trial-and-error methodologies are both time- consuming and resource-intensive, frequently failing to adequately account for the intricate nonlinear interactions inherent in formulation components. This study investigates the utilization of artificial intelligence (AI) techniques to optimize the formulation of sustained release tablets, thereby improving predictive accuracy in drug release performance. This study employed a machine learning-based modeling methodology to systematically assess crucial formulation parameters, specifically polymer concentration, binder level, compression force, and granule size. Predictive models, designed to estimate essential quality attributes like dissolution rate, hardness, friability and drug content uniformity, were developed using experimental datasets. These datasets were derived from laboratory-scale formulation trials. The models' performance was evaluated through statistical metrics, including the coefficient of determination (R^2), mean absolute error (MAE) and root mean square error (RMSE). The refined AI model exhibited considerable predictive accuracy, successfully pinpointing the ideal formulation parameters that facilitated prolonged drug release within the specified timeframe, all while upholding acceptable mechanical integrity and regulatory quality benchmarks. In contrast to traditional optimization methodologies, the AI-driven strategy substantially diminished the number of experimental iterations, shortened development timelines, and minimized material usage. These results underscore the potential of artificial intelligence as a potent decision-support instrument in the realm of pharmaceutical formulation development, thereby accelerating product optimization, enhancing quality control measures, and facilitating the seamless transition from academic research to industrial-scale manufacturing. This methodology is consistent with the emerging trend of data-driven pharmaceutical development and promotes the integration of digital technologies within the pharmaceutical sector.

Keywords: Artificial Intelligence, Machine Learning, Sustained Release Tablets, Formulation Optimization, Pharmaceutical Technology, Quality by Design.

FORMULATION AND DEVELOPMENT OF DRUG-LOADED CHITOSAN COATED PLGA NANOPARTICLES DRUG DELIVERY SYSTEM

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Abstract

Drug-loaded chitosan-coated PLGA nanoparticles were developed to enhance the solubility and sustained release of the drug up to 24 hrs. The formulation was prepared using celecoxib as an active component, acetone and water as solvents, PVA as a surfactant (copolymer), Chitosan and PLGA as a polymer by using the solvent evaporation method. Particle size and polydispersity index (PDI) analyses results indicated particle sizes of 174.64 nm and a PDI of 0.207, which reflects the homogenous population of particles. The zeta potential of the optimized batch was found to be - 3.4 mV and the optimum entrapment efficiency was found to be 84 % for CS coated CLX-PLGA NPs. FTIR spectroscopy shows that the celecoxib is compatible with other excipients. In DSC study, the melting endothermic peak of celecoxib was not observed in the thermogram of CS coated CLX- PLGA NPs, confirming drug encapsulation. The X-ray diffractogram of CS coated CLX-PLGA NPs showed a decrease in intensity of the peaks which leads to the amorphization of the drug. Field emission scanning electron microscopy (FESEM) micrographs revealed the smooth and spherical morphology for CS coated CLX-PLGA NPs. The *In vitro* drug release study showed the sustained release of the drug up to 24 hours which proved the drug retention for longer duration in the body. Compared with Celecoxib, Formulation exhibited a better pharmacokinetics profile. C_{max} and AUC 0-48hrs of formulation were found to be 1.3946 µg/ml and 39.96 µg.h/ml as compared to pure drug. Pharmacokinetic studies demonstrated that CS coated CLX-PLGA NPs showed more bioavailability in comparison to the conventional dosage form. Stability study showed that the formulation possesses good stability at room temperature. In conclusion, developed drug loaded CS coated CLX-PLGA NPs had improved bioavailability with enhanced retention time and with reduced dose, suggesting their potential delivery system for Rheumatoid Arthritis (RA) treatment as compared to conventional drug delivery system.

Keywords: Celecoxib, Chitosan, PLGA, Nanoparticle

**AG-NPS COATED SILK SUTURE DEVELOPMENT AND CHARACTERIZATION:
AN INNOVATIVE METHOD TO PREVENT SURGICAL SITE INFECTIONS**

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Abstract

Sutures are a crucial component of surgical procedures, serving to close and stabilize wound margins to promote healing. However, microbial contamination of sutures can increase the risk of surgical site infections (SSI) due to colonization by pathogens. This study aimed to tackle SSI by synthesizing silver nanoparticles (Ag-NPs) using the modified nanoprecipitation method and using them to produce antimicrobial sutures. The physiochemical characteristics of Ag-NPs were confirmed by morphology (through TEM) with a particle size of 26.23nm, a PDI of 0.383, and a zeta potential range from 3.34 mV. Drug content and release studies were conducted for Ag-NPcoated silk sutures. Scanning electron microscopy (SEM) was conducted to determine the coating of Ag-NP-coated silk sutures. Antimicrobial activity was studied using five microorganisms (*E. coli*, *P. aeruginosa*, *E. faecalis*, *S. aureus*, and *T. asperellum*) for Ag-NP-coated silk sutures. The cytotoxicity of the Ag-NP-coated silk sutures was investigated using HaCaT for 24 h, which exhibited good cell viability. Finally, this study evaluates the pharmacokinetics of Ag-NP-coated silk sutures in a rat model to determine the pharmacokinetic profile of Ag. Overall, the results indicate that Ag-NP-coated sutures can potentially be used as antimicrobials to diminish or inhibit SSI in postoperative or general surgery patients.

Keywords: Silver nanoparticles coated silk suture, characterization, antimicrobial effect, MTT assay, surgical site infections.

EVALUATION OF NOVEL RENAL BIOMARKERS IN EXPERIMENTAL NEPHROTOXICITY

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Abstract

Nephrotoxicity is a serious side effect linked to several medicinal substances and continues to be a major problem in clinical practice. The need for more sensitive and precise biomarkers is highlighted by the fact that traditional renal function measures like serum creatinine and blood urea nitrogen frequently fail to identify early kidney damage. In an experimental model of drug-induced nephrotoxicity, the current study sought to assess the value of new kidney biomarkers. Wistar albino rats were given a typical dose of a nephrotoxic drug to generate experimental nephrotoxicity. Kidney injury molecule-1 (KIM-1), neutrophil gelatinase-associated lipocalin (NGAL), cystatin-C, and urine N-acetyl- β -D-glucosaminidase (NAG) were among the novel biomarkers used to measure renal function in addition to more conventional biomarkers such as serum creatinine and urea. To corroborate biomarker results, oxidative stress measures and kidney tissue histopathology analysis were also carried out. When compared to traditional indicators, the results showed a considerable increase in new renal biomarkers at an early stage of nephrotoxicity. High sensitivity was demonstrated by KIM-1 and NGAL in identifying tubular damage before significant changes in serum creatinine levels. Renal tubular deterioration and inflammation were confirmed by histopathological results, which showed a strong correlation with changes in biomarkers.

Keywords: Nephrotoxicity, Novel renal biomarkers, KIM-1, NGAL, Experimental study, Kidney injury

AI-DRIVEN STRATEGIES FOR INNOVATIVE NASAL DRUG DELIVERY IN CHRONIC RHINOSINUSITIS

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Abstract

Chronic rhinosinusitis with nasal polyps is a persistent inflammatory disorder of the nasal and sinus mucosa, leading to nasal obstruction, loss of smell, recurrent infections, and a substantial reduction in quality of life. Conventional therapies, including corticosteroids, biologics, and surgical interventions, often provide only temporary or partial relief, emphasizing the urgent need for more targeted, effective, and patient-friendly treatment strategies. Innovative nasal drug delivery systems offer a promising solution, and the integration of artificial intelligence (AI) brings unprecedented opportunities to enhance their design and performance. AI can predict drug-polymer interactions, optimize formulation parameters such as viscosity, mucoadhesion, and mucosal deposition, and simulate clinical performance, enabling precise targeting and improved retention of therapeutic agents in the nasal cavity. By reducing trial-and-error experimentation and accelerating formulation optimization, AI-guided approaches facilitate the development of highly efficient, patient-centered therapies. The application of these advanced computational strategies in nasal drug delivery for chronic rhinosinusitis represents a forward-looking approach that combines technological innovation with practical therapeutic impact, offering the potential for personalized, effective, and commercially viable solutions, ultimately transforming the management of chronic nasal inflammatory conditions and improving patient outcomes worldwide.

Keywords: chronic rhinosinusitis, nasal drug delivery, artificial intelligence, mucoadhesion, drug targeting

HARNESSING NANOCARRIERS FOR SITE-DIRECTED THERAPEUTIC DELIVERY

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Abstract

Nanocarrier-based site-specific drug delivery systems have emerged as a groundbreaking approach in pharmaceutical research by overcoming the long-standing challenges of nonspecific drug distribution, systemic toxicity, and suboptimal therapeutic efficacy associated with conventional drug administration. This abstract highlights the integration of advanced nanocarrier platforms—such as liposomes, dendrimers, solid lipid nanoparticles, polymeric nanoparticles, and nanocrystal-lipid hybrid system—with intelligent computational technologies for precision therapy and for improved solubilization and bioavailability. Artificial Intelligence (AI) and Machine Learning (ML) are emerging as transformative tools for optimizing nano-vehicle design, formulation design parameters, and bio-interactions. AI-driven predictive modeling enables accurate estimation of parameters such as particle integrity, drug entrapment efficiency, and pharmacokinetic profiles, while ML algorithms facilitate the analysis of large-scale biological datasets to guide tailored surface modifications and receptor-mediated delivery strategies. The convergence of nanotechnology with intelligent innovation and cutting-edge breakthroughs fosters faster formulation development, reduced experimental trial cycles, and enhanced translational potential for personalized therapeutics. This study underscores the role of AI-guided nanocarriers as the next frontier in drug delivery research, marking a pivotal step toward intelligent, adaptive, and customized pharmaceutical systems for patient-specific treatment or an individualized drug delivery system.

Keywords: Nanocarriers, Site-Specific Delivery, Artificial Intelligence, Machine Learning, Personalized Medicine

TRANSFORMING CLINICAL RESEARCH WITH AI

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Abstract

Background: Traditional clinical trials face systemic inefficiencies, including recruitment delays affecting 80% of studies and escalating R&D costs exceeding \$ 200 billion annually. By 2026, AI will no longer be optional but a strategic imperative to address these challenges.

Key Objectives & Applications: Trial Design & Execution: AI -driven protocol automation is accelerating study startup by digitizing paper-based records and using historical data to write new protocols. Predictive models now simulate millions of chemical compounds, shortening lead development time by up to 70%.

Patient Recruitment: Advanced Natural Language Processing (NLP) tools analyze electronic health records (EHRs) to match eligible participants with 78% accuracy, improving enrollment rates by 65% and reducing screening time by up to 94%.

Continuous Monitoring: The integration of AI with clinical -grade wearables enables real -time health surveillance through digital biomarkers. These systems achieve 90% sensitivity in adverse event detection, a significant increase over traditional periodic clinic visits.

Outcomes & Benefits: Integrated AI systems have been proven to accelerate trial timelines by 30 –50% and reduce overall costs by up to 40%. Furthermore, "Agentic AI" has emerged in 2026, moving beyond simple prediction to autonomously executing complex, multi -step administrative and regulatory tasks.

Challenges & Ethical Considerations: Despite these gains, significant barriers remain, including algorithmic bias in non -representative datasets and the "black box" nature of complex models. In 2026, regulatory frameworks like the EU AI Act mandate transparency and human -in-the-loop oversight, emphasizing that AI must augment, rather than replace, clinical judgment.

Conclusion: AI represents a transformative force in clinical research, driving a shift toward more efficient, patient -centric, and decentralized trials. Success in 2026 depends on robust data governance and the responsible scaling of these technologies within validated ethical frameworks.

Keywords: AI, clinical research, patient -centric

ROLE OF FUNCTIONAL FOODS IN DIABETES MANAGEMENT

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Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by impaired glucose homeostasis and long-term complications affecting multiple organ systems. In recent years, functional foods have gained attention for their potential role in diabetes management due to their health-promoting properties beyond basic nutrition. Functional foods such as whole grains, legumes, fruits, vegetables, probiotics, and foods rich in dietary fiber, antioxidants, and bioactive compounds have been shown to improve glycemic control, enhance insulin sensitivity, and reduce inflammation and oxidative stress. Bioactive components, including polyphenols, omega-3 fatty acids, and plant sterols, contribute to the regulation of carbohydrate metabolism and lipid profiles. Regular consumption of functional foods may help in preventing the progression of diabetes and reducing the risk of associated complications. This review emphasizes the role of functional foods as an effective dietary strategy for diabetes management and highlights their potential as complementary interventions alongside conventional therapies.

Keywords: polyphenols, omega-3 fatty acids, flavonoids, probiotics, antioxidants.

PRECLINICAL EVIDENCE FOR THE POTENTIAL OF AGMATINE IN THE TREATMENT OF POLYCYSTIC OVARIAN SYNDROME IN RATS

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Abstract

Introduction: PCOS is a multifactorial disorder marked by reproductive, endocrine, and metabolic abnormalities. The present study investigated the therapeutic efficacy and underlying pharmacological mechanisms of agmatine in PCOS rats.

Method: Neonatal female rats were administered monosodium L-glutamate (MSG) subcutaneously at a dose of 4 g/kg from PND 2 to PND 10 to induce PCOS. MSG is used as a food additive and serves as a neurotoxin, which shows significant lesions, nearly 90%, in the hypothalamic ARC and neighbouring areas, resulting in dysregulated GnRH. Following the establishment of the PCOS phenotype, rats were treated with varying doses (20–80 mg/kg, i.p.) of agmatine for two weeks.

Result: MSG-induced PCOS was characterized by delayed onset of puberty, irregular estrous cyclicity, increased body weight, disrupted serum sex hormone levels, that is, elevated LH, AMH, and testosterone, and histological evidence of cystic ovarian morphology. The treatment with agmatine significantly ameliorated these pathophysiological alterations. Specifically, it restored estrous cyclicity and normalized hormonal profiles, including reductions in LH, AMH, testosterone, and lipid levels, alongside an increase in FSH and estradiol concentrations. Histopathological analyses revealed substantial restoration of follicular development and reduction in cyst formation within the ovaries. Furthermore, the agmatine effectively improved behavioral abnormalities commonly associated with PCOS.

Conclusion: These findings suggest that the agmatine exerts significant therapeutic effects in MSG-induced PCOS by restoring endocrine balance, improving metabolic parameters, and enhancing ovarian morphology and function.

Keywords: polycystic ovarian syndrome, monosodium L-glutamate, agmatine, neurotoxin, follicles

ARTIFICIAL INTELLIGENCE-DRIVEN GREEN NANOMEDICINE: INNOVATIVE METALLIC NANOPARTICLES FOR PERIODONTITIS THERAPY

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Abstract

Periodontitis, a chronic inflammatory disease affecting the supporting structures of teeth, remains a global oral health challenge due to microbial resistance and limited regenerative options. Recent advances in green synthesis of metallic nanoparticles offer a sustainable and biocompatible approach to target pathogenic biofilms while promoting tissue regeneration. Leveraging Artificial Intelligence (AI), researchers can now optimize nanoparticle design, predict therapeutic efficacy, and personalize treatment strategies, bridging the gap between laboratory innovation and clinical application. The integration of eco-friendly nanotechnology with AI-driven pharmaceutical development, emphasizing metallic nanoparticles such as silver, gold, and zinc oxide, is synthesized via plant-mediated routes. AI models can analyze vast data sets from preclinical studies, aiding in dose optimization, toxicity prediction and delivery system design, ultimately accelerating translational research. The convergence of green nanomedicine and AI represents a paradigm shift in periodontitis therapy, offering precise, sustainable and effective solutions. This approach not only aligns with the principles of future pharma, focusing on innovation, safety and environmental responsibility, but also provides a roadmap for integrating computational tools in drug discovery and patient-specific periodontal care.

Keywords: artificial intelligence, periodontitis, green nanomedicine, metallic nanoparticles, periodontal therapy

DEVELOPMENT OF AN HERBAL PIPERINE-LOADED NANOGEL FOR TOPICAL ANTIFUNGAL APPLICATIONS

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Abstract

Introduction: Fungal skin infections are common dermatological conditions that require prolonged topical therapy. Piperine, a bioactive alkaloid obtained from *Piper nigrum*, possesses significant antifungal, anti-inflammatory, and penetration-enhancing properties. However, its topical application is limited due to poor aqueous solubility, low skin permeability, and instability. Nanogel-based drug delivery systems offer a promising approach to overcome these limitations by enhancing skin penetration and providing controlled drug release.

Aim: The present study aims to develop and evaluate a piperine-loaded nanogel for enhanced topical antifungal activity.

Materials and Methods: Piperine-loaded nanogels were prepared using suitable polymers such as chitosan/Carbopol through techniques like ionic gelation or emulsion-based methods. The formulation was optimized and characterized for particle size, polydispersity index, zeta potential, drug entrapment efficiency, and morphology using dynamic light scattering and electron microscopy. Physicochemical compatibility between piperine and polymers was evaluated using FTIR and DSC. The optimized nanogel was incorporated into a topical gel base and evaluated for pH, viscosity, spreadability, in-vitro drug release, and ex-vivo skin permeation studies.

Results: The developed piperine-loaded nanogel exhibited a nanoscale particle size, high drug entrapment efficiency, and sustained drug release behaviour. Ex-vivo studies demonstrated enhanced skin permeation and retention of piperine compared to conventional gel formulations. In-vitro antifungal studies against *Candida albicans* and *Aspergillus* species showed significantly improved antifungal activity. Skin irritation studies indicated good biocompatibility and safety.

Conclusion: Piperine-loaded nanogel represents a promising, safe, and effective topical delivery system for antifungal therapy, offering improved skin penetration, prolonged drug release, and enhanced therapeutic efficacy.

Keywords: Piperine, Nanogel, Antifungal activity, Topical drug delivery, Skin permeation

OPTIMIZING ANTIBIOTIC STEWARDSHIP USING MACHINE LEARNING

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Antibiotic resistance is a major global health challenge mainly caused by the inappropriate and excessive use of antibiotics. Antibiotic stewardship programs aim to promote the rational use of antibiotics; however, their effectiveness is often limited by delayed laboratory results, increasing clinical data complexity, and uncertainty in early decision-making. Machine learning (ML), a key application of artificial intelligence, provides a data-driven approach to optimizing antibiotic stewardship practices. ML systems can analyze large volumes of healthcare data, including patient demographics, clinical symptoms, laboratory investigations, culture and sensitivity reports, and local antimicrobial resistance patterns. Based on this analysis, ML models assist healthcare professionals in selecting appropriate antibiotics, optimizing dosage, and determining the correct duration of therapy. In real-life hospital settings, particularly in intensive care units, ML-based tools have been used to predict bacterial infections at an early stage, enabling the timely initiation of targeted therapy and reducing unnecessary use of broad-spectrum antibiotics. These applications contribute to reduced antimicrobial resistance, improved patient outcomes, and decreased healthcare costs. The integration of machine learning into antibiotic stewardship programs represents a promising advancement in clinical pharmacy practice and supports safer and more effective antibiotic use.

Keywords: Machine Learning, Antibiotic Stewardship, Antimicrobial Resistance, Artificial Intelligence, Clinical Pharmacy.

BEMPEDOIC ACID: AN EMERGING NON-STATIN STRATEGY FOR CARDIOVASCULAR RISK REDUCTION

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Abstract

Background: A significant proportion of patients are unable to tolerate statins or fail to achieve optimal low-density lipoprotein cholesterol (LDL-C) targets with statin therapy alone. Therefore, additional lipid-lowering strategies are required to reduce the risk of atherosclerotic cardiovascular disease (ASCVD), particularly in high-risk populations.

Methodology: This review evaluates the mechanism of action, chemical characteristics, pharmacological profile, safety, and therapeutic efficacy of bempedoic acid (BA), along with its clinical relevance. A structured literature search of PubMed, Google Scholar, and Web of Science was conducted to identify studies published between 2007 and 2025.

Results: Evidence indicates that BA is a selective ATP citrate lyase (ACL) inhibitor that reduces hepatic cholesterol synthesis, leading to significant LDL-C lowering. As a prodrug activated primarily in the liver by very-long-chain acyl-CoA synthetase 1 (ACSVL1), BA minimizes skeletal muscle exposure, reducing the risk of statin-associated myopathy. Clinical trials show consistent lipid-lowering efficacy, especially in statin-intolerant individuals. The CLEAR Outcomes trial (n=13,970) demonstrated a 21% reduction in LDL-C and a 13% reduction in major adverse cardiovascular events (MACE).

Conclusion: Bempedoic acid offers effective LDL-C reduction with a favorable safety profile and proven cardiovascular benefit, supporting its role as an important adjunct or alternative therapy in ASCVD risk management.

Keywords: Bempedoic acid, Cholesterol, ASCVD, Statin, Lipoprotein

INTEGRATING ARTIFICIAL INTELLIGENCE IN NATURAL PRODUCTS

RESEARCH: NEW FRONTIERS IN PHARMACOGNOSY

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Abstract

Natural products remain a vital source of therapeutic agents, yet their development is often limited by chemical complexity, variability, and time-intensive experimentation. Recent advances in artificial intelligence (AI) offer powerful tools to accelerate plant-based drug discovery and formulation development. Machine learning and deep learning techniques are increasingly applied to metabolomic data, spectral analysis (LC–MS and NMR), and structure–activity relationship modeling to predict bioactive phytoconstituents and optimize extract standardization. This oral presentation focuses on the integration of AI in pharmacognosy with emphasis on plant-derived formulations. AI-assisted modeling enables prediction of drug release behavior, stability, and quality attributes, supporting rational formulation design and Quality by Design (QbD) approaches. The application of AI also aids in reducing batch-to-batch variability and improving the reproducibility of herbal products. Challenges related to data quality, interpretability, and regulatory acceptance are briefly discussed. By combining traditional plant knowledge with AI-driven analytics, pharmacognosy can evolve into a more predictive, efficient, and translational discipline for modern pharmaceutical development.

Keywords: Artificial intelligence, Pharmacognosy, Natural products, Plant-based formulations, Machine learning

ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING PHARMACEUTICAL SCIENCES

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Abstract

Artificial Intelligence (AI) focuses on the development of intelligent models capable of acquiring knowledge, solving complex problems, and supporting decision-making processes. In recent years, AI has emerged as a transformative technology in various domains of pharmacy, including drug discovery, drug delivery and formulation development, polypharmacology, and hospital pharmacy services. In drug discovery and formulation development, advanced Artificial Neural Networks (ANNs), such as Deep Neural Networks (DNNs) and Recurrent Neural Networks (RNNs), are increasingly employed to analyze complex datasets and predict drug behavior. Several AI-based implementations in drug discovery have demonstrated the effectiveness of these techniques in quantitative structure–property relationship (QSPR) and quantitative structure–activity relationship (QSAR) studies. Furthermore, AI-driven *de novo* drug design has facilitated the generation of novel drug molecules with optimized physicochemical and pharmacological properties. Beyond drug discovery, AI plays a significant role in polypharmacology by predicting multi-target drug interactions and enhancing hospital pharmacy practice through improved medication management, clinical decision support systems, and patient safety measures. This review highlights the current applications and future potential of artificial intelligence in pharmacy, with particular emphasis on drug discovery, drug delivery formulation development, polypharmacology, and hospital pharmacy practice.

Keywords: Artificial Intelligence, Pharmacy, Drug Discovery, Drug Delivery Systems, QSAR, QSPR, Polypharmacology, Hospital Pharmacy

PREDICTIVE TOXICOLOGY USING AI: ENHANCING SAFETY IN PRECLINICAL STUDIES

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ABSTRACT

Unintended toxicity is a significant bottleneck in pharmaceutical development, which has led to almost 30 - 40 percent of preclinical drug failures and a host of post-marketing withdrawals. Traditional approaches to toxicity testing have been based on the use of animal models, which are expensive, time-consuming, ethically limited and may not be sufficient to predict adverse effects unique to humans. The latter are now being mitigated by artificial intelligence (AI) based predictive toxicology, which allows early, data-driven safety evaluation. This paper is a critical review of recent developments in AI-based computational toxicology, such as machine learning (ML), deep learning and graph-based models to make predictions of major toxicity endpoints, including hepatotoxicity, cardiotoxicity (hERG inhibition), genotoxicity, carcinogenicity and acute toxicity. Recent ADMET predictive models have incorporated chemical structure, physicochemical properties, biological interaction networks and multi-omics data and can predict traditional in vivo assays. More so, mechanistic understanding, translational applicability and compliance with the 3Rs principle can be improved through the incorporation of AI with high-throughput in vitro screening, organ-on-chip technologies and physiologically based pharmacokinetic modeling. Nonetheless, in spite of the issues regarding the quality of data, interpretability and regulatory approval, AI-enabler predictive toxicology is a potential paradigm shift to a safer, more effective preclinical drug development.

Keywords: Predictive toxicology, Artificial intelligence, Machine learning, ADMET, Preclinical safety

CARCINOGENS UNCOVERED: HOW ENVIRONMENTAL AND BIOLOGICAL AGENTS DRIVE CANCER

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Abstract:

Carcinogens are physical, chemical or biological agents that induce genetic and epigenetic alterations in normal cells, which lead to the formation of tumours. Carcinogens and their modes of action are important from a public health perspective, since cancer continues to be a leading cause of global morbidity and mortality. There are three primary kinds of carcinogens. Chemical carcinogens include tobacco, polycyclic aromatic hydrocarbons (PAHs), nitrosamines, heavy metals and mycotoxins in tobacco smoke, industrial settings, polluted air and food. Physical carcinogens are ultraviolet and ionizing radiation, which cause DNA damage by inducing breaks and reactive oxygen species. Bio-carcinogens – including viruses, bacteria and parasites (red dots), contribute to cancer by chronic inflammation promotion of tumor microenvironment induction, changes in host genome, release classic oncogene into host genome. At the molecular level, carcinogens cause DNA mutations, chromosomal aberrations epigenetic changes and perturb pathways regulating cell growth, apoptosis and DNA damage response. Carcinogenesis is a process with initiation, promotion and progression stages, which depends on the level and time of exposure, and susceptibility of genetic factors has combined risk flaunt. Carcinogenic exposure is increased by various lifestyle factors such as use of tobacco, intake of alcohol, diet and air pollution. Bodies like the IARC categorise carcinogens by evidence. Proper risk evaluation, regulation, and public health strategies are strongly needed for reducing exposure and to promote the prevention of cancer, early diagnosis, and better therapy.

Keywords: Carcinogens, Carcinogenesis, Chemical carcinogens, Physical carcinogens, biological carcinogens, DNA damage, Cancer prevention.

POLYMERIC NANOPARTICULATE DRUG DELIVERY SYSTEM: A PROMISING APPROACH FOR THE MANAGEMENT OF DIABETES MELLITUS

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Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Conventional antidiabetic therapies often face limitations such as poor bioavailability, frequent dosing, systemic side effects, and inadequate patient compliance. In recent years, polymeric nanoparticulate drug delivery systems (PNDDS) have emerged as a promising strategy to overcome these challenges and enhance the therapeutic efficacy of antidiabetic agents. These nanoscale carriers, prepared from biodegradable and biocompatible polymers such as chitosan, PLGA, alginate, and Eudragit, offer controlled and targeted drug release, improved stability, and protection of labile drugs from enzymatic degradation.

Polymeric nanoparticles facilitate improved oral absorption, enhanced permeability across biological membranes, and prolonged circulation time, thereby reducing dosing frequency and minimizing adverse effects. They also enable site-specific delivery to pancreatic tissues or glucose-responsive release, which improves glycaemic control. Additionally, nanoparticle-based systems can encapsulate both insulin and oral hypoglycaemic drugs, making them suitable for multiple therapeutic approaches.

Overall, polymeric nanoparticulate drug delivery systems represent a novel and effective platform for diabetes management. Continued research and clinical translation of these systems may lead to safer, more efficient, and patient-friendly antidiabetic therapies, offering significant potential for improving long-term diabetes care.

Keywords: Polymeric nanoparticle, Nanotechnology, Ion gelation method, Polymer, Diabetic Mellitus

FORMULATION, CHARACTERIZATION, AND ANTIFUNGAL EVALUATION OF HERBAL CREAM

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Abstract

Fungal infections of the skin very common and effect of all age These infections are mainly caused by fungi such as Candida and Aspergillus species and are commonly seen due to poor hygiene, humid climate, and weak immunity. Although many synthetic antifungal creams are available in the market, their long-term use may lead to side effects such as skin irritation, redness, and development of resistance. Because of these problems. herbal formulations are gaining importance as they are safer, economical, and well accepted by patients.

The present study focuses on the formulation and evaluation of herbal cream prepared using selected medicinal plant extracts known for their antifungal activity. Herbal ingredients such as neem, turmeric, aloe vera, and other plant extracts were selected due to their traditional use and proven antifungal properties. The herbal cream was prepared using a suitable cream base by incorporating the plant extracts in appropriate concentrations. The prepared formulation was evaluated for various physicochemical parameters including appearance, pH, viscosity, spread ability, homogeneity, and stability to ensure product quality and safety.

Further, the antifungal activity of the formulated herbal cream was evaluated using standard in-vitro methods against selected fungal strains. The results showed that the herbal cream possessed satisfactory physical characteristics and exhibited good antifungal activity when compared with standard formulations. The study concludes that herbal cream can be an effective and safe alternative to synthetic antifungal creams for the management of fungal skin infections.

Keywords: Herbal cream formulation, Antifungal activity, Medicinal plant extracts, Topical drug delivery, Fungal skin infections

INTEGRATING ARTIFICIAL INTELLIGENCE IN NATURAL PRODUCTS

RESEARCH: NEW FRONTIERS IN PHARMACOGNOSY

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Abstract

Natural products remain a vital source of therapeutic agents, yet their development is often limited by chemical complexity, variability, and time-intensive experimentation. Recent advances in artificial intelligence (AI) offer powerful tools to accelerate plant-based drug discovery and formulation development. Machine learning and deep learning techniques are increasingly applied to metabolomic data, spectral analysis (LC–MS and NMR), and structure–activity relationship modeling to predict bioactive phytoconstituents and optimize extract standardization. This oral presentation focuses on the integration of AI in pharmacognosy with emphasis on plant-derived formulations. AI-assisted modeling enables prediction of drug release behavior, stability, and quality attributes, supporting rational formulation design and Quality by Design (QbD) approaches. The application of AI also aids in reducing batch-to-batch variability and improving the reproducibility of herbal products. Challenges related to data quality, interpretability, and regulatory acceptance are briefly discussed. By combining traditional plant knowledge with AI-driven analytics, pharmacognosy can evolve into a more predictive, efficient, and translational discipline for modern pharmaceutical development.

Keywords: Artificial intelligence, Pharmacognosy, Natural products, Plant-based formulations, Machine learning

SAFETY CONCERNS WITH RADIO-CONTRAST AGENTS: A COMPREHENSIVE OVERVIEW

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Abstract

Objective: To provide a comprehensive narrative review on the safety concerns associated with both iodinated and gadolinium-based contrast agents, including adverse reactions, nephrotoxicity, hypersensitivity, and preventive strategies. **Background:** Contrast agents are essential in diagnostic imaging, but their use may be associated with mild to severe adverse events, including contrast-induced nephropathy (CIN) and nephrogenic systemic fibrosis (NSF). **Methods:** A review of randomized trials, observational studies, meta-analyses, and guideline publications (2020–2025) was conducted, focusing on comparative safety, risk factors, and preventive measures. **Results:** Modern iodinated agents (LOCM, IOCM) and macrocyclic gadolinium agents demonstrate reduced incidence of severe adverse reactions. Patient-related risk factors, agent selection, hydration, and adherence to guideline-based protocols remain central to minimizing complications. **Conclusion:** A structured approach to patient assessment, agent selection, and risk mitigation enhances the safety profile of contrast media in clinical practice.

Keywords: Iodinated contrast agents; Gadolinium-based contrast agents; Contrast-induced nephropathy; Nephrogenic systemic fibrosis; Hypersensitivity; Pharmacovigilance; Tertiary care

ANTIOXIDANT ACTIVITY OF POLYHERBS USED IN AN ANTI-AGING CREAM

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Skin ageing is primarily influenced by oxidative stress resulting from excessive free radical generation, which causes cellular damage and disrupts normal skin function. Naturally sourced antioxidants have gained increasing attention in cosmetic formulations in recent years due to their favourable safety profile, biocompatibility, and multifunctional properties. The present study was designed to evaluate the antioxidant potential of selected polyherbal extracts proposed for incorporation into an anti-aging cream. *Punica granatum* (Pomegranate), *Curcuma longa* (Turmeric), *Rosa indica* (Rose), *Crocus sativus* (Saffron), *Selenicereus undatus* (Dragon fruit) were among the botanical extracts examined after authentication. The 2,2- diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging experiment was used to evaluate antioxidant potential and UV visible spectrophotometry was used to determine absorbance. To measure each extract's ability to scavenge free radicals, percentage inhibition was computed. The findings showed that all of the chosen herbal extracts had significant antioxidant activity and varied degrees of DPPH radical inhibition, suggesting that they were successful in scavenging free radicals. Bioactive phytoconstituents, including polyphenols, flavonoids, and related substances, may be responsible for this activity. According to the results, these polyherbal extracts have a great deal of antioxidant activity and can be used in anti ageing cosmetic compositions. The creation of natural, antioxidant-based skincare products targeted at reducing oxidative skin damage and early ageing is scientifically validated by this in vitro assessment. Additionally, these products have the potential to improve overall skin health and appearance.

Keywords: Polyherbal extracts, Antioxidant activity, Anti-ageing, Free radical scavenging, DPPH assay

ADVANCED INSIGHTS IN TRANSDERMAL DRUG DELIVERY SYSTEM

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Abstract

Transdermal Drug Delivery Systems (TDDS) have undergone a paradigm shift, transitioning from simple passive diffusion patches to sophisticated, "intelligent" platforms designed to bypass the body's most formidable bouncer: the skin. This study explores the recent technological and pharmacological advancements redefining the efficiency of systemic drug administration via the dermal route. While traditional TDDS offered the benefits of avoiding first-pass metabolism and improving patient compliance, they were historically limited to small, lipophilic molecules capable of traversing the stratum corneum. Recent insights highlight a multi-pronged approach to overcoming these molecular weight and polarity constraints. We examine the rise of physical enhancement techniques, such as microneedle arrays, sonophoresis, and electroporation, which create transient micro-conduits for large-molecule delivery, including proteins and vaccines. Simultaneously, the integration of nanotechnology, specifically ethosomes, transferosomes, and solid lipid nanoparticles, has demonstrated superior skin penetration and controlled release profiles compared to conventional vehicles. Furthermore, the "advance" in these systems lies in stimuli-responsive patches that utilize 3D printing for personalized dosing and integrated biosensors for real-time monitoring. These "smart" systems allow for precise, on-demand drug release triggered by internal physiological cues or external stimuli like heat or light. By synthesizing current research on pharmacokinetic modeling and biomaterial innovation, this study underscores the potential of TDDS to provide a painless, effective alternative to parenteral routes. Ultimately, the fusion of material science and digital health is positioning transdermal platforms as a cornerstone of next-generation personalized therapeutics, promising a future where the "needle-and-syringe" model becomes increasingly obsolete.

Keywords: TDDS, Microneedles, Nanocarriers, Stratum Corneum, Stimuli-responsive, Pharmacokinetics.

LIPOSOMAL GEL-BASED TRANSDERMAL PATCH OF VOLATILE HERBAL ANALGESIC OILS FOR L5-S1 VERTEBRAL DISC DISORDERS

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Abstract

Background: L5-SI vertebral disc disorders are a leading cause of chronic low back pain, often requiring prolonged pharmacological therapy. Conventional oral analgesics can produce systemic side effects, while topical herbal remedies suffer from poor skin penetration and rapid volatilization. Nanocarrier systems such as liposomes offer a strategy to enhance dermal delivery and sustain therapeutic action.

Methods: Volatile herbal oils (menthol, camphor, eucalyptus) were encapsulated into liposomes prepared by thin-film hydration followed by sonication. The liposomal dispersion was incorporated into a carbopol-based gel, optimized for viscosity, spreadability, and stability. Physicochemical characterization included particle size analysis, zeta potential, encapsulation efficiency, and release kinetics. Ex vivo permeation studies were conducted using porcine skin, while in vitro assays assessed anti-inflammatory and analgesic activity

Results: The optimized liposomal gel exhibited nanosized vesicles with uniform distribution and high encapsulation efficiency. Stability studies confirmed minimal volatilization of oils. Ex vivo permeation demonstrated significantly enhanced transdermal flux compared to conventional gels, attributed to liposomal penetration enhancement. In vitro assays showed marked inhibition of prostaglandin synthesis and improved analgesic response in nociception models. The transdermal patch provided sustained release over 12-24 hours, reducing dosing frequency.

Conclusion: The liposomal gel-based transdermal patch effectively stabilized volatile herbal oils, enhanced dermal penetration, and provided prolonged analgesic activity. This formulation represents a promising alternative for non-invasive management of lumbar disc pain, warranting further clinical evaluation for safety and efficacy in chronic L5-S1 disorders.

Keywords: L5-SI vertebral disc disorders, conventional oral analgesics, volatile herbal oils

FORMULATION AND EVALUATION OF SILVER NANOPARTICLES LOADED WITH SWERTIA CHIRAYITA EXTRACT FOR ITS ANTI - DIABETIC ACTIVITY

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Abstract

Swertia chirayita is a well-known medicinal plant traditionally used in the management of diabetes mellitus due to its rich content of bioactive phytoconstituents. However, the therapeutic efficacy of its extract is often restricted by poor solubility, limited stability, and low bioavailability. The present study aimed to formulate and evaluate silver nanoparticles (AgNPs) loaded with *Swertia chirayita* extract as a novel antidiabetic nano-delivery system. Silver nanoparticles were synthesized using the plant extract as a green reducing and capping agent, ensuring biocompatibility and enhanced phytochemical retention. The formation of AgNPs was confirmed by ultraviolet–visible spectroscopy, while particle size and morphology were analyzed using transmission electron microscopy, revealing uniformly distributed, spherical nanoparticles in the nanometer range. Additional characterization studies indicated favorable surface properties and successful incorporation of phytoconstituents within the nanoparticle matrix. In vitro release studies demonstrated a sustained and controlled release of the encapsulated extract compared to the conventional extract. The antidiabetic potential of the formulated nanoparticles was evaluated through in vitro enzyme inhibition assays, showing enhanced inhibitory activity against key carbohydrate-metabolizing enzymes when compared to the crude extract. Overall, *Swertia chirayita*-loaded silver nanoparticles exhibited improved physicochemical characteristics and superior antidiabetic activity, highlighting their potential as an effective nano-based therapeutic approach for diabetes management.

Keywords: Swertia chirayita, Diabetes, Silver nanoparticles, Nanotechnology, Antidiabetic agents

SKILL GAP IN AI FOR PHARMA: ACADEMIC CURRICULUM VS INDUSTRY EXPECTATIONS

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Abstract

Artificial intelligence is reshaping the pharmaceutical sector, with growing impact across drug discovery, clinical development, manufacturing, and post-marketing activities. As these applications mature, the need for a workforce capable of translating AI methods into practice has become increasingly evident. From an academic standpoint, however, a persistent gap remains between AI education and the pharmaceutical industry's expectations. This poster examines the skill gap by contrasting current scholarly approaches to AI training with the competencies required in industry settings. While academic curricula typically emphasize theoretical foundations and model development, industry roles place greater value on applied problem-solving, handling of real-world pharmaceutical data, regulatory awareness, and collaboration across scientific and technical domains. These differences often challenge graduates as they transition from academic environments to industry roles. The poster argues that bridging this gap requires closer and sustained engagement between academia and industry. Integrating applied case studies, industry-relevant tools, regulatory context, and experiential learning into academic programs can better prepare students for AI-driven careers in pharma. Aligning educational outcomes with practical needs is essential to ensuring that AI innovation in pharmaceutical science is both effective and sustainable.

Keywords: Artificial intelligence, pharmaceutical sector, drug discovery, clinical development

AI-ENABLED FORMULATION OPTIMIZATION BRIDGING PHARMACEUTICAL RESEARCH AND INDUSTRIAL TRANSLATION

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Abstract

Pharmaceutical formulation development is traditionally driven by iterative experimentation, requiring extensive time, material consumption, and expert intuition. Despite advances in experimental design, a significant gap remains between academic formulation research and its successful industrial translation. Artificial intelligence (AI) offers a data-driven approach to address this challenge by enhancing formulation optimization and decision-making processes. In this work, AI-based modeling tools were integrated with experimental formulation data to optimize critical quality attributes such as particle size, polydispersity index, stability, and drug loading efficiency. Machine learning algorithms were employed to identify complex, non-linear relationships between formulation variables, including oil phase composition, surfactant–cosurfactant ratios, and processing parameters. The optimized formulations demonstrated improved physicochemical stability and reproducibility compared to conventionally developed systems. The AI-enabled approach reduced experimental trials while improving prediction accuracy, thereby accelerating formulation development timelines. Importantly, the methodology emphasizes scalability, robustness, and regulatory relevance, making it suitable for industrial applications. This study highlights how AI can act as a translational bridge between academic research and pharmaceutical manufacturing by converting experimental data into actionable formulation strategies. The findings support the growing role of artificial intelligence as a practical tool for efficient, scalable, and industry-ready pharmaceutical formulation development.

Keywords: Artificial Intelligence, Pharmaceutical Formulation, Machine Learning, Formulation Optimization, Translational Research, Industry-Academia Interface

A REVIEW ON NEUROPROTECTIVE ACTIVITY OF POLYHERBAL EXTRACTS

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Neurodegenerative disorders such as Alzheimer's disease, Parkinson's disease, stroke, and other cognitive impairments represent a growing global health burden, with limited therapeutic options that effectively halt or reverse disease progression. In recent years, polyherbal formulations have gained increasing scientific attention due to their multitargeted neuroprotective potential and reduced adverse effects compared to single-compound therapies. This review critically evaluates the neuroprotective properties of polyherbal extracts, emphasizing their mechanisms of action, phytochemical synergy, and therapeutic relevance in neurodegenerative conditions. Evidence from in vitro, in vivo, and limited clinical studies demonstrates that polyherbal extracts exert neuroprotection primarily through antioxidant defense, inhibition of neuroinflammation, modulation of neurotransmitter systems, prevention of protein aggregation, and regulation of apoptotic pathways. Bioactive phytoconstituents such as flavonoids, alkaloids, phenolic acids, terpenoids, and glycosides contribute synergistically to enhance neuronal survival and functional recovery. Additionally, polyherbal formulations have shown promising effects in improving memory, learning, and motor coordination by mitigating oxidative stress, mitochondrial dysfunction, and excitotoxicity. This review also discusses challenges related to standardization, bioavailability, safety evaluation, and mechanistic validation of polyherbal extracts. Overall, the accumulated evidence suggests that polyherbal extracts represent a promising complementary strategy for neuroprotection and neuroregeneration. Future research should focus on rigorous pharmacological characterization, advanced formulation approaches, and well-designed clinical trials to translate these traditional formulations into effective neurotherapeutic agents.

Keywords: Neuroprotection, Polyherbal extracts, Neurodegenerative disorders, Oxidative stress, Phytochemical synergy

ANALYTICAL METHOD DEVELOPMENT AND VALIDATION OF AN ANTI-HYPERTENSIVE DRUG

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Abstract

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

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

THE ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING ACADEMIA INDUSTRY COLLABORATION IN PHARMACEUTICALS

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Abstract

Artificial Intelligence (AI) is rapidly transforming the pharmaceutical sector by redefining research methodologies, development pipelines, and healthcare delivery systems. The integration of AI technologies has created new opportunities to bridge the long-standing gap between academic research and industrial implementation. This abstract highlights the evolving role of AI in shaping the future of the pharmaceutical industry while emphasizing the need for stronger academia–industry collaboration. In academia, AI accelerates drug discovery through predictive modeling, molecular docking, and target identification, significantly reducing time and cost compared to conventional approaches. Machine learning algorithms enable efficient analysis of large biomedical datasets, facilitating personalized medicine and precision therapeutics. Meanwhile, the pharmaceutical industry leverages AI for optimizing clinical trials, improving manufacturing processes, ensuring quality control, and enhancing pharmacovigilance systems. Despite these advancements, challenges such as data standardization, ethical concerns, regulatory compliance, and limited interdisciplinary collaboration remain barriers to full-scale implementation. Bridging academic innovation with industrial imperatives is essential to translate theoretical models into practical, market-ready solutions. Collaborative research frameworks, shared data ecosystems, and industry-aligned academic curricula are key enablers of this transition. In conclusion, AI holds immense potential to revolutionize pharmaceutical sciences. Strategic partnerships between academia and industry will be crucial in harnessing AI's capabilities to deliver safer, faster, and more effective healthcare solutions for the future.

Keywords: Artificial Intelligence (AI), pharmaceutical sector, academic research, industrial implementation

**FORMULATION AND EVALUATION OF CANDIES FORTIFIED WITH THE PULP
OF PLUM FRUITS AND ORANGE EXTRACT: AN INTELLIGENT NUTRITIONAL
SOURCE FOR KIDS**

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Abstract

Natural candy is used as a source of a variety of vitamins, minerals and high calories, so it is often eaten by children during activities such as play, work, studying, and exercise. In general, the candy that is widely available in the community is hard candy, which has a hard texture and a shiny appearance. The benefits of this candy for the human body are that its nutrients, minerals, and other vitamins because this candy is made from real fruit pulp. *Prunus domestica* (Plum) is regarded as a nutritious meal all over the world. They are high in phenolic-like, flavonoids, glycosides, proanthocyanidins, benzoic acids, benzoyl hexoses, anthocyanins, cinnamoyl-hexoses, coumarins and cinnamic acids. They are used in India to cure leucorrhoea, asymmetrical menstruation, and debility after a miscarriage.

The purpose of this study was to formulate and evaluate hard candy by using natural fruits pulp so the candy can be easily eaten by the people specially children who dislike to eat fruits because of its sour taste. The main ingredient of this candy is pulp obtained from plum fruits with a variety of sucrose in order to get a delicious formula in the form of taste that is expected to meet the nutritional requirements of both children and adults. Candy was prepared using the open pan method. The research is experimental and includes the processing of making sweet candy, test parameters including organoleptic tests, pH tests, weight uniformity tests, water content tests, ash content tests and tests of preference level (hedonic test) by the respondent. The obtained results with candy shape, taste, and hardness are quite good; they have a pH around 6, and they meet weight uniformity requirements with a coefficient of variation of 1.08 to 1.45s, moisture content 2.7%, ash content below 2%. The results of the organoleptic preference level test in terms of liking, taste, and texture showed that all candies were prepared and evaluated well. The sucrose levels have an effect on the level of liking.

Keywords: Natural, pulp, plum candy, nutraceuticals

INNOVATIONS IN TRADITIONAL MEDICINE: INTEGRATING NANOTECHNOLOGY WITH AYURVEDA

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Abstract

Ayurveda-based traditional medicine is a well-known ancient system of medicine that has shown potential for the treatment and management of various diseases and ailments. Ayurveda has been recognized as a bona fide medical system in most of the SAARC countries. Ease of availability and affordability are the major advantages of traditional system of medicine. Its potential has been witnessed during COVID-19 as it has helped prevent the spread and increase immunity. Foundation of Ayurveda has been laid down in Charak Samhita and Sushrut Samhita, which describe the etiology, symptoms and therapeutics of diseases. Despite enormous potential, Ayurveda lags due to unknown mode and target of action. Furthermore, setbacks such as high dose, patient non-compliance, low shelf-life, and poor bioavailability affect its reproducibility. Therefore, recent trends involve integrating the concepts of novel drug delivery techniques with Ayurvedic medicine. This can help in designing a targeted delivery system which can reduce the dose, increase the bioavailability of the drug and ultimately improve patient compliance. This has been explained with a case study where nanoemulsion delivery system is used for the incorporation of an Ayurvedic drug for intranasal delivery.

Keywords: Ayurveda, Novel Drug Delivery, Nanotechnology, Traditional Medicine

NANOTECHNOLOGY-DRIVEN APPROACHES FOR ENHANCING PRETOMANID EFFICACY: A REVIEW OF SILVER NANOPARTICLE FORMULATIONS

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Abstract

Pretomanid is a novel nitroimidazole antitubercular agent with proven efficacy against drug-sensitive and drug-resistant *Mycobacterium tuberculosis*; however, its clinical performance is often limited by poor aqueous solubility, suboptimal bioavailability, and formulation challenges. Nanotechnology-driven drug delivery systems have emerged as promising tools to overcome these limitations and enhance therapeutic outcomes. Among them, silver nanoparticles (AgNPs) have gained significant attention due to their unique physicochemical properties, intrinsic antimicrobial activity, and ability to improve drug stability and targeted delivery. This review critically examines recent advances in the formulation of pretomanid-loaded silver nanoparticles, focusing on synthesis methods, optimization parameters, physicochemical characterization, and in vitro and in vivo evaluation strategies. The synergistic antimycobacterial potential arising from the combination of pretomanid and silver nanoparticles is discussed, along with mechanisms such as enhanced cellular uptake, sustained drug release, and improved interaction with mycobacterial cell walls. Safety considerations, cytotoxicity concerns, and translational challenges associated with silver nanoparticle-based systems are highlighted. By consolidating current research findings, this review provides valuable insights into the role of silver nanoparticle formulations in enhancing pretomanid efficacy and underscores their potential as next-generation nanocarriers for effective antimycobacterial therapy.

Keywords: Pretomanid, silver nanoparticles, antimycobacterial therapy, tuberculosis

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

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Abstract

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

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

POLY HERBAL FORMULATION, DEVELOPMENT AND ASSESSMENT OF ANTI-DIABETIC PLANTS

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Abstract

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Despite the availability of synthetic antidiabetic drugs, long-term use is often associated with adverse effects and limited efficacy. This has led to increased interest in plant-based therapies and polyherbal formulations, which offer synergistic effects, improved therapeutic efficacy, and reduced toxicity. The present study focuses on the development and assessment of a polyherbal formulation composed of selected medicinal plants traditionally used for the management of diabetes. Plants with documented antihyperglycemic, antioxidant, and insulin-sensitizing properties were selected based on ethnopharmacological evidence and literature review. The formulation was prepared using standardized extraction procedures and evaluated for physicochemical parameters, phytochemical constituents, and in vitro antidiabetic activity, including α -amylase and α -glucosidase inhibition assays. Additionally, antioxidant potential was assessed to understand its role in mitigating oxidative stress associated with diabetes. Preliminary findings indicate that the polyherbal formulation exhibits significant antidiabetic activity, attributed to the presence of bioactive compounds such as flavonoids, alkaloids, tannins, and phenolic acids. The study highlights the potential of polyherbal formulations as effective and safer alternatives for diabetes management and supports their further pharmacological and clinical evaluation.

Keywords: Polyherbal formulation, Diabetes mellitus, Medicinal plants, Antidiabetic activity, Phytochemicals.

DEVELOPMENT OF NANOLIPOSOMES FOR COX-2-MEDIATED ANTITUMOR THERAPY

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Abstract

Introduction: COX-2 overexpression and chronic inflammation are directly related to the development of cancer. Beyond its primary function in pain reduction, NSAIDs have demonstrated anticancer effects. The anti-proliferative and antioxidant qualities of flavonoids are well established.

Aim: The objective is to use a combination of computational and quality-by-design formulation techniques to build and optimise nanoliposomes that contain both an NSAID and a flavonoid.

Methodology: To determine the stability and affinity of COX-2 binding, we first ran molecular docking and molecular dynamics simulations. We developed and improved nanoliposomes using a Box-Behnken architecture, guided by these computational results. Important quality characteristics, such as particle size, encapsulation efficiency, and stability, were methodically assessed.

Evaluation: Cytotoxicity, synergistic interaction, apoptosis induction, ROS production, mitochondrial malfunction, and inhibition of cell migration and invasion were all examined in the optimised formulation. Both the gene and protein levels of COX-2 regulation were verified.

Conclusion: The work concludes that a synergistic, COX-2 targeted anticancer system can be produced by in-silico guided QbD optimization of flavonoid-NSAID nanoliposomes. There is a lot of promise for this system's application in cancer treatment.

Future Outcomes: In vivo pharmacokinetic and effectiveness investigations can validate tumour targeting and safety of the improved flavonoid-NSAID nanoliposome system. Targeting ligand surface functionalization could improve selectivity for cancers that overexpress COX-2. This platform's expansion to other anti-inflammatory phytochemical combinations, GMP validation, and scale-up could aid in clinical and translational development.

Keywords: NSAID repurposing, Flavonoids, COX-2 inhibition, Nanoliposomes, Quality by Design, In-silico modelling, Antitumor therapy

CARDIOPROTECTIVE EFFECT OF ALPHA KETOANALOGUES (KA) IN ISOPROTERENOL-INDUCED MYOCARDIAL INFARCTION IN RATS

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Abstract

Myocardial infarction (MI) remains a major cause of morbidity and mortality worldwide. Alpha-Ketoanalogues (KA) gets converted into essential amino acids in the body via transamination and could improve nutritional deficiencies caused by protein-restricted diets. In this, we evaluated cardioprotective effects of KA in isoproterenol-induced myocardial infarction in rats. We divided rats randomly into Group 1, Vehicle control, Group 2-Toxic control (ISO 85 mg/kg. 18), Group 3 and 4-KA (20 and 40 mg/kg. p,g, respectively) with ISO and Group 5, Amlodipine (5 mg/kg) alone for 14 days. After 24 h of the last dose, haemodynamic parameters were assessed, then animals were sacrificed and biochemical as well as histopathological changes were measured. Treatment with ISO significantly deviated the haemodynamic parameters (HR, SAP DAP, and MAP), biochemical parameters (CK-MB, LDH and Troponin-T) and antioxidant markers (TBARS, SOD, Catalase and GSH) Haematoxylin, and eosin staining of the cardiac tissue also indicated significant myocardial damage. Pre-treatment with KA significantly restored the antioxidant status, haemodynamic profile and cellular architecture of the heart. KA showed cardioprotection, which was reflected by restoration of oxidative stress, cardiac membrane damage, haemodynamic, and histopathological changes.

Keywords: Myocardial infarction (MI), morbidity, mortality

SAFETY CONCERNS WITH RADIO-CONTRAST AGENTS: A COMPREHENSIVE OVERVIEW

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Abstract

Objective: To provide a comprehensive narrative review on the safety concerns associated with both iodinated and gadolinium-based contrast agents, including adverse reactions, nephrotoxicity, hypersensitivity, and preventive strategies. **Background:** Contrast agents are essential in diagnostic imaging, but their use may be associated with mild to severe adverse events, including contrast-induced nephropathy (CIN) and nephrogenic systemic fibrosis (NSF). **Methods:** A review of randomized trials, observational studies, meta-analyses, and guideline publications (2020–2025) was conducted, focusing on comparative safety, risk factors, and preventive measures. **Results:** Modern iodinated agents (LOCM, IOCM) and macrocyclic gadolinium agents demonstrate reduced incidence of severe adverse reactions. Patient-related risk factors, agent selection, hydration, and adherence to guideline-based protocols remain central to minimizing complications. **Conclusion:** A structured approach to patient assessment, agent selection, and risk mitigation enhances the safety profile of contrast media in clinical practice.

Keywords: Iodinated contrast agents, Gadolinium-based contrast agents, Contrast-induced nephropathy, Nephrogenic systemic fibrosis, Hypersensitivity, Pharmacovigilance, Tertiary care

**PHARMACOLOGICAL AND TOXICOLOGICAL CHARACTERIZATION OF
BIOACTIVE PHYTOCONSTITUENTS FROM TRADITIONAL MEDICINAL
PLANTS**

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Abstract

Traditional medicinal plants serve as a cornerstone for global healthcare systems, offering therapeutic alternatives for complex pathologies ranging from obesity to cancer. However, the translation of ethnomedicinal knowledge into standardized pharmaceutical agents is often hindered by difficulties in accurate botanical identification, inconsistent bioactive profiling, and insufficient toxicological data. This paper proposes an integrated characterization framework that combines computer vision for raw material authentication with advanced *in silico* pharmacological modeling. By leveraging deep learning architectures for plant identification and graph neural networks for quantitative structure-activity relationship (QSAR) analysis, we aim to streamline the discovery of bioactive phytoconstituents. We review the efficacy of xanthones and other metabolites in targeting specific molecular pathways, such as MTOR and TNF, while also addressing safety concerns related to herbal consumption. This multi-disciplinary approach provides a robust methodology for validating the pharmacological potential and toxicological safety of traditional medicines in a modern clinical context.

Keywords: Traditional medicinal plants, Phytoconstituents, Pharmacological characterization, Toxicological evaluation, QSAR modeling, Computer vision, Deep learning, Herbal drug safety.

EVALUATION OF POLYHERBAL EXTRACTS TARGETING INFLAMMATORY AND OXIDATIVE STRESS PATHWAYS IN AN EXPERIMENTAL PSORIATIC RAT MODEL

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Abstract

Psoriasis is a chronic, immune-mediated dermatological condition characterized by hyperproliferation of keratinocytes, aberrant epidermal differentiation, and persistent inflammation. Although current pharmacological therapies provide symptomatic relief, their long-term use is often limited by adverse effects and high treatment costs, necessitating the exploration of alternative therapeutic strategies. The present study evaluates the efficacy of a novel polyherbal extract formulation targeting key inflammatory and oxidative stress pathways in an experimentally induced psoriatic rat model. The study is based on established mechanisms of immune dysregulation, including activation of nuclear factor kappa-B (NF- κ B) and interleukin-17 (IL-17) signaling pathways, which play a central role in psoriasis pathogenesis. A multi-targeted approach was adopted to restore immune and redox homeostasis. The methodology involved histopathological evaluation, biochemical estimation of oxidative stress markers, and molecular assessment of inflammatory mediators, supported by network-based analytical frameworks. The findings aim to elucidate whether synergistic phytochemical interactions within the polyherbal formulation can modulate macrophage network dysregulation and enhance adaptive immune responses. Overall, the study explores a safer and cost-effective therapeutic approach for the management of psoriatic inflammation.

Keywords: Psoriasis, Polyherbal extracts, Inflammatory pathways, Oxidative stress, NF- κ B, IL-17, Psoriatic rat model

AI IN DRUG DISCOVERY FROM TARGET IDENTIFICATION TO LEAD OPTIMISATION

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Abstract

In the field of drug discovery, artificial intelligence (AI) has emerged as a game-changing technology that provides potent tools to overcome the high costs, lengthy turnaround times, and poor success rates of conventional methods. AI-driven approaches facilitate quicker, more precise, and data-driven decision-making across the drug discovery process, from target selection to lead optimization. Machine learning algorithms use biological networks, multi-omics data, and empirical evidence in target identification to more confidently identify new and disease-relevant targets.

AI methods like deep learning, virtual screening, and generative models effectively search large chemical spaces to find interesting compounds with desired biological activity during hit discovery and lead creation. Additionally, AI aids in lead optimization by forecasting pharmacokinetic characteristics, toxicity, structure–activity connections, and off-target effects, which speeds up the process of refining potential compounds. AI speeds up drug discovery and makes it possible to create safer and more potent treatments by lowering the burden of experimentation and improving predictive accuracy. AI is redefining modern drug development and has great potential to advance precision medicine, despite ongoing issues with data quality, interpretability, and regulatory approval.

Keywords: AI, drug discovery, deep learning, SAR, Machine learning

AN ANTIULCER ORAL GEL OF ALOEVERA WITH CIMETIDINE-AN INDIGENOUS APPROACH FOR HEALING ULCERS

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Abstract

The main purpose of this study was to prepare an antiulcer preparation. An attempt is made to incorporate cimetidine into aloe vera gel. Aloe vera gel is non-toxic in nature and widely used as a herbal medicine. Six formulations were prepared by using various ratios of different polymers (gelling agent) because this is an edible preparation, so both polymers (sodium alginate and xanthan gum) are edible in nature and suitable for making the preparation.

All formulations are then evaluated for various parameters like percentage yield, drug content, pH, viscosity, in vitro release, in vitro kinetics & stability studies. The pH of the gel was found to be 6.2. For different formulation there is a different polymer ratio of the gelling agent, so there will be different viscosity of different formulations. The viscosity of the gel was found to be 1050cp and the formulation had good release.

Hence, the successful optimised formulation of aloe vera gel containing cimetidine has good drug content, drug release, viscosity, and pH. The stability studies are done for three months. In which there is not any significance changes in various evaluation parameter of the gel. Hence, the formulae containing a combination of cimetidine with aloe vera gel for antiulcer activity can be a good method for enhancing the healing property of antiulcer activity.

Keywords: Cimetidine, Sodium alginate, Xanthum gum, Aloevera gel.

NANOEMULGEL FORMULATIONS OF *WHEATGRASS* EXTRACT FOR ENHANCED SKIN PENETRATION: OPTIMIZATION AND IN-VITRO EVALUATION

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Abstract

A nanoemulsion-based hydrogel system was developed and characterised as a drug delivery system that employs nanotechnology to deliver enhanced therapeutic efficacy for wheatgrass through high-energy emulsification. The objective of the present study was to develop and characterise optimised nanoemulsion and nanoemulgel formulations for the topical delivery of wheatgrass extract. Nanoemulsion components were screened, and pseudoternary phase diagrams were constructed. The mean globule diameter and polydispersity index of the nanoemulsion were assessed, and the effect of formulation composition and ultrasonication process parameters was examined. The developed nanoemulgel system had wheatgrass extract incorporated and exhibited pseudoplastic behaviour with a thixotropic nature, which is beneficial for topical use. Extreme vertices mixture design was employed to study the effect of percentage composition of the independent variables of the oil mixture (25-30%), Smix (45-50%) and aqueous (25-30%) groups on the NE globule size. Subsequently, the nanoemulsion was prepared from optimised wheatgrass extract NE and Carbopol 940 gel. HLB values of 13.5 and 12 yielded greater nanoemulsion areas. The optimised percent compositions of oil phase, Smix and aqueous phase were 28.70%, 47.85% and 23.45%, respectively, having a predicted globule size (291.6 nm), Polydispersity index (0.4901 ± 0.001), and zeta potential (-27.24 mV). The nanoemulsion viscosity was 683.2 Pa.s and exhibited Newtonian flow. The NEG demonstrated non-Newtonian flow with shear-thinning behaviour. The release and penetration of wheatgrass extract into each of the model membrane layers at various time intervals were nanoemulsion > nanoemulgel > basic cream. At 180 min, the release and penetration of wheat grass extract into model membrane layers from wheatgrass extract nanoemulsion, basic cream, and nanoemulgel were 64.34%, 71.23%, 79.33%, 84.92%, 97.11% respectively. Wheatgrass extract NE slowed down the release and reduced the penetration of wheatgrass extract into the multilayer membrane model. This is significant to restrict the penetration of wheatgrass extract into the epidermal layer of the skin. From the SRB assay data, the A431 cell line will indicate the cytotoxicity of the sample when aliquots of the cell line were treated with various concentrations of the sample. Sample nanoemulsions were cytotoxic to a low degree. IC50 is the inhibitory/sample/formulation concentration at which half of the viable cells have been inhibited.

Keywords: Wheatgrass extract, orange oil, ultrasonication, LC-MS, nanoemulsion, nanoemulgel, A431 cell line, IC50, skin cancer.

**AI-GUIDED DESIGN AND SYNTHESIS OF NOVEL HETEROCYCLIC DERIVATIVES
AS DUAL DNA GYRASE/TOPO IV INHIBITORS TO COMBAT ANTIMICROBIAL
RESISTANCE**

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ABSTRACT

The escalation of multidrug-resistant bacterial strains necessitates the development of novel therapeutics with dual-targeting mechanisms. This study presents the rational design, synthesis, and computational validation of novel heterocyclic derivatives as inhibitors of bacterial DNA Gyrase and Topoisomerase IV. Utilising an AI-integrated workflow, a library of oxadiazole scaffolds was screened for binding affinity within the conserved ATP-binding pockets of both enzymes. Lead candidates were identified based on superior docking scores and favourable machine learning-predicted ADMET profiles. The identified leads were successfully synthesized via [Esterification, Cyclization, and SN2 reactions], and their structures were characterized using spectral techniques. To evaluate the stability of the leads, 100-ns Molecular Dynamics (MD) simulations were performed, confirming consistent binding trajectories (RMSD <0.7 nm). This research demonstrates a successful "Academia-Industry" bridge by combining high-level computational predictive modeling with benchtop synthetic chemistry to develop potent antibacterial scaffolds.

Keywords: AI-Guided Design, computational validation, ADMET, docking, Molecular Dynamics (MD) simulations

INTEGRATION OF AI AND PHARMACOLOGY: A NEW ERA IN DRUG DEVELOPMENT

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Abstract

The integration of artificial intelligence (AI) with pharmacology has emerged as a transformative approach in modern drug development. Conventional drug discovery is a time-consuming, expensive, and high-risk process, often associated with high failure rates during clinical trials. AI-based computational tools offer innovative solutions by enabling rapid analysis of large pharmacological datasets, including molecular structures, biological targets, and clinical outcomes. Machine learning and deep learning algorithms assist in target identification, lead optimization, and prediction of pharmacokinetic and pharmacodynamic properties, thereby improving drug safety and efficacy profiles at early stages. AI-driven models also play a significant role in toxicity prediction, dose optimization and drug repurposing, reducing dependence on extensive animal experimentation. In pharmacology, the application of AI facilitates personalized medicine by predicting patient-specific drug responses based on genetic and physiological variations. Furthermore, AI-supported in-silico screening enhances decision-making in preclinical and clinical development phases. Despite its advantages, challenges such as data quality, algorithm transparency and ethical considerations remain. However, continuous advancements in AI technologies are expected to overcome these limitations. Overall, the integration of AI and pharmacology represents a new era in drug development, offering faster, safer and more cost-effective therapeutic solutions.

Keywords: Artificial Intelligence, Pharmacology, Drug Development, Machine Learning, In-Silico Screening, Personalized Medicine

NIOSOMAL DRUG DELIVERY SYSTEM

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Abstract

Niosomes are vesicular drug delivery systems composed of non-ionic surfactants and cholesterol, developed as an efficient alternative to liposomes for targeted and controlled drug delivery. Owing to their bilayer structure, niosomes are capable of encapsulating both hydrophilic and lipophilic drugs, thereby improving drug solubility, stability, and bioavailability. Niosomal drug delivery systems offer several advantages such as chemical stability, low toxicity, biocompatibility, cost-effectiveness and ease of large-scale production. These systems enhance therapeutic efficacy by providing sustained drug release, reducing dosing frequency and minimizing systemic side effects. Niosomes have been extensively explored for various routes of administration, including oral, topical, transdermal, parenteral, and ocular delivery. They also demonstrate significant potential in targeted therapy for cancer, inflammatory disorders, infectious diseases and dermatological conditions. Surface modification and optimization of formulation parameters further improve drug entrapment efficiency and targeting capability. Recent advancements in niosomal technology focus on stimuli-responsive and ligand-targeted systems to achieve site-specific drug delivery. Overall, niosomal drug delivery systems represent a promising and versatile platform in modern pharmaceutical research, offering enhanced therapeutic outcomes and improved patient compliance.

Keywords: Niosome, Drug delivery system, Vesicular drug delivery system, Nanotechnology, etc.

ARTIFICIAL INTELLIGENCE–GUIDED MODULATION OF BACTERIAL EFFLUX PUMPS AND GUT MICROBIOME TO PREVENT EMPIRICAL ANTIBIOTIC FAILURE AND ADVERSE DRUG REACTIONS

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Abstract

Background: Empirical broad-spectrum antibiotic therapy is essential for managing severe infections such as sepsis and pneumonia. Empirical therapy becomes a threat and leads to treatment failure and adverse drug reactions (ADRs) frequently occur due to multi drug resistance, especially microbes with efflux pump mechanism.

Objective: To evaluate the role of Lactobacillus-derived bacteriocins and efflux pump inhibitors (EPIs) in overcoming efflux pump mediated antibiotic failure and to propose an artificial intelligence (AI) guided framework for precision empirical therapy.

Methods: Evidence from preclinical, translational, and emerging clinical studies was systematically reviewed to assess how bacteriocins and EPIs influence bacterial efflux systems, intracellular antibiotic accumulation, resistance propagation, and toxicity. These findings were integrated into a conceptual AI-driven decision model incorporating clinical parameters, empirical antibiotic selection, gut microbiome signatures, and resistance databases.

Results: Lactobacillus-derived bacteriocins demonstrated the ability to suppress efflux pump activity, disrupt bacterial membranes, and restore antibiotic susceptibility. EPIs enhanced intracellular drug retention, potentially allowing dose reduction and lowering ADR risk. AI-based integration enables early prediction of efflux pump activation, treatment failure, and ADR probability during empirical therapy.

Conclusion: Combining bacteriocins, EPIs, and AI-guided decision support represents a promising precision strategy to improve empirical antibiotic efficacy, reduce toxicity, and mitigate antimicrobial resistance.

Keywords: Antibiotic resistance, Adverse drug reactions, Artificial intelligence, Empirical antibiotic therapy, Gut microbiome.

HARNESSING MACHINE LEARNING FOR REAL-TIME DETECTION OF MEDICATION THERAPY PROBLEMS

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Abstract

Medication therapy problems (MTPs) are the most serious health issues in the medical field. They may arise from drug interaction and choosing the wrong drug or the wrong dose. Detecting MTPs in real-time using machine learning can help us know the drug safety, along with their mechanism. Machine learning algorithms use data from health care, including electronic health records, prescriptions, test results, and outcomes of patient reports. Machine learning algorithms constantly evaluate this data in real time to find possible MTPs. Several techniques are employed to assist in the identification of adverse signals, including supervised learning, deep learning, and natural language processing. Machine learning in clinical decision support systems is an important part of personalized medication, as it considers patient-specific factors like genetic profiles, kidney and liver function, and past medication history. These technologies can help doctors and pharmacists reduce the risk of drug side effects and improve the quality of patient care by sending real-time alerts.

Keywords: Algorithms, Deep learning, Health care, Medication, Real-time

TRADITIONAL CHINESE MEDICINE FORMULAS IN PARKINSON'S DISEASE- MECHANISTIC INSIGHTS AND CLINICAL EVIDENCE

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Abstract

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by dopaminergic neuronal loss, α -synuclein aggregation, and motor and non-motor dysfunctions. Current pharmacological therapies mainly offer symptomatic relief and are associated with long-term complications. Traditional Chinese Medicine (TCM), based on holistic and multi-target principles, has been used for centuries to manage tremors and age-related neurological disorders. This review evaluates mechanistic insights and clinical evidence supporting TCM formulas in Parkinson's disease management. A systematic literature search was conducted using PubMed, CNKI, Scopus, and Web of Science for studies published between 2000 and 2024. Preclinical and clinical studies were included, focusing on dopaminergic neuroprotection, anti-inflammatory and antioxidant effects, mitochondrial regulation, and clinical symptom improvement. Several TCM formulas, including Tian Ma Gou Teng Yin, Zhen Gan Xi Feng Tang, and Bu Zhong Yi Qi Tang, demonstrated significant neuroprotective effects in experimental PD models. Mechanistic investigations revealed modulation of oxidative stress pathways, suppression of neuroinflammation, and preservation of mitochondrial function. Clinical studies, although limited by small sample sizes, reported improvements in motor symptoms, sleep quality, and overall quality of life, particularly when combined with levodopa therapy. Some evidence also suggested reduced levodopa-induced complications. Overall, TCM represents a promising multi-target complementary therapy for Parkinson's disease management.

Keywords: Parkinson's disease, Traditional Chinese Medicine, Herbal formulas, Neuroprotection, Oxidative stress, Neuroinflammation, Dopaminergic neurons, Levodopa-induced dyskinesia.

BRIDGING THE GAP: ROLE OF ACADEMIA–INDUSTRY COLLABORATION IN AI-BASED PHARMA RESEARCH

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Abstract

Artificial Intelligence (AI) is emerging as a powerful tool in pharmaceutical research, transforming areas such as drug discovery, clinical trials, manufacturing, and healthcare decision-making. However, despite rapid academic advancements in AI algorithms and data science, a significant gap exists between academic research and its practical application in the pharmaceutical industry. Bridging this gap through effective academia–industry collaboration has become a critical need for sustainable and impactful innovation. Academic institutions contribute fundamental research, skilled human resources, and novel AI models, while the pharmaceutical industry provides real-world data, infrastructure, regulatory expertise, and commercialization pathways. Collaboration between these two sectors enables the translation of theoretical AI research into practical solutions that are safe, efficient, and patient-centric. Joint research projects, internships, industry-sponsored labs, and shared data platforms help align academic innovation with industrial requirements. Such partnerships also address major challenges including skill mismatch, data accessibility, regulatory compliance, and ethical deployment of AI technologies. Exposure to industry practices enhances students' employability and prepares researchers to develop AI tools that meet real-world pharmaceutical needs. Meanwhile, industry benefits from early access to cutting-edge research and a trained workforce. In conclusion, academia–industry collaboration acts as a bridge that accelerates AI-based pharmaceutical research from concept to clinic. Strengthening this partnership is essential to foster responsible innovation, reduce development timelines, and ultimately improve healthcare outcomes through intelligent and collaborative scientific efforts.

Keywords: Artificial Intelligence (AI), data accessibility, cutting-edge research, patient-centric.

FORMULATION AND EVALUATION OF GASTRORETENTIVE DRUG DELIVERY SYSTEM IN THE TREATMENT OF GERD

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Abstract

The reflux of acidic stomach contents into the esophagus is the cause of gastroesophageal reflux disease (GERD), a common chronic gastrointestinal condition that causes symptoms like heartburn, regurgitation, and mucosal damage. Short gastric residence times, uneven drug absorption, and frequent dosing are common drawbacks of conventional oral drug delivery systems used in GERD treatment, which may lower treatment effectiveness and patient compliance. By extending gastric retention and offering regulated drug release at the site of action, gastro-retentive drug delivery systems (GRDDS) have become a sophisticated and successful solution to these problems. The importance of GRDDS in the treatment of GERD is emphasized in this review-based study. The formulation principles and mechanisms of action of several gastro-retentive techniques, including floating, bioadhesive, expandable, high-density, and raft-forming systems, are examined. A summary is also provided on the function of frequently used polymers, formulation techniques, and important evaluation metrics such as floating lag time, total floating duration, in-vitro drug release, and stability tests. The latest developments and prospects for GRDDS in anti-GERD treatment are also briefly discussed. All things considered, gastro-retentive drug delivery systems are a useful approach for enhanced oral drug administration because they provide a viable platform for enhancing bioavailability, therapeutic efficacy, and patient compliance in the treatment of GERD.

Keywords: Gastroretentive drug delivery system, GERD, raft forming system, floating drug delivery system

ETHICAL CHALLENGES OF AI IN PHARMA: ACADEMIC RESPONSIBILITY AND INDUSTRY ACCOUNTABILITY

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Abstract

Artificial Intelligence (AI) is rapidly transforming the pharmaceutical sector by improving drug discovery, clinical trials, manufacturing, and patient care. While AI offers speed, accuracy, and cost reduction, it also raises important ethical challenges that cannot be ignored. The use of large datasets, automated decision-making, and predictive algorithms in pharma demands strong ethical responsibility from both academic institutions and the pharmaceutical industry. Academic researchers play a crucial role in developing AI models, generating data, and shaping future professionals. They are responsible for ensuring data quality, transparency of algorithms, and unbiased research outcomes. Ethical training and responsible research practices must be embedded in academic curricula to prepare students for real-world applications. On the other hand, the pharmaceutical industry holds accountability for the practical deployment of AI systems. This includes protecting patient data privacy, ensuring regulatory compliance, preventing algorithmic bias, and maintaining transparency in AI-driven decisions that affect patient safety. Lack of explainability, data bias, and misuse of AI tools can lead to incorrect clinical decisions and loss of public trust. Therefore, strong collaboration between academia and industry is essential to establish ethical guidelines, shared standards, and continuous monitoring frameworks. By promoting responsible innovation, ethical governance, and mutual accountability, AI can be used as a powerful and trustworthy tool to improve healthcare outcomes while safeguarding human values and patient rights.

Keywords: Artificial Intelligence (AI), transparency of algorithms, responsible innovation, safeguarding human values.

HERBAL PLANTS AS EMERGING ANTICONVULSANT AGENTS: PHYTOCHEMICAL AND PHARMACOLOGICAL PERSPECTIVES

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Abstract

Epilepsy is a chronic neurological disorder characterized by recurrent seizures and remains a major global health challenge despite the availability of multiple antiepileptic drugs. Limitations such as adverse effects, drug resistance, and high treatment costs have stimulated interest in plant-based alternatives. *Bacopa monnieri* (Brahmi), a renowned medicinal herb in traditional Ayurvedic medicine, has emerged as a promising anticonvulsant candidate due to its rich phytochemical profile. The plant contains bioactive constituents such as bacosides, alkaloids, flavonoids, and saponins that contribute to its neuropharmacological activity. Preclinical studies using experimental seizure models, including maximal electroshock (MES) and pentylenetetrazole (PTZ)-induced seizures, demonstrate significant anticonvulsant and neuroprotective effects of *B. monnieri* extracts. Mechanistically, its activity is attributed to modulation of GABAergic neurotransmission, antioxidant defense enhancement, inhibition of excitotoxic pathways, and regulation of ion channels. Additionally, its cognitive-enhancing and anxiolytic properties provide supportive benefits in epilepsy management. Collectively, current pharmacological evidence suggests that *Bacopa monnieri* represents a promising herbal candidate for the development of safer and more effective adjunct therapies in seizure disorders.

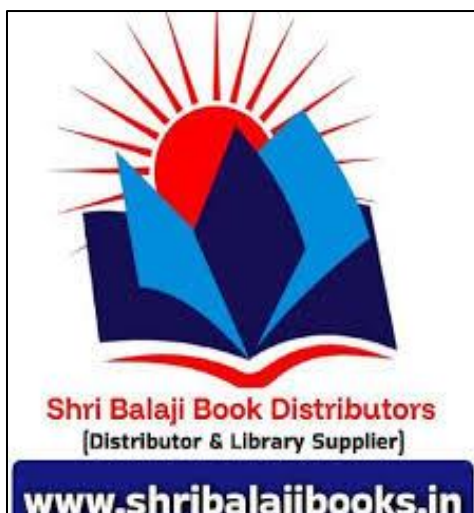
Keywords: *Bacopa monnieri*, Anticonvulsant activity, Epilepsy, Bacosides, Phytochemicals, GABAergic modulation, Neuroprotection, Oxidative stress, Experimental seizure models, Herbal therapeutics.

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Prof. (Dr.) Sanjar Alam



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Dr. Akhil Sharma



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