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I.T.S College of Pharmacy

in collaboration with

APP West Indies International Branch

Indo-Caribbean International Conference

on

Trends & Challenges in Drug Design, Discovery and Pharmaceutical Sciences

SOUVENIR

15th February, 2025

Organized by

I.T.S College of Pharmacy

Delhi-Meerut Road, Murad Nagar, Ghaziabad, Uttar Pradesh, 201206

ABOUT I.T.S -THE EDUCATION GROUP

I.T.S - The Education Group, established in 1995 by a charitable trust under the leadership of Dr. R.P. Chadha, has grown into a prominent institution under the guidance of Vice Chairman Mr. Arpit Chadha. Starting from its first campus at Mohan Nagar, I.T.S operates four campuses across 60 acres in Ghaziabad and Greater Noida. It offers postgraduate and undergraduate Management, Information Technology, Dental, Engineering, Pharmacy, and Physiotherapy programs. With state-of-the-art campuses and hostel facilities, I.T.S produces approximately 8,000 globally competent professionals annually for the international business community.

ABOUT I.T.S COLLEGE OF PHARMACY

I.T.S College of Pharmacy came into existence in 2004 at Murad Nagar, Ghaziabad. We are conducting B. Pharm. and M. Pharm. (Pharmaceutics and Pharmacology) affiliated to Dr. A.P.J Abdul Kalam Technical University and D. Pharm. affiliated to Board of Technical Education and approved by PCI. B. Pharm. program has also been accredited by NBA. Our faculties have presented research papers in various symposia and conferences in South Korea, USA, Germany, Egypt, Australia etc. and published around 400 papers in reputed Journals.

OBJECTIVE OF CONFERENCE

The conference aims to explore and address the diverse aspects of drug design, discovery, and pharmaceutical sciences. Drug discovery involves identifying potential therapeutic entities using computational, experimental, translational, and clinical models. Drug design focuses on creating molecules that complement biological targets in shape and charge, often utilizing computer modeling techniques. Drug development bridges the gap between discovery and market introduction. Pharmaceutical science plays a crucial role in optimizing therapeutic molecules and delivering them to the right targets effectively. This conference will bring together pharmaceutical experts from international and national organizations to share insights, advancements, and innovations in these critical domains.

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Message from Chief Patron

Dr. R.P. Chadha

Chairman, I.T.S-The Education Group

It is a great honor to welcome you all to the International Conference on "Trends and Challenges in Drug Design, Discovery, and Pharmaceutical Sciences," organized by I.T.S. College of Pharmacy. This prestigious event serves as a dynamic platform where distinguished experts from academia, research, and the pharmaceutical industry come together to share their knowledge, innovations, and insights.

At I.T.S. College of Pharmacy, we are committed to fostering academic excellence and driving impactful research in pharmaceutical sciences. This conference reflects our dedication to advancing drug discovery and development, addressing critical challenges, and exploring emerging trends that will shape the future of healthcare.

I am delighted to welcome all esteemed delegates, keynote speakers, and participants who have gathered from various institutions and industries. Your presence underscores the significance of this conference, as it brings together brilliant minds working on pioneering advancements in drug design and pharmaceutical sciences. This collective exchange of ideas will enhance scientific discourse and pave the way for meaningful collaborations and innovations that can transform patient care.

I extend my heartfelt gratitude to the organizing committee, distinguished speakers, and all participants for their valuable contributions. I am confident that this conference will be a source of inspiration, knowledge, and new opportunities for academic and industrial advancements.

Wishing you all a successful and enriching experience!

Message from Patron

Mr. Arpit Chadha

Vice Chairman, I.T.S-The Education Group

It is with immense pleasure and enthusiasm that I extend a warm welcome to all participants of the International Conference on "Trends and Challenges in Drug Design, Discovery, and Pharmaceutical Sciences," organized by the I.T.S. College of Pharmacy on 15th February 2025.

This conference serves as a dynamic platform for researchers, industry professionals, and academicians to come together, exchange knowledge, and explore cutting-edge advancements in drug discovery and pharmaceutical sciences. The theme of this event highlights the evolving landscape of drug design, emphasizing innovative strategies, emerging challenges, and the transformative role of technology in shaping the future of healthcare.

Scientific collaboration and knowledge-sharing are the driving forces behind groundbreaking discoveries. By fostering discussions on novel approaches, interdisciplinary research, and industry-academic partnerships, this conference will play a pivotal role in addressing global healthcare challenges and accelerating progress in pharmaceutical sciences. I am confident that the insights gained and the connections established here will lead to meaningful advancements and inspire new frontiers in drug discovery and development.

My heartfelt congratulations to the organizing team for curating this impactful event. I extend my best wishes to all participants for a conference filled with enriching discussions, innovative perspectives, and valuable takeaways.

Message from Patron

Mr. B.K. Arora

Secretary, I.T.S-The Education Group

With great enthusiasm, I welcome you to the International Conference on "Trends and Challenges in Drug Design, Discovery, and Pharmaceutical Sciences," organized by I.T.S. College of Pharmacy. This conference serves as an excellent platform for collaboration and knowledge exchange among leading professionals, researchers, and academicians in the pharmaceutical sciences.

We are privileged to host distinguished speakers and participants from diverse backgrounds, all driven by a shared commitment to advancing drug discovery and pharmaceutical innovation. As we delve into the latest advancements and address critical challenges in drug design and development, I encourage each of you to actively participate in discussions, share insights, and foster meaningful collaborations.

Your contributions are essential in shaping the future of pharmaceutical sciences, and together, we can drive innovations that will have a lasting impact on global healthcare. Let us seize this opportunity to inspire one another, exchange ideas, and build connections that extend beyond this conference.

Wishing you all a successful, insightful, and inspiring conference!

Message from Advisor

Mr. Surinder Sood

Director PR, I.T.S-The Education Group

It is with immense pride and heartfelt joy that I welcome you all to the International Conference on "Trends and Challenges in Drug Design, Discovery, and Pharmaceutical Sciences," organized by I.T.S. College of Pharmacy on 15th February 2025.

At a time when pharmaceutical sciences are witnessing rapid advancements, this conference provides an invaluable opportunity to explore novel research methodologies, cutting-edge technologies, and interdisciplinary collaborations that drive meaningful progress. It embodies our institution's commitment to academic excellence, industry integration, and fostering a knowledge-driven ecosystem that bridges research with real-world applications.

I am confident that the discussions, collaborations, and insights emerging from this event will have a far-reaching impact, inspiring innovative solutions and paving the way for significant advancements in healthcare and pharmaceutical sciences.

I appreciate the I.T.S organizing team, esteemed speakers, and all participants for their dedication in making this event a grand success. The collaboration between I.T.S College of Pharmacy and Association of Pharmacy Professionals (APP) is a stepping stone for creating an enriching and memorable experience that contributes to the ever-evolving field of pharmaceutical research and development.

Message from Convener

Dr. S. Sadish Kumar

Professor & Director, I.T.S College of Pharmacy

It is with great pride and enthusiasm that I welcome you to the International Conference on "Trends and Challenges in Drug Design, Discovery, and Pharmaceutical Sciences," organized by I.T.S. College of Pharmacy on 15th February 2025. This conference is a testament to our unwavering commitment to fostering innovation, collaboration, and academic excellence in pharmaceutical sciences.

This esteemed gathering brings together brilliant minds from academia, research, and industry to address current challenges and explore groundbreaking advancements in drug discovery and development. I am particularly delighted to witness the participation of distinguished speakers, researchers, and professionals from diverse backgrounds, each bringing unique perspectives and expertise. This exchange of knowledge and ideas is invaluable in driving transformative progress in healthcare and pharmaceutical sciences.

I extend my heartfelt gratitude to all the speakers, participants, and organizing team members whose dedication and efforts have made this event possible. May the discussions, collaborations, and insights gained during this conference propel us toward new frontiers in pharmaceutical research and education.

With warm regards and best wishes for a successful and enriching conference!

I.T.S College of Pharmacy

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15th February, 2025

Program Schedule

Registration (*Venue: Activity Hall*) **8:30 – 9:30 am**

Inauguration

Venue: Vikram Sarabhai Auditorium

Arrival of Chief Guest and Seating of Delegates in the Auditorium / Lamp Lighting	9:30-9:40 am
Welcome Address by **Dr. S. Sadish Kumar** Director, I.T.S College of Pharmacy	9:45-9:50 am
Speech by **Mr. Arpit Chadha** Vice Chairman, I.T.S-The Education Group	9:50-10:00 am
Speech by **Mr. Surinder Sood** Director-Public Relations, I.T.S-The Education Group	10:00-10:10 am
Talk to theme by **Prof. Rajiv Dahiya** (Hon'ble Guest) Faculty of Medical Sciences, The University of the West Indies, St. Augustine, Trinidad & Tobago	10:10-10:20 am
Objective of the Conference by **Dr. Simone Faye Walcott** Co-convener & Vice President APP West Indies International Branch	10:20-10:30 am

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Trends & Challenges in Drug Design, Discovery and Pharmaceutical Sciences

15th February, 2025

Program Schedule

SCIENTIFIC SESSIONS

Venue: Vikram Sarabhai Auditorium

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SCIENTIFIC SESSION - II **PROF. AJAY SHARMA** Department of Pharmacognosy and Phytochemistry, School of Pharmaceutical Sciences Delhi Pharmaceutical Sciences and Research University, Pusph Vihar, New Delhi	11:15 – 12:00 noon
SCIENTIFIC SESSION - III **PROF. JYOTI SHRIVASTAVA** Faculty of Pharmacy, School of Healthcare and Allied Sciences G.D. Goenka University, Sohna, Gurugram, Haryana	12:00 – 12:45 pm

Q & A Session	12:45 – 1:00 pm
Lunch ***(Venue: Lawn Adjacent to Academic Block)***	1:00 – 1:45 pm
Oral Presentation ***(Venue: R. Ahmad Hall)*** &	
Poster Session [Parallel] (***Venue: Pharmacy Block – III & IV floor)***	1:45 – 3:45 pm
Award Ceremony **(*Venue: Vikram Sarabhai Auditorium)***	3:45 – 4:15 pm
Closing Remarks	4:15 – 4:30 pm
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Recent Advances in Herbal Approaches for the Treatment of Mouth Ulcers- A Comprehensive Review

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ABSTRACT

Mouth ulcers affect a significant portion of the population. A mouth ulcer is an uncomfortable condition that affects the oral mucosa. Due to the severity of these ulcers, an efficient herbal cure is frequently required. They are not lethal, but they can make it difficult to do daily activities like eating and talking. Herbal medicines are gaining popularity because they are safer and more accessible, even though traditional medications are still effective. Given the potential side effects of synthetic drugs, effective natural alternatives are crucial. While the exact pathogenesis is yet unknown, stress, hunger, and microbial diseases are commonly associated. Herbal alternatives offer a viable treatment with minimal side effects. Recent studies have demonstrated the antiulcer effects of specific herbal formulations through mechanisms such as enhancing mucosal healing, immune system regulation, and providing anti-inflammatory and antibacterial properties. This study highlights the effectiveness of plant-based therapies as natural alternatives to synthetic drugs by looking at the research on herbal treatments for mouth ulcers. It emphasizes their antioxidant action, anti-inflammatory and antibacterial properties, minimal side effects, and capacity to support mucosal healing. As interest in natural therapies grows, herbal drugs provide an enticing approach to treating oral ulcers, with a focus on efficacy, patient safety, and ease of use.

Keywords: Mouth ulcers, herbal treatment, antioxidant effect, anti-inflammatory activity, antimicrobial activity.

The Evolution of Antifungal Infection Management: Bridging Gaps in Research and Practice

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ABSTRACT

Antifungal infections pose a significant global health burden, particularly in immunocompromised populations. Despite advances in antifungal therapies, the rising incidence of drug-resistant fungal pathogens and limitations in diagnostics underscore the need for improved management strategies. This review highlights the evolution of antifungal infection management, focusing on advancements in diagnostics, therapeutic options, and emerging research. Innovations in molecular diagnostics have revolutionized early pathogen identification, enabling more precise and timely interventions. However, challenges remain in their accessibility and cost-effectiveness, particularly in resource-limited settings. Developing novel antifungal agents, including next-generation azoles, echinocandins, and combination therapies, has expanded the therapeutic arsenal. Yet, issues such as toxicity, drug interactions, and resistance persist, necessitating continued exploration of alternative treatment strategies. This review also emphasizes the importance of global surveillance systems and interdisciplinary collaboration in addressing antifungal resistance and improving patient outcomes. Bridging the gaps between research and clinical practice requires concerted efforts to develop cost-effective diagnostics, novel therapeutics, and evidence-based guidelines tailored to diverse healthcare settings. By integrating advances in science with practical solutions, the future of antifungal infection management holds promise for more effective and equitable care.

Keywords: Immunocompromised, Antifungal Therapies, Pathogens, Diagnostics, Interdisciplinary.

Mitigation Strategies for Bioaccumulation of Environmental Microplastics

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ABSTRACT

Microplastics are one of the most widespread environmental pollutants, threatening both ecosystems, human health, and pharmaceutical safety. Their persistent bioaccumulation in aquatic water bodies, soil, and even food chains needs to take urgent measures to mitigate their presence and prevent further contamination. This review examines different mitigation approaches, including advanced filtration technologies, biodegradable alternatives, and regulatory frameworks designed to minimize the release of microplastics into the environment. Case studies such as the European Union's (EU) regulatory framework are designed to minimize microplastic release and restrict intentionally added microplastic in cosmetics and pharmaceuticals while mandating detailed reporting requirements. Nanocellulose-based membranes show a very good performance for microplastic removal and could be implemented in PWW treatment plants. Likewise, the development of biopolymer-based packaging and pharmaceutical excipients, like polylactic acid (PLA) and polyhydroxyalkanoates (PHA), provides a sustainable alternative to

traditional plastic formulations. In addition, the application of microplastic adsorption strategies has taken central place in environmental remediation, such as biochar and chitosan- based materials. In the pharmaceutical industry, the development of microplastic-free drug delivery systems and the incorporation of green chemistry principles are crucial for reducing the risks associated with microplastic contamination. Policy-driven solutions can be informed by regulatory efforts such as the EU's Microplastics Restriction Proposal and the U.S. Microbead-Free Waters Act. This review will offer actionable insights to pharmaceutical stakeholders to incorporate sustainable practices while protecting human and environmental health.

Keywords: Microplastic Bioaccumulation, Environmental Remediation, Sustainable Drug Formulations, Biodegradable Polymers, Regulatory Strategies.

Phytosomes: A Novel Approach to Enhance the Bioavailability of Natural Compounds

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ABSTRACT

Bioavailability refers to the fraction of an administered dose of a drug or active moiety from the drug product that is absorbed and becomes available at the target site for therapeutic action. Bioavailability enhancement focuses on increasing the rate and extent to which a substance is absorbed into the body. The improvement of bioavailability is mainly directed at increasing the rate and extent to which the active ingredient is absorbed into the body. This can be achieved by altering the drug's physical properties or by employing different formulations. Micronization, solid dispersions, prodrugs, encapsulation, and co-crystallization are examples of techniques used to improve bioavailability. Some works concerning lipid-based nanocarriers, known as phytosomes, greatly help in improving the pharmacokinetic and pharmacodynamic parameters of herbal-derived polyphenolic compounds. Herbal medicine and phytochemicals have attracted great attention in recent years as promising therapeutic agents for treating a wide range of ailments, including acute and chronic diseases. Despite their potential therapeutic benefits, as a result, they

often do not achieve high enough concentrations at the site of action to elicit the desired effect. However, poor bioavailability is one of the greatest limitations in their clinical usage. Consequently, bioavailability is regarded as a crucial obstacle to enhancing bio-efficacy regarding the delivery of dietary phytochemicals. Various approaches have been suggested to produce effective carrier systems for enhancing the bioavailability of phytochemicals. Of these, nano-vesicles, in particular, have emerged as promising entities for insoluble phytochemical delivery. The bilayer vesicles are easy to prepare and can be adjusted to a different size or composition; therefore, they have been widely used and widely recognized in the scientific literature.

Keywords: Bioavailability; Phytochemical; Nanomedicine; Phytosome; Delivery

General Considerations of Design and Development of Dosage Form: Pre-formulation Review

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ABSTRACT

The primary goal of formulation development is to convert active drug moiety into suitable dosage forms. This can be achieved by investigating the physicochemical properties of a drug substance alone and along with excipients before the formulation. The main objective of pre-formulation testing is to collect useful information to develop stable, bioavailable dosage forms with safety considerations. Pre-formulation investigations are designed to collect all necessary data, especially physicochemical, physico-mechanical, and biopharmaceutical properties of drug substances, excipients, and packaging materials. This review provides information about pre-formulation parameters such as physical & chemical properties, solubility, stability, storage, and precautions to ensure a quality product.

Keywords: Flow properties, Fourier transform infrared spectroscopy, Preformulation, solubility, Stability

Formulation And Evaluation of *Azadirachta Indica* Loaded Nanogel

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ABSTRACT

Azadirachta indica, commonly known as neem, is a medicinal plant renowned for its antimicrobial, anti-inflammatory, and wound-healing properties. This study focuses on the formulation, and evaluation of a nanogel incorporating *Azadirachta indica* extract to enhance its therapeutic efficacy and skin penetration for topical applications. The neem extract was obtained through cold maceration and subjected to phytochemical screening to confirm the presence of active constituents such as flavonoids, tannins, and alkaloids. Nanoparticles were prepared using a nanoprecipitation method, optimized for particle size, polydispersity index (PDI), and zeta potential. The optimized nanoparticles were then incorporated into a hydrogel matrix using carbopol 934 as a gelling agent. The prepared nanogel was characterized by its physical appearance, pH, spreadibility, viscosity, and drug content. *In-vitro* drug release studies were conducted to evaluate the release kinetics and mechanism. Furthermore, skin permeability studies confirmed enhanced transdermal delivery compared to conventional formulations. The nanogel exhibited superior antimicrobial activity against common skin pathogens, including Staphylococcus aureus and Escherichia coli. Stability studies conducted as per ICH guidelines demonstrated good shelf life under accelerated conditions. The findings suggest that *Azadirachta indica*-loaded nanogel offers a promising approach for skin infections and inflammation, leveraging the enhanced bioavailability and sustained release of active constituents. Further clinical studies are recommended to validate the therapeutic potential of this nanogel for commercial and medical use.

Keywords: *Azadirachta indica,* Nanogel, Neem, Nano-particles, Topical Drug Delivery, Antimicrobial Activity.

Innovative Approaches for Enhancing Bioavailability of Myrrh Using Buccal Patches

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ABSTRACT

Buccal drug delivery systems are gaining attention as a viable alternative to traditional oral administration, especially for drugs with poor bioavailability due to first-pass metabolism or gastrointestinal instability. The bioavailability of myrrh can vary depending on how it is consumed, whether as resign, extract, powder, or essential oil. Myrrh contains bioactive compounds such as sesquiterpenes and diterpenes, which are various health benefits. However, when taken orally, these compounds generally have low bioavailability due to poor absorption in the GIT. The use of specific formulations or delivery method (such as buccal patch, nano-emulsion, liposomal encapsulation) improve the absorption of its active compounds. Buccal patches, which adhere to the mucosal lining of the mouth, enable the controlled and sustained release of drugs directly into the systemic circulation through the richly vascularized buccal mucosa. This method offers advantages such as improved drug stability, reduced dosing frequency, and enhanced patient adherence. Advanced polymers with enhanced mucoadhesive properties, the inclusion of permeation enhancers to boost drug absorption, and nanotechnology-based delivery systems for better solubility and targeted action. Buccal patch technology emphasizing innovative techniques to improve drug bioavailability and therapeutic efficacy. Challenges such as mucosal irritation, limited drug capacity, and variability in absorption are addressed, along with strategies to overcome these limitations. These developments highlight the potential of buccal patches as a transformative drug delivery platform, offering new possibilities for treating a wide range of diseases.

Keywords: Buccal drug delivery, Bioavailability enhancement, Permeation enhancers, Nanotechnology-based drug carriers, First-pass metabolism, Advanced drug delivery systems.

Pharmacokinetics and Pharmacodynamics of 1,2,3-Triazole

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ABSTRACT

The 1,2,3-Triazole framework attracted immense attention in pharmaceutical research due to its broad biological activity and potential as a therapeutical agent. This abstract intends to give an overview of the pharmacokinetics (PK) as well as pharmacodynamics (PD) of 1,2,3-triazole derivatives by focusing on their absorption, distribution, metabolism, excretion, and mechanism of actions. The effects of structural alterations on bioavailability, half-life, and tissue penetration are examined in the PK section, along with the function of cytochrome P450 enzymes in metabolism. We also look at how formulation techniques affect systemic exposure and medication release characteristics. We examine how 1,2,3-triazole chemicals interact with several molecular targets, such as enzymes, receptors, and ion channels, in relation to Parkinson's disease (PD), emphasizing their potential for use in antifungal, anticancer, and antibacterial treatments. We also go over these compounds' potential side effects, therapeutic windows, and dose-response relationships. Optimizing the therapeutic use of 1,2,3-triazole derivatives and directing future drug development require an understanding of their PK/PD characteristics. In addition to providing insights into improving the efficacy and safety profile of 1,2,3-triazole-based medicines, this work highlights the significance of an integrated strategy in drug design.

Keywords: 1,2,3 Triazole, Pharmacokinetics, Pharmacodynamics, ADME, SAR.

Preparation And Evaluation of a Sustained Release Matrix Tablet

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ABSTRACT

The study developed and evaluated an oral controlled-release paracetamol tablet using wet granulation. Polymers like hydroxypropyl methylcellulose, microcrystalline cellulose, and polyvinyl pyrrolidone controlled drug release. Granules were assessed for micromeritic properties, then lubricated and compressed. Tablets were tested for friability, hardness, active ingredient content, in-vitro dissolution, and release kinetics.

Drug content was determined using UV Spectrophotometer at a wavelength of 243nm. The *in - vitro release* study of matrix tablet was carried out in 0.1M phosphate buffer with pH6.8 for 12 hours. The prepared matrix tablet showed 59.97% drug release over a period of 12 hours establishing its sustained release. Pharmacokinetic models were applied to the release kinetics such as Higuchi model, Hixson Crowell model, Korsmeyer- Peppas model. The tablet passed the evaluation parameters as per Indian Pharmacopoeia. Angle of repose was in range of 25-30, Carr's index was in range 12-16, Hausner's ratio was in range 1.00 -1.11 and the tablet followed Hixson Crowell model showing R^2 value of 0.9701 as compared to other models such as zero order R^2 value is 0.905, first order R^2 value is 0.9034, Higuchi R^2 value is 0.8039, Korsmeyer Peppas R^2 value is 0.9546.

The drug release from the tablet indicates that the cube root of the released amount of the incorporated drug is linearly related to the time, which is specifically a system its surface alters over time.

Keywords: Sustained release, matrix tablet, micromeritic properties, dissolution, pharmacokinetic model, U.V spectroscopy.

In Silico and In Vitro Evaluation of *Harpagophytum procumbens* (Devil's Claw) for Anti-Arthritic Potential: A Preclinical Approach Using Wistar Rats

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ABSTRACT

The chronic autoimmune and inflammatory disease known as rheumatoid arthritis (RA) is typified by joint damage, synovial hyperplasia, and chronic discomfort. A medicinal herb that has long been used to treat inflammatory diseases, *Harpagophytum procumbens*, sometimes known as Devil's Claw, has demonstrated encouraging anti-arthritic properties. Using in vitro pharmacological tests and in silico molecular docking, this study examines its effectiveness. Molecular docking techniques were used to identify and screen the active phytoconstituents of *Harpagophytum procumbens* for their binding affinity toward important molecular targets involved in arthritis pathogenesis, including cyclooxygenase-2 (COX-2), tumour necrosis factor-alpha (TNF-α), and interleukin-6 (IL-6). The extract's safety profile was evaluated by cytotoxicity tests, while the in-vitro anti-arthritic effectiveness was evaluated using egg albumin protein denaturation inhibition and human red blood cell membrane stabilization assays. The bioactive components of *Harpagophytum procumbens* showed high interactions with inflammatory mediators, according to the in-silico docking data, which may indicate a mechanism for the plant's anti-arthritic properties. The in-vitro tests also demonstrated a strong anti-inflammatory effect, as evidenced by the dose-dependent suppression of membrane stabilization and protein denaturation. Furthermore, investigations on cytotoxicity showed a large margin of safety, supporting the plant's potential for medicinal use. These results demonstrate that *Harpagophytum procumbens* has the potential to be an effective anti-arthritic medication that also inhibits inflammatory mediators. The study offers a solid scientific foundation for more in-vivo research and clinical studies to determine its safety and effectiveness in treating arthritis.

Keywords: *Harpagophytum procumbens*, Devil's Claw, rheumatoid arthritis, in silico, in vitro, anti-inflammatory.

TDDS: - Innovative Pharmaceutical Developments and Recent Advancements

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ABSTRACT

Pharmaceutical Relevance: Transdermal drug delivery systems (TDDS) offer a non-invasive and convenient alternative to conventional needle injections, providing sustained drug release and reduced side effects. TDDS is particularly relevant in the pharmaceutical industry for chronic disease management and in the cosmetic industry for localized treatments, offering both patient compliance and enhanced therapeutic efficacy. Aim of the Study: This study aims to focus on the advancements made to overcome the limitations of skin permeability and delivery systems. It highlights key developments, including microneedle technologies, and evaluates the advantages and disadvantages of various TDDS approaches. Materials and Methods: A thorough review of current literature on TDDS was conducted, including patch-based systems, microneedles, iontophoresis, sonophoresis, and chemical enhancers. Studies on the physicochemical properties of the skin and methods used to enhance drug penetration were examined to assess the effectiveness and potential of each approach. Results: The review identified several promising TDDS methods. Patch-based systems are effective for controlled release, while microneedles show significant potential for delivering large molecules and biologics. Advanced technologies, such as iontophoresis and sonophoresis, have also shown efficacy in enhancing skin permeability. Despite these advances, challenges such as skin irritation, drug limitations, and device complexity remain. Conclusion: TDDS presents a highly effective and patient-friendly drug delivery approach with applications in both pharmaceuticals and cosmetics. While significant progress has been made, ongoing research and technological innovations, especially in microneedle technology, are essential to address the existing challenges and expand the clinical use of TDDS.

Keywords: Transdermal Drug Delivery System, Controlled and Sustained Drug Release, Skin Permeability, Microneedles.

Enhancement of Calendula officinalis Bioavailability: A Promising Approach

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ABSTRACT

The bioavailability calendula officinalis refers to its active compounds how effectively absorbed by the body. Bioavailability of calendula officinalis vary based on the method of ingestion. Calendula officinalis commonly applied topically (cream, ointment) and orally (capsule, tincture) and it contain active ingredient like flavonoids, triterpenoids, and carotenoids, are moderately absorbed when consume it orally. The bioavailability can improve by changing their formulation. Nano-emulgel a hybrid formulation combining nanoemulsion and gel base has emerged as a promising solution to enhance the bioavailability of drugs. This system leverages the advantages of both components nanoemulsion improve drug solubility and stability, and the gel matrix provides controlled release and targeted delivery. The nanoemulgel formulation significantly enhances drug permeation across biological membranes, they increase absorption and bioavailability. Particle size, drug loading, and gel viscosity is essential for maximizing the therapeutic potential of nanoemulgel. In vitro and in vivo studies have demonstrated their effectiveness in improving the solubility, stability, and absorption of drugs, making nanoemulgel an ideal formulation for advanced drug delivery systems.

Keywords: Nanoemulgel, Bioavailability, Pharmacokinetics, Drug Delivery, Topical Formulation.

Pre-formulation Blueprint For mRNA Vaccines: Challenges, Solutions And Innovations

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ABSTRACT

mRNA technology is becoming increasingly prominent due to its transformative applications in medicine. Two highly promising uses are the treatment of off-target gene disorders and the development of mRNA vaccines for combating viruses and cancer. Remarkably, mRNA can act as a self-regulating stress modulator, with translated peptides processed through MHC-I complexes, leading to the activation of cytotoxic T lymphocytes that target and destroy malignant cells. The production process for mRNA vaccines is simple, rapid, and cost-effective. These vaccines stimulate the immune system without interacting with the host's nuclear genetic material, eliminating the risk of genomic integration. Advances in neo-epitope discovery and cancer gene sequencing have made mRNA vaccines a leading option for personalized cancer therapies. Vaccination remains one of the most effective tools for preventing infectious diseases. To reduce mortality, morbidity, and transmission during epidemics or pandemics, vaccines must be developed quickly and made widely available. However, vaccine development and distribution have proven challenging, particularly in resource-limited regions, as observed during the COVID-19 pandemic. Many low- and middle-income countries faced restricted access to vaccines developed in high-income nations due to high costs, as well as complex storage, transportation, and delivery requirements. Domestic vaccine production would significantly improve global access. A crucial factor in expanding vaccine availability is the local production of adjuvants, which are essential for enhancing and directing immune responses to specific antigens. Ensuring the local availability of adjuvants would accelerate immunization efforts and support the development of traditional subunit vaccines, enabling faster protection for populations worldwide.

Keywords: mRNA, vaccines, off-target gene disorders, immunization.

Drug Repurposing: Transforming Healthcare and Addressing Unmet Needs

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ABSTRACT

Drug repurposing has become an effective drug discovery technique, drastically cutting down on the time and expense of conventional drug development. This method speeds up the process of finding new therapeutic indications for well-known medications by utilizing the safety and efficacy data already available. Since many medications interact with several biological targets, increasing their potential uses, polypharmacology is essential to repurposing. Molecular docking, machine learning, and network pharmacology are examples of computational advances that have made it possible to analyze drug databases at high throughput and more precisely identify viable candidates. Confirming the effectiveness of repurposed medications still requires experimental validation using preclinical models and cell-based assays. The effectiveness of this strategy has been shown by a number of success stories, where medications that were initially created to treat one ailment have turned out to be helpful for completely different illnesses. For example, antivirals have been repurposed for cancer treatment and neurological diseases. Off-target consequences, extensive regulatory approval procedures, intellectual property issues, and the requirement for strong clinical validation are still obstacles, yet. Although regulatory bodies are modifying their frameworks to allow for the repurposing of drugs, regional differences in approval procedures may hinder market penetration. Drug repurposing is still an essential strategy for meeting unmet medical needs in spite of these obstacles, especially in uncommon diseases and newly developing infectious diseases where new medicines are desperately needed.

Keywords: Drug repurposing, drug repositioning, drug discovery, drug development, polypharmacology, computational drug discovery

Formulation And Evaluation of Floating Pulsatile Drug Delivery System Of Metoprolol Tartrate.

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ABSTRACT

The objective of present investigation was to prepare and evaluate a floating pulsatile drug Delivery system of metoprolol tartrate. The prepared floating pulsatile delivery system consisted Of three different parts: a core tablet, containing the active ingredient, an erodible outer shell And a top cover buoyant layer. The rapid release core tablet (RRCT) was prepared by using Superdisintegrants along with active ingredient. Dry coating of optimized RRCT was done by Using different grades of hydroxy propyl methyl cellulose (HPMC) E5, E15, and E50 and upper Most buoyant layer was prepared with HPMC K15M and sodium bicarbonate. Developed Formulations were evaluated for their physical characteristics, drug content, in vitro Disintegration time, in vitro drug release profile (lag time), floating lag time, floating time .On the basis of these evaluation parameters it was found that optimized Floating pulsatile release formulation (FPRT) F9 showed floating lag time of 4 min, floating time Of 12 hrs and release lag time of 6 hrs. The F9 formulation showed compliance with Chronotherapeutic objective of hypertension.

Keywords: Chronotherapy, Floating pulsatile release tablet, Metoprolol tartrate, Lag time, Floating time.

Role of Artificial Intelligence in Management of Paediatric Diabetes

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ABSTRACT

Artificial intelligence is a very active computer science field aiming to develop systems that mimic human intelligence and is helpful in many human activities, including medicine. Paediatric endocrinology, as a subspecialty of paediatrics, encompasses a wide range of endocrine abnormalities. Numerous chronic afflictions that were once postulated to be conditions of adults alone are now being seen commonly in paediatric population. Since paediatric diabetes is most prevalent problem, hence our study focuses on the solutions AI can provide in dealing with the complications of the same. An automated artificial intelligence - based dependent decision support system (AI-DSS) is as effective and safe as those guided by physicians in controlling glucose levels. A Smartphone system (GoCARB), which is especially for patients with Type-1 diabetes and can estimate the Carbohydrate content in meals. The following study will deal with the various mechanisms of artificial intelligence involving machine learning, deep learning, natural language processing, computer vision and reinforcement learning and their applications in paediatric diabetes.

Keywords: Artificial intelligence, metabolic disorders, machine learning, deep learning

Artificial Intelligence in Drug development

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ABSTRACT

Drug development is changing as a result of artificial intelligence (AI), which speeds up discovery, improves molecular design, and improves clinical results. Large biological datasets are processed by advanced machine learning (ML) and deep learning algorithms to find potential therapeutic targets, forecast molecular interactions, and improve lead molecules. While generative AI helps create new pharmaceutical molecules, natural language processing (NLP) draws valuable insights from scientific literature. based on artificial intelligence models help with drug recycling, toxicity assessment, and personalised medicine by customising therapies for each patient's unique profile.AI helps with regulatory decision-making, promotes patient selection in clinical trials, and tracks side effects, all of which contribute to more accurate and economical medication development. By improving pharmacokinetic modelling and toxicity predictions, AI-powered simulations lessen reliance on conventional laboratory testing. AI also speeds up high-throughput screening by understanding complex biochemical relationships, which significantly decreases down on the time needed for drug discovery. Drug development is becoming more dependent on data, quicker, and more efficient as a result of the use of AI into pharmaceutical research. AI is transforming the development of novel therapeutics by lowering costs and increasing success rates. It is anticipated that technology will play an increasingly significant role in modern medicine as it develops, promoting innovation to improve patient outcomes.

Keywords: Artificial Intelligence (AI), Drug Discovery, Molecular Design, Clinical Trials, Innovation in Medicine

Unveiling the Anti-Arthritic Potential of *Salix alba*: In Silico and In Vitro Investigations on Wistar Rats

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ABSTRACT

Chronic joint inflammation is a hallmark of rheumatoid arthritis (RA), a progressive inflammatory disease that causes pain, stiffness, and cartilage destruction. Even if there are traditional treatments available, their drawbacks and restrictions make it necessary to look for safer, plant-based substitutes. Traditionally used for its analgesic and anti-inflammatory qualities, *salix alba*, sometimes known as white willow, has drawn attention as a possible anti-arthritic medication. This work uses in vitro pharmacological assessments and in silico molecular docking to explore its medicinal potential. Molecular docking techniques were used to identify and analyse the active phytoconstituents of *salix alba* for their binding affinity toward important inflammatory mediators, such as cyclooxygenase-2 (COX-2), tumour necrosis factor-alpha (TNF-α), and interleukin-6 (IL-6). To evaluate its anti-arthritic properties, in vitro procedures such as membrane stability and protein denaturation inhibition were performed. Furthermore, cytotoxicity tests were conducted to assess its safety profile for possible medical uses. Strong interactions between *salix alba's* bioactive components and pro-inflammatory targets were shown by molecular docking research, suggesting a possible mode of action for the treatment of arthritis. Its strong anti-inflammatory properties were further supported by the in vitro data, which showed a dose-dependent suppression of membrane stabilization and protein denaturation. Furthermore, cytotoxicity tests showed little toxicity, indicating that it could be used therapeutically. The results of this investigation offer scientific proof of *salix alba's* anti-arthritic properties. To confirm its effectiveness and establish its function as a natural option for the treatment of RA, more in vivo research and clinical trials are necessary. This study demonstrates the potential of herbal therapy in the treatment of autoimmune and inflammatory diseases.

Keywords: *Salix alba*, White Willow, rheumatoid arthritis, in silico, in vitro, anti-inflammatory.

A comprehensive study of facial serum and castor oil in skincare

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ABSTRACT

This study explores the integration of castor oil into facial serum formulations, emphasizing its potential benefits for modern dermatological applications. Facial serums are concentrated skincare formulations designed to address specific dermatological concerns, including xerosis, cutaneous aging, and textural irregularities. Castor oil, characterized by its high content of ricinoleic acid, exhibits significant emollient and humectant properties, contributing to enhanced hydration and barrier function. Its inclusion in serum formulations has been observed to facilitate the transdermal delivery of bioactive compounds, thereby augmenting their therapeutic efficacy. This research examines the role of castor oil in improving skin hydration, elasticity, and regenerative capacity within serum-based applications. Through a systematic review of scientific literature and experimental analysis, the study elucidates its potential in mitigating transepidermal water loss, promoting collagen biosynthesis, and fortifying the epidermal barrier. Additionally, its anti-inflammatory and antimicrobial attributes suggest its suitability for individuals with reactive or compromised skin conditions. A comparative analysis of castor oil-infused serums versus formulations incorporating other lipid-based emollients underscores its superior moisture retention and protective capabilities. Moreover, the study addresses key formulation challenges, including physicochemical stability, compatibility with active ingredients, and dermatological safety. This presentation will provide a comprehensive overview of formulation strategies, functional advantages, and emerging trends in the application of castor oil in facial serums. The findings aim to support both industry professionals and consumers in making informed decisions regarding the use of castor oil in skincare innovations.

Keywords: Anti-inflammatory, Ageing, Facial serum, Castor oil, Ricinoleic acid.

Narrative Review on Ibrutinib: A New Targeted Therapy for Hematologic Cancers

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ABSTRACT

Ibrutinib is a potent and highly selective irreversible BTK inhibitor. It has transformed the treatment of B-cell lymphomas, particularly mantle cell lymphoma and chronic lymphocytic leukaemia (CLL). It is thought that BTK is essential for the survival and activation of healthy and cancerous B-cells. In recent years, an oral BTK inhibitor called ibrutinib has emerged as a ground-breaking treatment for haematological malignancies such as chronic lymphocytic leukaemia. The viability of ibrutinib, though, could not end there. This drug has been identified to inhibit several additional kinases linked to solid cancers (EGFR, HER2). Recent findings suggest BTK may be a target for anti-solid tumour treatment. As a result, research has been done on ibrutinib, a BTK-inhibitor, as a potential treatment for solid tumours. This review provides an in-depth analysis of intriguing medication, emphasising its mechanism of action, metabolism, safety profile, clinical studies, authorised applications, and prospects in the future.

Keywords: Ibrutinib, Targeted Therapy, BTK inhibitor

Unravelling Pharmacokinetics of Novel Drug Delivery System for Management of Various Disorders

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ABSTRACT

Novel drug delivery systems are designed to address the limitations of conventional drug delivery system including abbreviated half-life, inadequate targeting, low solubility, and bioavailability. Recent drug delivery systems such as nanoparticles, molecular imprinted polymers and 3D printing technology, have emerged as cutting-edge drug delivery technologies. NDDS is a pivotal strategy for achieving targeted and precise drug delivery. NDDS offers numerous key advantages over conventional drug delivery system such as enhanced drug stability and minimize degradation; optimize drug distribution, leading to increased target concentration, and reduced adverse reactions; precise drug localization, timing and targeted release; decreased therapeutic dosage that reduce the toxicity and elevated therapeutic index. It has been documented that with recent advancement in novel drug delivery systems, pharmacokinetic evaluations have gained immense popularity among researchers as a central part of study of NDDS. ADME of any drug needs to be considered primarily for achieving any therapeutic goal through NDDS for the final clinical evaluations. Recently developed carrier-based drug delivery system such as liposomes are characterized by their order bilayers of lipids forming enclosed vesicles, possess a hydrophobic shell and hydrophilic core, with a particle size ranging from 20-1000 nm. Liposomes are prevalent strategy for facilitating drug permeation across the blood brain barrier. It is also well reported that liposomes modified with transferrin have demonstrated efficient drug transport capabilities and may be proved as a boon for delivery of various drugs.

Keywords: NDDS, Pharmacokinetics, Liposomes, Carrier-based drug delivery system, ADME.

Lipid Nanoparticles: An Innovative approach in Diabetes Management

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ABSTRACT

Among the numerous challenges in managing diabetes mellitus (DM) are the requirement for efficient blood glucose regulation and the shortcomings of the available insulin delivery systems, which frequently include daily subcutaneous injections. Because they provide better medication stability, increased bioavailability, and controlled release patterns, lipid nanoparticles (LNPs) have become a game-changing invention in the treatment of diabetes. LNPs are perfect vehicles for insulin and other antidiabetic medications due to their biocompatibility and capacity to encapsulate both hydrophilic and lipophilic medications. By simulating natural insulin release and lowering a patient's reliance on injections, LNP-based solutions, such as solid lipid nanoparticles (SLNs) and nanostructured lipid carriers (NLCs), have shown promise in overcoming the challenges related to oral insulin administration. Additionally, by offering tailored distribution, these nanoparticles improve therapeutic results and lessen systemic negative effects. Lipid nanoparticles have the potential to completely transform diabetes treatment as research progresses by offering safer, more efficient, and more palatable treatment alternatives.

Keywords: Diabetes mellitus, Lipid Nanoparticles, Insulin Delivery, Solid Lipid Nanoparticles (SLNs), Nanostructured Lipid Carriers (NLCs), Controlled Drug Release

Solid Phase Peptide Synthesis, Characterization and Antibacterial activity of Temporin-L Analogue

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ABSTRACT

Antimicrobial resistance (AMR) is a serious global concern and a huge burden on the healthcare system. Antimicrobial peptides (AMPs) are considered as a solution of AMR due to their membrane-lytic and intracellular mode of action and therefore resistance development against AMPs is less frequent. One such AMPs, temporin-L (TL) is a 13-mer peptide reported as a potent and broad-spectrum antibacterial agent with significant immunomodulatory activity. However, TL is toxic to human erythrocytes at their antibacterial concentrations and therefore various analogues were synthesized with potent antimicrobial activity and lower hemolytic activity. In this work, we have replaced phenylalanine with cyclohexyl-alanine with help of solid phase peptide synthesis and characterized for their correct sequence by using of UPLC-MS method.

Further we have evaluated the antibacterial activity of synthesized analogues by broth microdilution assay against representative gram-positive and gram-negative bacterial strains and found significant antibacterial activity with minimum inhibitory concentrations (MIC) in the range of 3.1-15.6 µM concentrations. Due to insertion of cyclohexyl-alanine in the sequence of temporin-L the resulting analogues will be more protease stable in comparison to native analogue. To prove that the therapeutic potentials of these molecules further warrants toxicity studies and mode of action studies of these peptides in bacteria or bacterial mimetic conditions. Overall, the new synthesized analogues gave a new analogue of temporin-L peptide and can design further novel and potent therapeutics against evolving drug-resistant pathogens.

Keywords: Antimicrobial resistance, cyclohexyl-alanine, UPLC-MS, temporin-L (TL)

In Silico Screening, Synthesis, and Biological Evaluation of Thiadiazole and Its Derivatives for Potent Antidiabetic Activity

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ABSTRACT

Derivatives of thiadiazole have garnered a lot of interest because of their wide range of biological functions, especially their potential for treating diabetes. In order to design, synthesize, and assess the antidiabetic efficacy of several Thiadiazole derivatives, this project will combine in-silico and experimental methodologies. Compounds having a high binding affinity for important antidiabteic targets will be found using molecular docking and in-silico screening, indicating their potential as strong antidiabetic medicines. Then, utilizing effective, economical, and ecologically friendly techniques, the discovered lead compounds will be produced. To verify their chemical identity and purity, structural elucidation will be carried out utilizing spectroscopic methods such nuclear magnetic resonance (NMR) and mass spectrometry. Through in-vivo models, the produced compounds will undergo biological evaluation to determine their potential as antidiabetic agents. According to in-silico projections, a number of thiadiazole derivatives are expected to have strong antidiabetic effects. By bridging the gap between computational modeling and experimental validation, this study offers a methodical approach to facilitating the development of new antidiabetic drugs based on Thiadiazole scaffolds. It is anticipated that the findings may help develop diabetic treatments by identifying potential drug candidates with better efficacy and safety records. These discoveries will help refine molecules based on thiadiazole for more pharmacological research, ultimately leading to the development of clinically effective antidiabetic medications. This study intends to increase therapy options and provide novel approaches to diabetes care by combining computational and experimental approaches.

Keywords: Thiadiazole derivatives, Antidiabetic activity, In-silico screening, Molecular docking, Synthesis, Drug design

Antioxidant & Anti-inflammation Properties of Marine Algae in Gastric Mucosal Protection

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ABSTRACT

Marine algae have garnered significant attention for their bioactive compounds, which exhibit diverse therapeutic properties, including antioxidant and anti-inflammatory effects. These properties play a crucial role in protecting the gastric mucosa from damage caused by oxidative stress and inflammation, often induced by non-steroidal anti-inflammatory drugs (NSAIDs), alcohol, and other gastrointestinal irritants. This study highlights the protective potential of marine algae in mitigating gastric mucosal injury, with a focus on the antioxidant and anti-inflammatory properties of their bioactive constituents, such as phlorotannin's, fucoidans, carotenoids, and sulphated polysaccharides. The antioxidant activity of marine algae helps neutralize reactive oxygen species (ROS) and prevent lipid peroxidation in gastric tissues, thereby reducing cellular damage. Simultaneously, the anti-inflammatory properties inhibit the release of pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-α) and interleukins, while downregulating key inflammatory mediators, including cyclooxygenase (COX) enzymes. These dual mechanisms contribute to maintaining gastric mucosal integrity and accelerating tissue repair.

Experimental and clinical studies have demonstrated that marine algae-derived compounds can effectively reduce gastric ulceration and inflammation, offering a promising natural alternative to conventional therapies. The findings underscore the need for further exploration of marine algae as a novel therapeutic resource for gastric mucosal protection, paving the way for future pharmaceutical applications.

Keywords: Marine algae, antioxidant, anti-inflammatory, gastric mucosal protection, phlorotannin's, fucoidans, oxidative stress, inflammation.

Pharmacological Evaluation of Diverse Extracts of *Solanum nigrum*: A Multi-Target Approach

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ABSTRACT

Solanum nigrum (Black Nightshade) has been traditionally utilized for its therapeutic properties. This study systematically evaluates the bioactivity of different solvent extracts to evaluate its medicinal significance scientifically. Aqueous, ethanolic, methanolic, and chloroform extracts of *Solanum nigrum* were prepared and analyzed for phytochemical composition. The extracts were subjected to antioxidant (DPPH and FRAP assays), anti-inflammatory (protein denaturation and carrageenan-induced paw edema), hepatoprotective (CCl_4-induced liver toxicity in animal models), antimicrobial (agar well diffusion against bacterial and fungal strains) evaluations. Phytochemical screening confirmed the presence of alkaloids, flavonoids, tannins, and saponins, with the methanolic extract exhibiting the highest bioactive content. Antioxidant assays revealed potent radical scavenging activity (IC_{50} = 38.6 µg/mL). The anti-inflammatory assay showed significant inhibition of protein denaturation (67.3% at 200 µg/mL). Hepatoprotective effects were evident, with reduced serum ALT and AST levels in treated groups. Antimicrobial studies demonstrated strong inhibition against *Escherichia coli* (18 mm zone of inhibition) and *Staphylococcus aureus* (16 mm). The findings highlight *Solanum nigrum* as a promising medicinal plant with multi-faceted pharmacological benefits. Among the extracts, methanol exhibited the highest bioactivity, reinforcing its therapeutic potential. This research contributes to the scientific foundation for the development of herbal formulations based on *Solanum nigrum*.

Keywords: *Solanum nigrum*, phytochemistry, multi-target activity, medicinal plants, hepatoprotection, antioxidant, antimicrobial.

The Role of Iron in Myelination, Neuroprotection, and Oxidative Stress: Challenges and Innovations in Drug Development for Traumatic Brain Injury

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ABSTRACT

Healthy brain development and function depend on a variety of factors. on processes that require iron, which aid in the release of neuroprotective chemicals and supports neuron health. However, completely removing iron can lead to oxidative stress, exacerbating issues like brain injuries. At low levels, iron can damage mitochondria, trigger inflammation, and generate reactive oxygen species; on the other hand, at high levels, it can promote certain behaviors and stimulate axon growth. This complex role of iron in the brain makes medical treatments for traumatic brain injury (TBI) more challenging. Recent advancements in medicine have focused mainly on reducing cellular antioxidant damage without enhancing iron's neuroprotective and myelination-supporting effects. New treatment strategies are being investigated, such as targeted antioxidants, detoxification therapies, and nanoparticle-based drug delivery systems. As we gain a deeper understanding of the complex relationship between iron and TBI, various pharmaceutical approaches that maintain proper iron balance will be explored as potential therapies. Given the ongoing difficulties in translating these findings into effective treatments, further research is crucial to optimize iron management in injured brains. An overview of TBI underscores the links between oxidative stress, myelination, iron, and neuroprotection, highlighting the significance of understanding iron's role in TBI for successful drug development.

Keywords: Iron breakdown, Myelination, Neuroprotection, Oxidative stress, Traumatic brain injury (TBI), Iron homeostasis, Reactive oxygen species, Neuroinflammation

Enzymatic medication of starch for sustainable drug delivery system

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ABSTRACT

Starch, a naturally abundant and biodegradable polysaccharide, is widely used in drug delivery systems due to its biocompatibility and renewability. However, native starch has limitations such as poor mechanical strength, high solubility, and rapid degradation, which restrict its effectiveness in controlled drug release applications. Enzymatic modification of starch is an emerging approach that can help overcome these limitations by selectively altering its molecular structure, thereby enhancing its stability, mechanical properties, and resistance to degradation. Unlike chemical modification, enzymatic treatment offers a greener, milder process that avoids the use of harmful reagents, making it more suitable for pharmaceutical applications. Enzymes such as amylases and pullulanases can modify starch by introducing cross-linkages or selectively hydrolyzing amylopectin and amylose chains, which results in tailored swelling behavior, reduced solubility, and a more consistent drug release profile. This study aims to investigate the impact of enzymatic modification on the structural and functional properties of starch for sustained drug delivery applications. By addressing the limitations of native starch, enzymatic modification holds promise for developing efficient, eco-friendly drug delivery systems, supporting a shift toward sustainable pharmaceutical materials without compromising performance.

Keywords: Enzymatic medication, Starch modification, Drug delivery, crosslinking

Quantitative Estimation of Leukotriene Antagonist in Nasal Fabrication

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ABSTRACT

Leukotriene antagonists are a class of medications used to treat allergic rhinitis and asthma by blocking the action of leukotrienes, inflammatory chemicals that contribute to airway constriction and inflammation. This study focuses on the development and validation of a sensitive and accurate analytical method for the quantitative determination of a leukotriene antagonist in nasal formulations. The method involves analytical technique, e.g., HPLC. Method parameters such as selectivity, linearity, accuracy, precision, and robustness were evaluated according to ICH guidelines. The developed method was successfully applied to the analysis of the leukotriene antagonist in nasal sprays and other dosage forms. This validated method provides a reliable tool for quality control, stability studies, and bioequivalence studies of nasal formulations containing leukotriene antagonists, ensuring their safety and efficacy.

Keywords: HPLC, ICH Guidelines, Leukotriene, Rhinitis, quality control, stability studies, and bioequivalence studies

Investigating the Role of NLCs in Overcoming Blood-Brain Barrier Limitations for Parkinson's Disease Treatment

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ABSTRACT

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by the depletion of dopaminergic neurons in the substantia nigra. The blood-brain barrier (BBB) presents a significant challenge in delivering therapeutic agents to the central nervous system (CNS), limiting the efficacy of conventional treatments. Nanostructured Lipid Carriers (NLCs) have emerged as a promising strategy to enhance drug permeability and bioavailability in PD management. These lipid-based nanosystems offer several advantages, including improved drug stability, controlled release, and enhanced brain targeting through various transport mechanisms such as endocytosis and transcytosis. Additionally, NLCs protect bioactive compounds from enzymatic degradation, thereby prolonging their therapeutic action. Recent research has demonstrated that NLCs encapsulating neuroprotective agents like Piperine can significantly enhance CNS bioavailability, potentially improving PD treatment outcomes. By modulating oxidative stress, neuroinflammation, and mitochondrial dysfunction, these carriers contribute to neuroprotection and symptomatic relief. The versatility of NLC formulations further enables the co-delivery of multiple therapeutic agents, paving the way for personalized treatment approaches. Despite promising advancements, challenges such as large-scale production, long-term stability, and regulatory approval must be addressed before clinical translation. Future investigations should focus on optimizing formulation parameters, exploring novel lipid compositions, and conducting in vivo studies to validate their therapeutic efficacy. NLCs hold significant potential in overcoming BBB limitations, offering a novel and effective approach for Parkinson's disease treatment.

Keywords: Nanostructured Lipid Carriers, Blood-Brain Barrier, Parkinson's Disease, Neuroprotection, Drug Delivery

Advanced Analytical Techniques for Marker Profiling and Quality Assessment of Glycyrrhetinic Acid in Ayurvedic Formulations

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ABSTRACT

The quality assessment and standardization of Ayurvedic formulations are essential to ensure their safety, efficacy, and therapeutic consistency. Glycyrrhetinic acid, a bioactive compound derived from Glycyrrhiza glabra, possesses significant pharmacological properties, including anti-inflammatory, hepatoprotective, and immunomodulatory effects. However, variations in its concentration across different formulations necessitate the development of reliable analytical techniques for marker profiling and quantification. This study focuses on advanced analytical methodologies for the rapid and precise estimation of glycyrrhetinic acid in selected Ayurvedic formulations. High-performance liquid chromatography (HPLC), high-performance thin-layer chromatography (HPTLC), and UV-visible spectrophotometry were employed to assess the presence and concentration of glycyrrhetinic acid. Various extraction techniques, including solvent-assisted and ultrasonic-assisted methods, were optimized to achieve maximum recovery. The developed methods were validated as per ICH guidelines for parameters such as linearity, accuracy, precision, and robustness. The study revealed significant variations in glycyrrhetinic acid content across different formulations, highlighting the necessity of stringent quality control measures. The optimized analytical methods demonstrated high sensitivity and reproducibility, making them suitable for routine quality assessment in the herbal pharmaceutical industry. The findings emphasize the importance of marker-based standardization to enhance the reliability of Ayurvedic medicines. This research contributes to the advancement of herbal drug standardization by providing a scientific approach for the quality evaluation of glycyrrhetinic acid.

Keywords: Glycyrrhetinic Acid, Marker Profiling, Quality Assessment, Ayurvedic Formulations, Advanced Analytical Techniques

Applications of artificial intelligence (AI) in pharmaceutical formulations

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ABSTRACT

Pharmaceutical formulations are undergoing a revolution thanks to artificial intelligence (AI), which is increasing medication discovery, formulation design, and manufacturing efficiency. Machine learning (ML), deep learning (DL), and neural networks are examples of AI-driven approaches that make predictive modeling for drug-excipient interactions, bioavailability optimization, and stability evaluations easier. AI speeds up the process of finding the best drug compositions by evaluating large datasets, which lowers the time and expense of formulation development. Personalized medication, controlled-release mechanisms, and Nano formulations are just a few of the precise drug delivery system designs made possible by AI-powered computational tools. The use of predictive analytics aids in the selection of excipients that minimize toxicity while improving drug solubility and bioavailability. Through real-time monitoring and predictive maintenance, AI-driven automation improves process control in manufacturing, guaranteeing consistency, quality, and regulatory compliance. AI also helps with regulatory compliance by automating paperwork and guaranteeing that Good Manufacturing Practices (GMP) are followed. Large-scale pharmaceutical production is further optimized by its combination with robotics and digital twins. AI-powered simulations encourage ethical and sustainable drug development methods by reducing the need for intensive in vitro and in vivo testing. Regulatory obstacles, data privacy issues, and the requirement for interdisciplinary cooperation are some of the obstacles that prevent AI from being widely used in pharmaceutical formulations, despite its revolutionary promise.

Keywords: Artificial intelligence, machine learning, drug formulation, bioavailability optimization, predictive analysis, regulatory compliance.

Innovative RP-HPLC Method Development and Validation for Asiatic Acid Quantification in Centella Asiatica Hydrogel Formulations

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ABSTRACT

RP-HPLC and RP-UPLC are crucial analytical tools for separating and quantifying pharmaceutical compounds. Asiatic acid, derived from *Centella asiatica*, is widely studied for its therapeutic benefits. Recent advancements, such as Design of Experiments (DoE), Quality by Design (QbD), and artificial intelligence, have revolutionized method development, enabling robust, efficient, and precise chromatographic analysis. This study aims to develop and validate RP-HPLC and RP-UPLC methods for quantifying Asiatic acid in hydrogel formulations. The objective includes optimizing critical parameters and leveraging advanced techniques like DoE, QbD, and AI to ensure compliance with ICH guidelines, enabling accurate, reliable, and routine quality control analyses. The developed methods demonstrated exceptional linearity, precision, and specificity, confirming their robustness and reliability. They were validated for all critical parameters, showing accurate quantification of asiatic acid in hydrogel formulations. Integration of DoE, QbD, and AI significantly streamlined the method development process.

Keywords: RP-HPLC, RP-UPLC, Asiatic acid, Quality of design, Chromatographic, Analysis

Implementation of Good Documentation Practices (GDP) in Pharmaceutical Quality Assurance

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ABSTRACT

Good Documentation Practices (GDP) are essential in the pharmaceutical industry to ensure regulatory compliance, data integrity, and transparency across manufacturing, distribution, and quality control processes. GDP encompasses standardized methods for creating, handling, and maintaining documentation in both paper and electronic formats. Regulatory authorities such as the U.S. Food and Drug Administration (FDA), the International Council for Harmonization (ICH), and the World Health Organization (WHO) emphasize the significance of GDP in maintaining product quality and patient safety. In pharmaceutical quality assurance, GDP supports Good Manufacturing Practices (GMP) and Good Distribution Practices (GDP) by ensuring that all records are accurate, complete, and securely maintained. It applies across the pharmaceutical supply chain, including logistic service providers, wholesalers, repackagers, and warehousing companies, which must undergo regular audits to verify compliance. The implementation of GDP involves maintaining legible, traceable, and tamper-proof records, covering batch records, quality control logs, and distribution documentation. These practices help prevent regulatory violations such as mislabeling, contamination, and inadequate documentation, which could lead to non-compliance penalties and reputational damage. Furthermore, strict adherence to GDP enhances data integrity, ensuring that records are verifiable and readily available for audits and regulatory inspections. By following GDP principles, pharmaceutical companies can streamline operations, improve efficiency, and ensure compliance with global regulatory standards. approval but also strengthens consumer trust and enhances product reliability.

Keywords: Good Documentation Practices (GDP), Regulatory Compliance, Data Integrity, Pharmaceutical Quality Assurance, Good Manufacturing Practices (GMP)

Importance of Pharmacovigilance in Ensuring Drug Safety and Quality

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ABSTRACT

Pharmacovigilance, as defined by the World Health Organization (WHO), involves the science and activities related to the detection, assessment, understanding, and prevention of adverse effects or other drug-related problems, particularly long-term and short-term adverse effects. The need for pharmacovigilance became prominent after the Sulfanilamide disaster of 1938, which led to the establishment of stringent safety measures. This tragedy highlighted the importance of monitoring drug safety and the necessity of regulatory oversight in drug production. The primary objective of pharmacovigilance is to detect and evaluate adverse drug reactions (ADRs) throughout the drug's lifecycle, from production to consumption, ensuring patient safety. While clinical trials provide controlled conditions for evaluating drug safety, pharmacovigilance extends these evaluations into real-world scenarios, including the monitoring of vaccines, herbal medicines, biological products, and even medical devices. Through continuous monitoring, pharmacovigilance systems identify drug-related issues that may not have been apparent during pre-market trials. It supports healthcare professionals by identifying potential problems with ongoing treatments and ensuring proper compliance. Through pharmacovigilance studies, patients can be monitored for issues such as medication errors, misuse, and substandard products, contributing to safer therapeutic practices. Significant historical milestones, such as the Thalidomide disaster in 1961, led to major changes in the pharmacovigilance system, including global collaboration for drug safety. International cooperation through the WHO's Uppsala Monitoring Centre ensures continuous evaluation of drug safety across borders. Pharmacovigilance continues to be critical throughout the entire product lifecycle, identifying new safety concerns and ensuring effective reg ulatory action.

Keywords: Pharmacovigilance, Adverse Drug Reactions (ADRs), Drug Safety, Regulatory Oversight, Uppsala Monitoring Centre

Ophthalmologic toxicities of antineoplastic agents in genitourinary cancers: Mechanisms, management, and clinical implications

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ABSTRACT

The immune system protects us from diseases, pathogens attacking our body, and tumor cells. Genitourinary (GU) cancers are the cancer of kidneys, bladder, urinary tract, prostate, and testis. Genitourinary cancers are the most common malignant diseases in men. Various genitourinary cancer risk factors include obesity, smoking, genetics, and chemical exposure to heavy metals, working in agriculture where pesticides are used. Obesity is a significant risk factor for numerous cancers, including genitourinary cancers. While therapeutic techniques continue to develop, immune checkpoint inhibitors, molecular targeted therapies, antibody-drug conjugates, and radioligand therapies, these treatments are associated with various adverse effects, including ophthalmologic toxicities. Various ocular side effects may be caused by drugs used in the treatment of GU malignancy such as corneal perforation, dry eyes, cataracts, eye pain, blurred vision, uveitis, etc. Early identification of these side effects can reduce morbidity, increase ophthalmology referrals and ultimately improve visual outcomes in patients experiencing medication-induced ocular toxicities. The most commonly used antineoplastic agents such as bleomycin, cisplatin, vinblastine, and doxorubicin, for the kidneys, bladder, urinary tracts, prostate, testis, and penis, their mechanism, indication, and recent trials and their uses. Disorders of the optic nerve (e.g. metabolic, inflammatory, ischemic) resulting from the use of chemotherapeutic agents can be very challenging to manage Various categories of antineoplastic therapy such as chemotherapy, platinum-based chemotherapy, targeted chemotherapy, etc. are employed in the treatment of ophthalmic toxicities induced from medications. Awareness and recognition of possible ophthalmologic manifestations resulting from the use of therapeutic agents for the management of genitourinary malignancies is essential.

Keywords: Genitourinary cancer, molecular targeted therapies, adverse effects, chemotherapy

Molecular docking analysis of phytochemicals of *Polystichum discretum* against LRP-6: A probable anticancer mechanism

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ABSTRACT

The activation of LRP6 (Low-Density Lipoprotein Receptor-Related Protein 6) within the Wnt/β-catenin signaling pathway is significant in the progression of cancer. When Wnt ligands attach to the Frizzled (FZD) receptor and LRP6, it initiates the phosphorylation of LRP6, which subsequently inhibits the β-catenin destruction complex (Axin/APC/GSK-3β). This action stops the degradation of β-catenin, resulting in its accumulation in the cytoplasm and eventual movement into the nucleus. Once inside the nucleus, β-catenin stimulates the expression of oncogenic target genes like MYC and CCND1, promoting uncontrolled cell growth, survival, and tumor formation. Because of the limitations with the existing therapies, the contemporary scientific community has progressively moved towards therapies based on plants. The plants of the *Polypodiaceae* family have demonstrated significant promise in recent cancer studies due to their abundant phytochemicals, one of which is *Polystichum discretum* (PD). This study is focused on evaluating the anticancer properties of 45 bioactive compounds derived from the methanolic extract of PD through GC-MS analysis, specifically by investigating their ability to suppress the Wnt signaling pathway via molecular docking studies. Swiss ADME (Lipinski violation 0 and oral bioavailability score ≥0.55) was used to screen molecules. The binding affinity of molecules with the chosen proteins LRP-6 (PDB:8DVL) was assessed using Pyrx software and amino-acid interactions were analyzed with the "BioVia" software program. After preliminary screening, 18 molecules were identified and then analyzed through molecular docking, showing an affinity for the LRP6 protein. Of these, two molecules displayed a higher binding affinity than the reference compound, indicating their potential to block LRP6 and subsequently hinder the Wnt signaling pathway effectively. Further studies are warranted to evident the activity of PD against other proteins of the pathway so that the anticancer potentials can be proposed.

Keywords: Cancer, Wnt pathway, Docking, Polypodiaceae.

Green Analyzed Approaches: An alternatives of organic synthesis

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ABSTRACT

Environmental deterioration and global warming provide significant obstacles to our day-to-day existence. The businesses based on organic chemicals expanded their manufacturing methods in response to the years-long spike in demand for everyday home items. The Green Chemistry Approach was first put forth by Cathcart (1990), who used the term "Green Chemistry" to advocate for the growth of the Irish industry. However, in 1996, Anastas & Williamson proposed the principles of green chemistry, which revolutionized the field and are now accepted by academicians, research scholars, industrialists, and others. The significance of creating such technology (Green Approach) to prevent dangerous, poisonous, and junk byproducts and to increase the rate of synthetic compound manufacturing in a short amount of time with a high yield of goods with no risk element. Therefore, the green approach is founded on twelve fundamentals: prevention, atomic economy, safe chemical economy, safer chemical design, safe chemical synthesis, use of safer chemicals, auxiliary, use of renewable raw materials, reduction of derivatives, catalysis, degradation product design, real-time analysis for pollution prevention, and accident prevention. It benefits scientists, engineers, the economy, human and environmental safety, and, last but not least, the search for alternatives to the dangerous materials that resulted from the traditional synthesis of organic processes up to the middle of the 20th century. These days, the focus is not just on cutting waste and chemical toxicity; it is also on conserving energy and improving living conditions by eliminating dangerous environments

Keywords: Green chemistry, Sustainable products, hazardous, Environment, organic Synthesis.

Optimized Nano-formulation Strategies for Targeted Drug Delivery in Parkinson's Disease

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ABSTRACT

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by the loss of dopaminergic neurons, leading to motor and cognitive impairments. Conventional therapeutic approaches are often limited by poor bioavailability, rapid metabolism, and inadequate blood-brain barrier (BBB) penetration. To overcome these challenges, nanostructured lipid carriers (NLCs) have emerged as a promising drug delivery system for targeted brain delivery. This study focuses on the formulation, optimization, and evaluation of piperine-loaded NLCs as a potential treatment strategy for PD. Piperine, a bioactive alkaloid with proven neuroprotective properties, exhibits limited solubility and permeability, restricting its therapeutic application. The optimized nano-formulation was developed using a combination of lipids, surfactants, and stabilizers to achieve desirable physicochemical properties. Various characterization techniques assessed formulation stability and integrity, including particle size, zeta potential, encapsulation efficiency, and surface morphology. In-vitro studies evaluated piperine's controlled release from the NLC matrix, while in-vivo pharmacokinetics and biodistribution analyzed brain targeting and therapeutic efficacy. The results demonstrated a significant improvement in drug permeability across the BBB, enhanced bioavailability, and prolonged circulation time. This research highlights the potential of optimized nano-formulation strategies for targeted drug delivery in neurodegenerative disorders. The findings support the development of NLC-based systems as an effective therapeutic approach for improving the treatment outcomes of PD. Further studies on clinical translation and long-term efficacy may contribute to the advancement of nanomedicine in neuropharmacology.

Keywords: Nanostructured Lipid Carriers (NLCs), Parkinson's Disease (PD), Targeted Drug Delivery, Piperine Nano-formulation, Blood-Brain Barrier (BBB) Permeability.

Taxifolin loaded ethosomal gel formulated and optimized with Box-Behnken design of Quality by design

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ABSTRACT

Taxifolin is an herbal potent molecule with substantial activity against number of diseases but limited water solubility low skin permeation is restricting its clinical applications. To address this, we prepared a taxifolin loaded ethosomal gel for enhancing its transdermal application as novel topical treatment, which offers a natural alternative to allopathic drugs with harsh side effects and eco-friendly approach. Taxifolin loaded ethosomes was prepared by various concentrations of lipid and ethanol using the cold method. Design expert software was used for the optimization of formulation and applied to evaluate the particle size, zeta potential and entrapment efficiency were selected as the critical quality attribute. The fabricated taxifolin loaded ethosome were assessed with FTIR, DSC, and TEM characterization. Based on the desirability function one formula was incorporated into gel and evaluated for pH, viscosity, drug content, rheology, spredability, extrudability, stability studies, in-vitro and ex-vivo permeation studies. The prepared taxifolin-loaded ethosomal formulation demonstrated entrapment efficiency within the desired range, and the zeta potential indicated good stability. FTIR and DSC analyses revealed no significant chemical interactions. TEM images showed spherically shaped vesicles. Prepared gel shows an elegant physical appearance, shear thinning rheological behavior, good spredability and extrudability. Among the drug release kinetic models, the formulation followed the higuchi model with drug release of 92.639 ± 0.484 % in 24 h. The prepared ethosomal gel shows prolonged release and enhanced permeation compare to conventional gel. The study successfully proved the ethosomal gel's outstanding capacity for taxifolin transdermal penetration. This method is environmentally friendly, sustainable.

Keywords: Taxifolin; ethosomes; ethosomal gel; Box-Behnken design;

Preformulation Consideration for Topical Hydrogel Preparation

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ABSTRACT

Hydrogels are three-dimensional, water-swollen polymeric networks extensively employed in topical drug delivery due to their high water content, biocompatibility, and ability to provide sustained drug release. Preformulation studies for hydrogel development focus on evaluating the physicochemical properties of the drug, polymer compatibility, and formulation stability, ensuring optimal drug loading, release, and skin penetration for effective therapeutic outcomes. These studies typically assess drug solubility, stability, and compatibility with excipients to ensure formulation stability and efficacy, utilizing techniques such as Fourier-transform infrared (FTIR) spectroscopy, differential scanning calorimetry (DSC), and rheological analysis to identify interactions and optimize gel properties. The goal of preformulation is to evaluate the drug's solubility, stability, and interactions with polymers to guide the selection of suitable excipients and formulation conditions for enhanced drug delivery and skin absorption. Future research in this area is focused on advancing drug stability, controlled release, and skin penetration through the development of novel polymers and nanocarriers. The emergence of stimuli-responsive hydrogels, such as pH- or temperature-sensitive systems, offers the potential to improve targeted drug delivery and patient compliance, while the incorporation of bioactive and biodegradable materials may further optimize therapeutic efficacy. These innovations are expected to contribute to the creation of more effective, patient-friendly hydrogel formulations for dermatological and transdermal applications.

Keywords: Hydrogels, Preformulation studies, Drug stability, Skin penetration, Nanocarriers

Efficacy and Safety of Tirzepatide for treatment of overweight or obesity. A systematic review and meta-analysis

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Tirzepatide, a dual GIP and GLP-1 receptor agonist, shows strong potential for weight loss in individuals with overweight or obesity. This systematic review and meta-analysis evaluates the effectiveness and safety of tirzepatide for weight reduction in these patients. We conducted a search across Medline, Embase, and Cochrane CENTRAL for randomized controlled trials (RCTs) assessing tirzepatide's weight loss effects. The primary outcomes—≥5%, ≥10%, and ≥15% weight loss—along with adverse events (AEs) were analyzed through a single-arm meta-analysis of proportions. A meta-analysis of means assessed secondary outcomes. Additionally, a comparative meta-analysis was performed between tirzepatide and control arms, estimating mean differences and odds ratios for continuous and dichotomous outcomes, respectively. Among 5800 patients, 78.22%, 55.60%, and 32.28% achieved ≥5%, ≥10%, and ≥15% weight loss, respectively. Tirzepatide 5 mg showed superior weight loss to placebo (MD: -12.47 kg) and semaglutide (MD: -1.90 kg), with dose-dependent improvements at 10 mg and 15 mg. Gastrointestinal AEs were more frequent with tirzepatide than placebo, but not compared to semaglutide. Tirzepatide is a promising weight loss therapy with minimal additional AEs compared to other treatments, offering potential for targeting multiple aspects of metabolic syndrome.

Keywords: Dual GIP/GLP-1 receptor agonist; Meta-analysis; Systematic review; Tirzepatide, RCTs.

Review on Targeted Drug Delivery Systems: Innovations and Challenges in Modern Pharmaceutics

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ABSTRACT

Targeted drug delivery systems (TDDS) have emerged as a revolutionary approach to improving the efficacy and safety of pharmaceuticals. By delivering drugs directly to the intended site of action, TDDS aims to minimize side effects, enhance therapeutic effects, and improve patient compliance. Recent innovations in nanotechnology, biomaterials, and molecular targeting have significantly advanced the development of these systems. Nanoparticles, liposomes, and dendrimers are among the most widely studied carriers for targeted drug delivery, while ligand-receptor interactions and antibody-targeted therapies are utilized to enhance specificity. However, despite their potential, there are significant challenges in the clinical translation of TDDS, including issues related to formulation stability, targeting efficiency, regulatory hurdles, and scalability of production. This review examines the latest innovations in TDDS, explores the challenges faced in their development, and discusses future directions for overcoming these barriers in order to fully harness the potential of targeted therapies in modern pharmaceutics.

Keywords: Targeted Drug Delivery, Nanotechnology, Nanoparticles, Liposomes, Drug Delivery Systems, Therapeutic Targeting, Personalized Medicine, Pharmaceutical Sciences

AI in Personalized Medicine: Tailoring Treatments to Individual Patients

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ABSTRACT

Artificial intelligence (AI) is revolutionizing personalized medicine by providing personalized treatments based on an individual's genetic, environmental, and lifestyle factors. This approach aims to increase the effectiveness of drugs while minimizing side effects and improve safety of medications.AI is improving personalized medicine by analyzing patient-specific data to develop more accurate treatment plans. In the context of transdermal drug delivery systems (TDDS), AI is playing a key role in optimizing drug release in real time, enabling personalized dosing, and improving treatment outcomes. This technology offers a bright future for personalized medicine by solving the problems associated with accurate drug administration while improving safety and patient compliance. It also explores how real-time monitoring and precise control of drug release can improve patient compliance and treatment success. The study also highlights the technical, ethical, and legal challenges of implementing AI in personalized treatment of TDDS. Patient data collected through wearable sensors and medical records is analyzed using machine learning algorithms to identify patterns that can help personalize medication prescriptions and delivery schedules. Real-time monitoring adjusts the rate of drug dispensing based on patient feedback. The effectiveness of the system is tested through clinical trials and simulation models that evaluate patient compliance, safety, and treatment outcomes. In conclusion, integrating AI into personalized TDDS represents a significant advancement in patient care, addressing critical challenges in healthcare delivery while delivering personalized treatments AI advancements will enable more precise, autonomous systems. Overcoming ethical, technological, and regulatory challenges will unlock more efficient, customized healthcare solutions.

Keywords: Personalized Medicine, Simulation, AI, TDDS

Hydrocortisone and Camphor in Dermatological Formulations

A Comprehensive Review on Analytical and Pharmacological Aspects

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ABSTRACT

Hydrocortisone is a glucocorticoid used to treat corticosteroid-responsive dermatoses, endocrine disorders, immune conditions, and allergic disorders. Hydrocortisone, or cortisol, is a glucocorticoid secreted by the adrenal cortex. Hydrocortisone is used to treat immune, inflammatory, and neoplastic conditions. **Camphor** is a compound used topically to help relieve pain and also as a topical antiseptic. Camphor is a bicyclic monoterpene ketone found widely in plants, especially Cinnamomum camphora. It is used topically as a skin antipruritic and as an anti-infective agent. When ingested, camphor has a rapid onset of toxic effects, and camphorated oil is the product most often responsible for its toxicity. The FDA ruled that camphorated oil could not be marketed in the United States and that no product could contain a concentration higher than 11%. However, camphor can be found in several nonprescription medications at lower concentrations. . The Combination of both provides as Hydrocortisone reduces inflammation and itching, the Camphor provides pain relief and a cooling effect. Camphor work by causing a sensation of cooling and then warmth, which distracts feeling the skin irritation or itch. Hydrocortisone reduces the swelling, itching, and redness that can occur in these types of conditions. This formulation is typically used to treat a variety of skin conditions, including but not limited to, eczema, dermatitis, minor skin irritations, and rashes. It can also be used to soothe itchy skin caused by insect bites, poison ivy, or other similar conditions. It also provides a moisturizing effect, which can help to soothe dry, irritated skin. The active ingredients are absorbed through the skin, providing localized treatment to the area where it is applied.

Keywords: Hydrocortisone, Camphor, Glucocorticoid, allergic disorders

Formulation and Optimization of the combination Anti-Allergic Tablet of Cetirizine and Curcumin

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ABSTRACT

The objective of this study was to formulate and optimize a combination anti-allergic tablet containing cetirizine and curcumin, with rosemary extract included to enhance therapeutic effects in both acute and chronic conditions. The anti-allergic tablet was formulated using the wet granulation method, incorporating excipients such as HPMC, lactose, starch, and polyethylene glycol at varying concentrations to optimize the formulation. Rosemary extract, rich in ursolic acid and rosmarinic acid, was included for its known anti-inflammatory and anti-allergic properties, complementing the effects of cetirizine and curcumin. FTIR analysis confirmed no significant interaction between the active pharmaceutical ingredients (APIs) and excipients. The formulation underwent pre-compression evaluations (bulk density, tapped density, Carr's index, Hausner's ratio, and angle of repose) and post-compression testing (weight variation, disintegration, dissolution, uniformity of drug content, appearance, friability, and hardness), all of which met standard pharmacopeial limits. The optimized formulation demonstrated maximum drug release of 78.90% for cetirizine and 87.35% for curcumin within 14 minutes during dissolution studies. Stability testing at 40°C for three months indicated that the formulation remained stable and compatible with the excipients. The study concludes that the developed formulation is stable, meets quality standards, and exhibits an enhanced drug release profile, making it a promising candidate for anti-allergic therapy.

Keywords- Curcumin, Cetirizine, Fast dissolving tablet, Solid dispersion techniques, Anti-allergic, HPMC.

Innovative Raft-Forming Tablets of Lansoprazole for Gastric Ulcer Therapy

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ABSTRACT

The objective of this study was to develop raft-forming tablet formulations incorporating lansoprazole solid dispersions for the effective treatment of gastric ulcers. Raft-forming systems provide prolonged gastric retention, forming a protective barrier over ulcerated areas, thereby enhancing drug efficacy. Lansoprazole, a proton pump inhibitor with limited solubility, was prepared as a solid dispersion using hydrophilic carriers such as polyethylene glycol (PEG) and polyvinylpyrrolidone (PVP) to enhance its solubility and bioavailability. The tablets were formulated using sodium alginate and calcium carbonate as raft-forming agents, complemented by sodium bicarbonate as an effervescent component to facilitate raft formation upon contact with gastric fluids. Pre-compression parameters, including bulk density (0.42–0.48 g/cm³), tapped density (0.50–0.56 g/cm³), Carr's index (12–15%), and Hausner's ratio (1.12–1.15), indicated excellent flow properties. Post-compression evaluation revealed uniform weight variation (<5%), adequate hardness (4.5–5.5 kg/cm²), low friability (<0.5%), rapid buoyancy lag time (<30 seconds), and sustained raft retention for over 6 hours. The raft exhibited a strength of 18.5 ± 1.2 g and provided effective gastric coverage. Drug release studies demonstrated enhanced dissolution of lansoprazole from the solid dispersion, with over 90% release achieved within 30 minutes, compared to 65% from pure drug tablets. Accelerated stability studies (40°C/75% RH) over three months confirmed the formulation's physical and chemical stability. The developed raft-forming tablet formulation successfully improved lansoprazole's solubility, dissolution, and gastric residence time, offering a promising therapeutic approach for managing gastric ulcers with enhanced efficacy and patient compliance.

Keywords: Lansoprazole, Raft forming, Gastric ulcers, Solid dispersion techniques, Proton pump inhibitors.

Drug Repurposing

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ABSTRACT

Drug repurposing is a strategic approach that leverage existing drugs or compounds to address previously untargeted medical conditions or disease. The drug repurposing also known as repositioning, re -tasking. Typically, drug repurposing involves investigating drugs that are no longer protected by patents, enabling the discovery of novel use without patent restrictions. This streamlined approach facilitates the rapid advancement of repurposed drugs into preclinical and clinical trials, mitigating risk and reducing development cost. Repurposing existing drugs minimize the risk of failure, as their pharmacological and toxicological properties are well understood. Advances in human genomics, chemo proteomics and network biology have revolutionized the field of drug, shifting it from a serendipitous approach to a more systematic and targeted process. The effective repurposing of existing medication is exemplified by the cases of Sildenafil (Viagra), now used to treat erectile dysfunction and pulmonary hypertension and thalidomide which has been repurposed for the treatment of leprosy and multiple myeloma. In response to COVID -19 pandemic, drug repurposing efforts surged, leveraging rapid data collection, AI – data prediction and high throughput screening to fast track over 100 repurposed drugs into clinical trials within a two-year period. Drug repurposing or repositioning refers to the application of a drug for another indication than it was originally approved for and has received increasing interest as an alternative strategy to de novo drug synthesis.

Keywords: Untargeted disease, repositioning, Sildenafil, serendipitous, COVID -19.

AI-Driven Virtual Screening for Natural Product-Based Drug Discovery

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ABSTRACT

Bougainvillea glabra (Nyctinaginacea) is a valuable traditional medicine for treating common ailments. It is traditionally employed against several diseases such as diarrhoea and Diabetes. This study is to determine the diabetes induced vascular dementia by isolation of effective bioactive compounds from the hydro alcoholic extract, after that Elution is done by the combination of petroleum ether : ethyl acetate and ethyl acetate: ethanol which gives 5 compounds i.e. Bg1, Bg2, Bg3, Bg4, Bg5. they further Characterised with the help of TLC, IR, and NMR spectroscopy. Virtual screening of phytochemicals was performed through molecular docking, simulations, in-silico ADMET and drug-likeness prediction to identify the potential hits that can inhibit the effects of vascular dementia caused by Endothelium Dysfunction. In-silico docking studies revealed that the fractions showed activity against vascular dementia by decreasing the protein metabolism, responsible for micro vascular dysfunction of endothelium.

Keywords: Traditional medicine, TLC, IR, NMR spectroscopy, Molecular docking, virtual screening, In-silico ADMET, drug-likeness prediction, Endothelial dysfunction, Microvascular dysfunction

In Silico Design, Synthesis, and Biological Evaluation of Triazole Derivatives as Potent Antidiabetic Agents

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ABSTRACT

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by elevated blood glucose levels, that poses serious health risks and raises mortality rates worldwide. Using both in silico and experimental methods the proposed work intends to design synthesize and assess triazole derivatives for their possible antidiabetic properties. First, triazole compounds with high binding affinities towards stabilities targets such as α-glucosidase, dipeptidyl peptidase-4 (DPP-4), and α-amylase will be found using in silicon molecular docking and virtual screening approaches. Enabling these enzymes, which are essential for the metabolism of carbohydrates, is a proven Method of treating postprandial hypoglycemia in diabetic patients. The chosen triazole derivatives will next be produced by effective and sustainable organic synthesis methods. To verify their structures and purity, the synthesized compounds will be thoroughly characterized using spectroscopic methods such electrospray ionization mass spectrometry (ESI-MS), proton nuclear magnetic resonance (1H-NMR), and Fourier-transform infrared spectroscopy (FT-IR). Several biological tests will be used to assess these compounds' antidiabetic potential after they have been successfully synthesized and characterized. The triazole compounds are expected to have inhibitory activity against enzymes such as α-glucosidase, DPP-4, and α-amylase, improving glucose absorption and providing diabetic patients with therapeutic advantages. Positive results from these tests may open the door for these compounds to be further developed and optimized as possible antidiabetic medicines. In summary, by combining in-silico screening with experimental validation, this study aims to investigate the potential of triazole-based compounds as antidiabetic medicines.

Keywords: Triazole derivatives, Antidiabetic agents, In-silico screening, DPP-4 inhibition, Molecular docking, Diabetes mellitus

Peptic Ulcer: A Review on Etiology, Pathogenesis and Treatment

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ABSTRACT

Peptic ulcer is a chronic disease affecting up to 10% of the world's population. . A peptic ulcer is a lesion that develops on the stomach or duodenal lining. "Gastric ulcers" and "duodenal ulcers" are the two most prevalent peptic ulcer kinds. Peptic ulcers are caused by an imbalance between aggressive factors like hydrochloric acid (HCL), pepsin, refluxed bile, leukotrienes (LTs), reactive oxygen species (ROS), and defensive factors like the mucus-bicarbonate barrier, prostaglandins (PGs), mucosal blood flow, cell renewal and migration, non-enzymatic and enzymatic antioxidants. The most common causes of peptic ulcer disease are H. pylori infection and the use of nonsteroidal anti-inflammatory medications (NSAIDs). In addition, a variety of variables are implicated in the pathogenesis of gastric ulcer, including bacterial infection (Helicobacter pylori), certain drugs (NSAID), chemicals (Hcl/ethanol), and stomach cancer, with minor factors including stress, smoking, spicy food, and nutritional deficiencies. Conventional treatments of peptic ulcers, such as proton pump inhibitors (PPIs) and histamine-2 (H2) receptor antagonists, have demonstrated adverse effects, relapses, and various drug interactions. On the other hand, An effective first-line therapy for uncomplicated cases of h. pylori infection would be Amoxicillin + Metronidazole + Pantoprazole. Treatment of H. pylori usually leads to clearing of infection, relief of symptoms and eventual healing of ulcers. The main aim of this review article has to summarize the ulcerogenic mechanisms of various mediators involved in peptic ulcer disease.

Keywords: Peptic Ulcer, Types, Pathogenesis, Helicobacter pylori, Diagnosis & Treatment.

Nanoemulgel-Based Drug Delivery for Rheumatoid Arthritis: Formulation, Evaluation, and Therapeutic Potential

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ABSTRACT

The widely accessible anti-inflammatory medications have the drawback of being hydrophobic, which results in low permeability and inconsistent absorption. Novel drug delivery technologies called nanoemulgels (NEGs) are designed to increase a medication's solubility and permeability across biological membranes. Together with surfactants and co-surfactants that function as permeation enhancers and can further improve permeability, the nano-sized droplets in the nanoemulsion boost the formulation's permeation. NEG's hydrogel component has a synergistic impact with the active moiety and improves the formulation's overall therapeutic profile by increasing the formulation's viscosity and spreadability, which makes it perfect for topical application. As a result, hydrophobic medications with improved pharmacokinetic and pharmacodynamic qualities are developed, preventing systemic adverse effects in patients with external inflammatory diseases. The nanoemulsion is better suited for topical application in the treatment of numerous inflammatory conditions, including dermatitis, psoriasis, rheumatoid arthritis, osteoarthritis, and others, due to its efficient spreadability, simplicity of use, non-invasive administration, and subsequent capacity to attain patient compliance. The development of an alternative nanoemulsification technique can address the issues with NEG's scalability and thermodynamic instability, which result from the use of high-energy approaches during the nanoemulsion's production and limit its large-scale practical application.

Keywords: Anti-inflammatory, Hydrogel, Nanoemulgel, Pharmacokinetics, Pharmacodynamic.

Biopolymers: Properties, characterization and their applications in drug delivery

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ABSTRACT

Biopolymers derived from natural sources such as plants, animals, and microorganisms, have gained significant attention in biomedical and pharmaceutical applications due to their exceptional biocompatibility, biodegradability, and non-toxic nature. Unlike synthetic polymers, they offer enhanced safety and minimal biological adverse effects, making them ideal candidates for medical innovations. This review provides a comprehensive analysis of the fundamental properties of biopolymers, including their physical, thermal, mechanical, and optical characteristics. It classifies biopolymers based on their origin as well as their functionality and structural composition. Additionally, various natural sources and synthesis techniques, such as microbial fermentation, enzymatic processes, and chemical modifications, are explored to highlight strategies for enhancing their functional attributes for targeted applications. Furthermore, biopolymers have emerged as crucial materials in tissue engineering, serving as scaffolds for cell growth, tissue regeneration, and wound healing. Their applications extend to biosensors, and medical devices, reinforcing their significance in modern healthcare. The integration of biopolymers into 3D printing technologies further enables the development of patient-specific implants and personalized regenerative medicine solutions. By synthesizing insights from cutting-edge research and real-world applications, this review highlights the transformative impact of biopolymers in biomedical and pharmaceutical sciences. Their sustainable, safe, and versatile nature positions them as powerful alternatives to synthetic materials, driving the next wave of innovation in medicine and healthcare.

Keywords: Sustainable biomaterials, 3D printing, biosensors, hydrogels, biodegradability.

Rosemary's Efficacy in Stimulating Hair Growth & Preventing Hair Fall

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ABSTRACT

Hair loss is a prevalent issue that affects people all around the world, which fuels the need for safe, natural solutions. Rosmarinus officinalis, or rosemary, is one of the botanical remedies that has drawn interest due to its possible ability to both prevent and encourage hair loss. The anti-inflammatory, antioxidant, and antibacterial qualities of rosemary, which is abundant in bioactive substances including rosmarinic acid, flavonoids, and essential oils, support healthy scalps and stimulate hair follicles. The processes via which rosemary promotes hair development are examined in this article, with particular attention paid to the plant's capacity to increase scalp circulation, lower oxidative stress, and suppress dihydrotestosterone (DHT), a major contributor to androgenic alopecia. According to scientific research, which includes in vitro, in vivo, and clinical investigations, rosemary prolongs the anagen (growth) phase, encourages hair follicle regeneration, and may be just as effective as synthetic therapies like minoxidil with fewer adverse effects. Its antibacterial qualities also aid in the fight against dandruff and other scalp disorders that can exacerbate hair thinning. In contrast to traditional pharmacological therapies, rosemary offers a comprehensive strategy by promoting follicular health, improving microcirculation on the scalp, and lowering inflammation—all of which are essential for long-term hair development. As consumers' preferences for plant-based and chemical-free remedies continue to expand, rosemary shows promise as a natural substitute for traditional hair loss treatments. To determine its effectiveness, ideal formulation, and long-term advantages, further standardized clinical trials are necessary. This review bridges the gap between traditional herbal knowledge and contemporary scientific confirmation by highlighting rosemary's potential as a botanical remedy for managing hair loss.

Keywords: Rosmarinus officinalis, Rosemary, Hair loss, Hair growth, Alopecia, DHT inhibition, Scalp health

Role of Phenylalanine Zipper in Antibacterial activity and Toxicity of Temporin-L Peptide

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ABSTRACT

Antimicrobial resistance (AMR) is a serious global concern and a huge burden on the healthcare system. Antimicrobial peptides (AMPs) are considered as a solution of AMR due to their membrane-lytic and intracellular mode of action and therefore resistance development against AMPs is less frequent. One such AMPs, temporin-L (TL) is a 13-mer peptide reported as a potent and broad-spectrum antibacterial agent with significant immunomodulatory activity. However, TL is toxic to human erythrocytes at their antibacterial concentrations and therefore various analogues were synthesized with potent antimicrobial activity and lower hemolytic activity. In this work, we have replaced phenylalanine with cyclohexyl-alanine with help of solid phase peptide synthesis and characterized for their correct sequence by using of UPLC-MS method. Further we have evaluated the antibacterial activity of synthesized analogues by broth microdilution assay against representative gram-positive and gram-negative bacterial strains and found significant antibacterial activity with minimum inhibitory concentrations (MIC) in the range of 3.1-15.6 µM concentrations. Due to insertion of cyclohexyl-alanine in the sequence of temporin-L the resulting analogues will be more protease stable in comparison to native analogue. To prove that the therapeutic potentials of these molecules further warrant toxicity studies and mode of action studies of these peptides in bacteria or bacterial mimetic conditions. Overall, the new synthesized analogues gave a new analogue of temporin-L peptide and can design further novel and potent therapeutics against evolving drug-resistant pathogens.

Keywords: Antimicrobial resistance, Antimicrobial Peptides, Temporin-L, MRSA, phehylalanine zipper

Role of cholesterol content in enhancing the stability of liposomal drug carriers

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ABSTRACT

Liposomal drug carriers have emerged as a promising tool in targeted drug delivery, offering enhanced bioavailability and controlled release. However, their stability under physiological and storage conditions remains a critical challenge. Cholesterol, a key component in liposomal formulations, plays a pivotal role in stabilizing the lipid bilayer by modulating membrane rigidity and fluidity. This study investigates the effect of varying cholesterol content on the stability of liposomal formulations, focusing on parameters such as particle size, zeta potential, encapsulation efficiency, and leakage under stress conditions. Liposomes were prepared with different cholesterol-to-lipid molar ratios and characterized using dynamic light scattering (DLS), transmission electron microscopy (TEM), and high-performance liquid chromatography (HPLC). Stability was assessed under oxidative stress, freeze-thaw cycles, and different storage temperatures. The results demonstrate that an optimal cholesterol content significantly enhances liposomal stability by reducing leakage and preserving structural integrity, with a notable improvement in encapsulation efficiency and resistance to stress conditions. These findings highlight the critical role of cholesterol in designing robust liposomal drug carriers and provide valuable insights for their application in pharmaceutical formulations.

Keywords: Liposomal stability, Cholesterol, Drug delivery systems, Encapsulation efficiency, Lipid bilayer rigidity.

The Use of AI in Drug Discovery

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ABSTRACT

The drug discovery field transforms through AI technology because it makes operations more effective and less expensive while shortening pharmaceutical launch schedules. The conventional drug discovery process takes excessively long periods spanning multiple years accompanied by significant financial expenses amounting to billions of dollars. Scientists employ machine learning (ML) and deep learning (DL) components of AI to analyze large datasets and identify drug-target bonds and refine molecular designs for better safety and effectiveness. AI uses virtual screening as its main drug discovery tool. Current pharmaceutical data serves to train AI models which determine the binding energies between molecules and biological targets while cutting down the necessity of lab-based examinations. AI technology assists drug scientists by developing fresh molecular structures which fulfil specific therapeutic requirements. GANs alongside RL algorithms use machine learning to produce optimized drug molecules that combine effectiveness with high absorption rates along with reduced adverse reactions. AI functions for converting currently available pharmaceutical products into alternative therapeutic applications. It evaluates genomic and clinical information together with proteomic information to discover different therapeutic applications for existing drugs thus accelerating overall development periods. During the COVID-19 pandemic AI-assisted drug repurposing accelerated the discovery of potential antiviral candidates through its methods. AI-driven doctoral research accelerates drug discovery, reducing costs while improving accuracy. Continuous advancements in AI algorithms, expanding data resources, and evolving regulations further enhance drug development. Integrating AI with experimental and clinical research can significantly speed up treatment discoveries, benefiting global healthcare.

Keywords: Drug discovery, machine learning, virtual screening, Drug repurposing.

A Nano suspension Approach to Overcoming Cognitive Decline in Sporadic Alzheimer's Disease: Development and Analysis

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ABSTRACT

Alzheimer's disease (AD) is a neurological disorder characterized by cognitive decline and memory impairment, leading to disabilities in movement, memory, and speech. Which mostly impacts the hippocampus and entorhinal cortex parts of the brain. The pathogenesis of Alzheimer's disease is contingent upon Amyloid-β, hyper phosphorylation of tau protein, mitochondrial dysfunction, the cholinergic hypothesis, and oxidative stress. The nose-to-brain delivery system facilitates targeted medication administration through the olfactory and trigeminal nerves, employing both active and passive targeting mechanisms while circumventing the Blood-Brain Barrier. Mucoadhesive agents and permeation enhancers are primarily employed to improve drug retention time and bioavailability. The review emphasizes nanosuspension-based formulations and its capacity to reduce adverse effects, enhance medication bioavailability, pharmacodynamics, and pharmacokinetics. The findings indicate that nano-suspension-based medication delivery can successfully address the limitations of conventional therapy by boosting brain bioavailability and improving cognitive performance in sporadic Alzheimer's disease. The current treatment for Alzheimer's disease primarily aims to alleviate symptoms and slow disease progression, however it is associated with several adverse effects, including dizziness, fatigue, nausea, vomiting, myocardial infarction, and stroke. There is an urgent necessity to develop alternate treatments for the management of Alzheimer's disease. Herbal remedies have been utilized for an extended period to address Alzheimer's disease. Certain phyto-molecules have demonstrated promise efficacy against

Keywords: Nano suspension, Sporadic Alzheimer's disease, Cognitive enhancement, Targeted delivery, Nanotechnology, Brain to nose delivery, Phytomolecule.

A Comprehensive review of Medicinal Properties of Curcuma Longa (turmeric)

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ABSTRACT

Curcuma Longa Linn is a well-known and valued medicinal plant. The phytochemical pharmacological and molecular studies of C. Longa are reviewed. Curcuma Longa is a flowering plant in the ginger family Zingiberaceae. Historically it is used in Ayurvedic and Unani. The main active component of turmeric is Curcumin which is a curcuminoid. Other components include sesquiterpenes, atlantone, dimethoxycurcumin, diarylhaptanoids, and tumerone. The objective of this comprehensive review is to research and analyze the qualities and bioactive compounds within turmeric that contribute to human nutrition health promotion and chronic disease prevention.A thorough search of the literature search was conducted using PubMed and Google Scholar covering studies from 2000 to 2024. Keywords including "herbal treatment," "Curcuma longa," "herbal medicine," and "antiseptic agents" were used. Clinical trials, case studies, and traditional knowledge were reviewed to gather information on therapeutic uses of turmeric (Curcuma longa).The pharmacological action of Curcuma longa is mainly due to its main bioactive components such as curcumin, demethoxycurcumin were present in Curcuma longa. Turmeric powder is used as a gastro protects against irritants, antiulcer, ulcerogenic activities, lowering cholesterol, anti-inflammatory, antioxidant, and anticancer.Curcumin can be considered a great potential therapeutic agent for a variety of inflammatory conditions and cancer types.

Keywords: herbal treatment, curcuma longa, herbal medicine, and antiseptic agents.

Kava - therapeutic use and interaction

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ABSTRACT

Kava (Piper methysticum) is a tropical plant indigenous to the Pacific Islands. Its roots have been traditionally consumed for centuries in social, cultural, and ceremonial contexts. The plant's name derives from the word "kava," meaning bitter, reflecting its characteristic taste. In the Pacific Islands, kava has been used as a beverage with calming and relaxing effects. The objective of this study is to examine the therapeutic potential of kava (Piper methysticum) as a treatment for anxiety, stress, and sleep disorders, while also evaluating its safety profile and the interactions it may have with other pharmaceuticals. A thorough search of the literature search was conducted using PubMed, Google Scholar, and Scopus databases, covering studies from 2000 to 2024. The methodology for this study will consist of a comprehensive review of existing literature, including clinical and preclinical studies, as well as a systematic analysis of case reports and regulatory guidelines related to kava use. Kava is effective in reducing anxiety and stress, with effects comparable to benzodiazepines but fewer sedative side effects. It improves sleep quality, particularly in anxiety-related insomnia, and may have a mild antidepressant-like effect. Kava shows promising therapeutic potential for managing anxiety, stress, and sleep disorders, with effects similar to conventional anxiolytics but fewer sedative side effects.

Keywords: Kava, anxiety, stress, sleep disorders, kavalactones, liver toxicity, drug interactions, serotonin, dopamine, hepatotoxicity.

Eudragit coated microparticulate system of a bio herbal component loaded with anticancer agent

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ABSTRACT

Colorectal cancer (CRC) is the third most widespread following lung and breast cancer with high morbidity. Its treatment methodology comprises of chemotherapeutics agent viz alkylating agent and antimetabolites; predominantly stem cell and novel delivery system. Bio-herbals such as curcumin, asthathantin, rutin possess strong anti-oxidant activities ameliorating free radical generation. A novel approach combining anticancer drug with bioherbal based delivery system were rationalized targeting CRC. A bioherbal component (BC) based matrix loaded with 5-FU were prepared as macroparticulate system coated with Eudragit. Granules composed of 5-FU and BC was prepared using wet-granulation method at varying proportions of BC act as matrixing agent. Different batches of granules were coated with Eudragit using dip coating method. Macroparticulate system (MPC) were physically characterized for excipient interaction and further evaluated for micromeritic and drug release characteristics. Micromeritics studies comprised of angle of repose, Carr's index, Hausner ratio, bulk density, and tapped density. Physical characterization showed that the components selected in the fabrication of macroparticulate system were biocompatible since no drug-excipient interaction were revealed. Drug release studies performed in the simulated intestinal media showed the 5-FU release had sustained action for the extended duration. In vitro antioxidant activity showed that the developed MPC had DPPH activity in the range of 3µg/ml to 133 µg/ml. Role of BC in MPC was to produce sustained delivery, adjuvant action and DPPH activity. In conclusion, Eudragit coated macroparticulate system of bio herbal component loaded with anticancer agent can be used as a potential treatment option for colorectal cancer and further studies will establish it as such.

Keywords: Colorectal cancer, anticancer, bioherbal component, Eudragit, drug targeting, formulation

Pharmacokinetic of novel drug delivery system

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ABSTRACT

The field of drug delivery has evolved significantly with the development of a novel drug delivery system (NDDS), which aim to optimise pharmacokinetics improved therapeutic outcomes. These systems include nanoparticles liposomes, microsphere, transdermal patches ,and controlled-release formulation which enhance drug, absorption, distribution, metabolism, and excretion (ADME) overcoming challenges such as poor bio- availability, rapid degradation and systemic toxicity. NDDS, the modify drug release profile through controlled, sustained or targeted drug delivery. Ensuring site-specific action and minimizing side effects. Factors such as particle size, surface modification and carrier properties influence the pharmacokinetic of these systems. understanding the interaction between NDDS and biological barriers, including the gastrointestinal tract, blood brain barrier and cellular uptake mechanism, is crucial for the clinical success. This abstract highlights key pharmacokinetic principle, governing and other potential to revolutionize drug therapy by enhancing efficacy and safety.

Keywords: Therapeutic outcomes, target drug delivery, biological barriers, pharmacokinetic principle

Regulation of Athlete Supplements: Current Scenario and Way Ahead

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ABSTRACT

The global market for athlete supplements has expanded significantly, driven by increasing demand for performance enhancement and recovery aids. However, the safety, efficacy, and regulatory oversight of these products remain critical concerns. This paper provides a comprehensive analysis of the regulatory policies governing athlete supplements, addressing the challenges posed by contamination, mislabeling, and the presence of prohibited substances. The study explores the global regulatory landscape, highlighting the role of key bodies such as the World Anti-Doping Agency (WADA), the U.S. Food and Drug Administration (FDA), the European Food Safety Authority (EFSA), and regional authorities in North America, Europe, and Asia-Pacific. The review identifies key issues such as cross-contamination during manufacturing, misleading marketing claims, and the influence of social media on consumer behavior. Third-party certification programs like NSF Certified for Sport® are explored as crucial mechanisms for ensuring supplement quality. The paper proposes recommendations to strengthen regulatory oversight, including global harmonization of supplement laws, advanced testing technologies, stricter digital marketing regulations, and enhanced consumer education. By addressing regulatory gaps and promoting evidence-based practices, the study aims to safeguard athletes from unintentional doping violations and health risks while ensuring the integrity of the sports supplement industry.

Keywords: Sports nutrition, Regulatory policies, Supplement contamination, Anti-doping regulations, Third-party certification.

DNA Nanostructure Based Chemotherapy-Phototherapy (CTPT)

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ABSTRACT

According to National Center of Health Statistics (2021), United States reported 18, 98,160 new cancer cases and 6, 08,570 cancer death. It clearly symbolizes that cancer is the leading cause of death in today's time. The convention methods of treating cancer involve chemotherapy, surgery, radiotherapy, gene therapy and immunotherapy. Out of this 50-60% cancer patient receives chemotherapy and among this chemotherapy treated cancer patients 50-90% patients develop Multiple Drug Resistance (MDR). It can result in decreased treatment efficacy, limited treatment options, compromised immune system, higher treatment cost, increased risk of recurrence and all these things leads to the development of fatal health condition of our patient. In order to prevent this condition, the nanotechnology based novel targeting drug delivery system which provide a new idea for co-delivery of multidrug and combination therapy is used. It was found that for this purpose DNA aptamer-tethered nanostructure were used to deliver both chemotherapeutic agents and phototherapeutic agents for treating cancer. These nanostructures show high specificity and stability. In present scenario, the studies on following DNA nanostructure-based chemotherapy phototherapy are going on:

- Idarubicin or mithramycin was combined with acridine orange
- Doxorubicin and toluidine blue
- Daunorubicin and acridine orange to DNA Tetrahedron

Keywords: Cancer, DNA aptamer-tethered, Nanostructure, Chemotherapy, Phototherapy.

Microneedles: A Smart Painless Approach to Deliver Exenatide

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is characterized by reduced insulin sensitivity and a relative lack of insulin secretion. Non-insulin dependent diabetes affects 90-95% of people globally. Exenatide (EXT) is a drug used in the management of T2DM. This injectable drug mimics the actions of GLP-1, a hormone that regulates blood sugar. EXT slows digestion, reduces blood sugar, and increases insulin levels to improve glycemic control. Multiple injections administered daily may be inconvenient and reduce patient compliance. For this reason, microneedle (MN) administration is chosen because to its numerous advantages. According to reported evidences, the injection site may be swollen, stinging, blistering, burning, chilly, discolored, pressured, hives, infected, inflamed, itchy, lumpy, numb, painful, rash, red, scarred, sore, tingly, ulcerated, or warm. To avoid all of these problems and assess the feasibility of transdermal delivery of EXT for type 2 diabetes using Microneedles of low molecular weight sodium hyaluronate (HA). The purpose of tiny, microscopic needles, or microneedles, is to hold and administer drug nanoparticles, or nanodrugs, straight to the skin.

Keywords: Microneedles, Type 2 diabetes mellitus, Exenatide, Nanoparticles

AI vs. Human Scientists: Who Designs Better Drugs?

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ABSTRACT

Artificial Intelligence (AI) is changing the way new medicines are discovered. It can quickly study large amounts of data, find patterns, and suggest new drug ideas much faster than human scientists. However, they cannot replace the expertise and experience of human research. AI can only provide predictions based on the data available. AI can accelerate drug development, reduce cost, and improve treatment efficacy, but it faces challenges like data quality and regulatory hurdles. Ex Scientia is an AI-driven precision medicine company committed to designing, discovering, and developing the best possible drugs in the fastest and most effective manner using its AI technology. AI excels in efficacy, but humans provide deeper biological understanding and regulatory expertise. Machine learning models can process immense biochemical information far beyond human capacity, making AI invaluable for accelerating early-stage drug design. Now, in certain scenarios, AI can potentially design better drugs than human scientists. But the biggest problem in applying AI to drug design is the lack of high quality. Humans are better than AI in drug design because they have creativity, interdisciplinary thinking, and problem-solving skills. Nowadays, AI is faster at analyzing data and finding potential drugs, but humans are better at making final decisions, understanding real-world challenges, and ensuring the safety of drugs. AI accelerates drug design through rapid data analysis predictive molecular interaction, and optimizing candidate compounds, often surpassing human capabilities in speed and efficacy, while humans contribute creativity, intuition, and regulatory expertise to combine both to achieve the best drug design outcomes.

Keywords: Artificial intelligence, Human research, Regulatory hurdles, Clinical trials, Ex Scientia.

Plant-based remedies for non-alcoholic fatty liver disease

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ABSTRACT

Non-alcoholic fatty liver disease (NAFLD) is a major cause of liver diseases and is closely related to metabolic syndrome and its related conditions like diabetes mellitus and dyslipidemia. On the other hand, NAFLD as a multi-system disease increases the risk of several chronic diseases including type 2 diabetes mellitus, cardiovascular disease (CVD), and chronic kidney diseases. This is normally seen on liver biopsy and can range from mild (steatosis) to more severe forms (non-alcoholic steatohepatitis), advanced fibrosis, cirrhosis, and liver failure. Histologic evaluation with liver biopsy remains the gold standard for diagnosing NAFLD. Diagnosis of NAFLD is defined as the presence of hepatic steatosis, ballooning, and lobular inflammation with or without fibrosis. Weight loss, dietary modification, and the treatment of underlying metabolic syndrome remain the mainstays of therapy once the diagnosis is established. But, for long-term relief or a complete cure, natural remedies that are plant-based play a significant role. Over the past decades, herbal medicines have garnered growing attention as potential therapeutic agents to prevent and treat NAFLD, due to their high efficacy and low risk of side effects green tea, turmeric, milk thistle, garlic, and flaxseeds show hepatoprotective, anti-inflammatory, and anti-oxidant effects hence reducing liver fat and inflammations, improving insulin sensitivity, etc.

Keywords: Liver biopsy, Hepatic steatosis, Fibrosis, Herbal medicine.

Microneedles for Ocular Drug Delivery System

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ABSTRACT

The extensive barriers within the eye structures create major challenges for ocular drug delivery systems. The current delivery procedures which include eye drops combined with systemic administration damage bioavailability and display patient non-compliance issues. The painless delivery approach offered by microneedles (MNs) shows strong potential to provide precise and effective drug delivery to the eye. Microscopic structures penetrate the eye with minimal pain to deliver drugs through the tissues at defined release rates. Scientists create these microneedles from biodegradable polymers as well as metals and silicon until they achieve the needed application through solid, coated, dissolving and hollow designs. Drug permeability reaches higher levels when utilizing microneedle-based delivery systems that make drugs more effective for the eyes and less likely to cause systemic effects. These drug delivery systems provide an alternative approach to intravitreal injections thus providing more comfortable and safer treatment to patients. The development of modern microneedle technology has shown successful outcomes when used for the management of glaucoma together with macular degeneration and different retinal conditions. The advantages of microneedle delivery systems are preventing ongoing research efforts for addressing the complex manufacturing process alongside requirements for sterility control and regulatory clearances. This poster focuses on microneedle designs alongside their delivery mechanisms along with current advances and upcoming potential uses in ophthalmic medication. Medical use of microneedles holds great promise to transform drug delivery systems for the eye by improving therapeutic effects for patients.

Keywords: Ocular drug delivery systems, microneedles, biodegradable polymers.

Innovations and Challenges in Medicinal Chemistry: Pioneering the future of Drug Discovery

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Pharmaceutical Chemistry

ABSTRACT

The field of medicinal chemistry has evidence rapid advancement due to innovative technologies and emerging technologies due to drug design and discovery. Recent advancements include integration of machine learning (ML) and artificial intelligence (AI) with lead optimization, application of structure based drug design (SBDD), and increasing application of computational chemistry in predicting drug-target interactions. Along with these, fragment based drug design and DNA-coded library are enhancing the efficiency to find potential therapeutic target by transforming early stages screening processes. Despite these advancements, multi drug resistance, poor bioavailability, pharmacokinetics limitations remains as hurdle in drug design and development. This poster is a presentation of key trends and persistent challenges from the medicinal chemistry point of view. It presents current breakthroughs as well as limitations that hinder efficient drug development. Understanding these factors play an important role in the advancement of novel therapeuties and optimization of pharmaceutical research.

Keywords: Drug design, Machine learning, Artificial intelligence, structure -based drug design, Computational chemistry

A Review On: Potential Antidiabetic Plants and Their Formulation

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ABSTRACT

Diabetes is sometimes referred to as diabetes mellitus (DM). It is a chronic metabolic condition that develops when the body cannot utilize or create enough insulin. The main causes of this disease are unhealthy diet, physical inactivity, and obesity in developing countries. The rapid growth of diabetes mellitus necessitates innovative plans for the effective management of this deadly disease. Literature studies suggest herbal supplements/formulations targeting different aspects of diabetes management. It also includes glucose regulation, insulin sensitivity, and oxidative stress. There are so many options available for the treatment of DM. However, the long-term use of allopathic medicines may cause unwanted side effects. It results in uncontrolled blood sugar as well as complications of diabetes. It will also affect the immune system. The use of herbal medicine for the treatment of DM has been in practice since ancient times. India is a major contributor of herbal medicine.

Generally, it is believed that the risk associated with herbal medicine is very low, but reports on serious reactions to herbal drugs are also necessary. Numerous herbal formulations have been investigated to treat different types of diabetes. Herbal antidiabetics may delay the development of diabetic complications or correct metabolic abnormalities. Many herbal plants and formulations found effective in the treatment of DM. The present review paper focused on various formulations as antidiabetics in various formulations.

Keywords: Diabetes, Glucose regulation, Herbal formulation, Anti-diabetic.

Optimizing Bioavailability: A Key to Effective Drug Design and Development

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ABSTRACT

Bioavailability, as defined broadly, is one of the most significant parts of concern in drug design since it indicates the percentage of the entire medication that enters the systemic circulation and produces action, usually the intended action of the medication. This must be understood in pharmaceutical design in order to obtain the desired effect at the right dosage. Insufficient bioavailability causes a treatment to not work as intended, either failing entirely or requiring higher dosages that result in excessive exposure and adverse health effects. There are two primary types of bioavailability that can be tested: absolute and relative. By comparing the amount of drug that enters the bloodstream after being administered through one route (typically oral) versus the availability of the same amount if administered intravenously, absolute bioavailability, which avoids the effect of digestion and metabolism causing a loss in the drug, is used to estimate the amount of drug loss due to poor gut or metabolism. Logically, drug design includes techniques that may interact with bioavailability, which is further complicated by the medication's levels of comfortability in a solubility system and, of course, stability, whether or not it has the ability to pass through bodily barriers. This is an indication of a band-aid solution for things like better medication performance, oh, and bothersome side effects, as well as therapies that are much more in line with the patient's goals. Thus, the goal of bioavailability is crucial when creating drugs with pharmacological behaviour that resists fire.

Keywords*:* Bioavailability, Drug design, Pharmaceutical design, Dosage form

Phytochemical Study of Turmeric Extraction

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ABSTRACT

Numerous research have 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. 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.

In silico modeling and in vivo analysis of wound healing effectiveness of benzhydroxamic acid using adult zebrafish model

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ABSTRACT

The primary objective of this study is to assess the effectiveness of wound healing using the zebrafish (Danio rerio), a model organism renowned for its remarkable regenerative capabilities. Zebrafish provide a promising platform for investigating new therapies for human skin wounds, particularly chronic or non-healing wounds. Benzhydroxamic acid, selected as the test compound, has not been extensively studied for its Wound healing potential. Povidone, a widely available standard drug, was used for comparison. Both Insilco (Auto Dock) and invivo(Zebrafish study) studies were conducted. This study examined the healing of zebrafish skin wounds over a 21-day period. A 2mm biopsy punch was used to create wounds on each fish, with the room temperature maintained at 27°C. The fish were divided into five groups: a control group, a standard group, and three groups treated with high, medium, and low doses of the Benzhydroxamic acid. The healing process was monitored over the 21-day period, with changes in wound size tracked. Wound regeneration was documented using macroscopic images to monitor healing activity and assess tissue recovery. Benzhydroxamic acid showed promising results in zebrafish, demonstrating significant healing compared to the standard drug. Over the 21-day period, the wound closed by Day 14, with the remaining 7 days dedicated to tissue regeneration. The Benzhydroxamic acid was selected based on AutoDock analysis, which revealed a higher binding score.Our study highlights the versatility of zebrafish models in investigating wound healing responses and their potential as ideal experimental models for both acute and chronic inflammation studies. These models serve as essential tools for the successful development of new pharmacological strategies. It is anticipated that these findings will identify a promising candidate for wound healing therapies.

Keywords: Wound healing, Insilco, invivo, Biopsy punch, Benzhydroxamic acid.

Artificial Intelligence and Personalized Medicine: Transforming Drug Discovery and Pharmaceutical Sciences

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ABSTRACT

Integrating AI and personalized medicine is changing the way drug discovery and pharmaceutical sciences are conducted. As AI can take in and process vast amounts of data, the gain from understanding biological complexity and patient variability remains unprecedented. It has been possible to identify previously invisible patterns by using machine learning algorithms over huge amounts of genomic, proteomic, and clinical information. AI accelerates the discovery process of drugs by enhancing decision-making at various steps. It helps identify new candidate drugs by predicting which molecules are more likely to interact with other molecules and optimizing chemical structures. This expedites the conventional drug development timeline, reduces time and costs, and ultimately introduces new therapies to the market. Moreover, algorithms of AI can mimic how different patient subpopulations will respond to specific drugs; hence, researchers can fine-tune their therapies based on genetic variations and environmental factors or individual health histories. Within the arena of clinical trials, AI helps in optimizing selection for the correct patients with a higher chance of responding to treatment. This helps to have robust and meaningful results, thus giving more chances for a successful trial. Furthermore, AI improves the collection of real-world evidence, monitoring continuously how patients may be responding after treatment and detecting potential adverse effects sooner than a traditional method. In addition, AI in personalized medicine is applied beyond drug development. It allows doctors to create specific treatment plans based on the patient's characteristics, which enhances the effectiveness of therapy and reduces the side effects.

Keywords: personalized medicine, drug discovery, candidate drugs, candidate drugs, proteomic.

Endophytes: A Treasure House of Bioactive Compounds of Medicinal Importance

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ABSTRACT

Endophytes are a type of microorganisms that live within plants and can be easily isolated from any microbial or plant growth medium. They serve as repositories of unique bioactive secondary metabolites, including alkaloids, phenolic acids, quinones, steroids, saponins, tannins, and terpenoids, which hold promise for antimicrobial, anti-insect, anticancer, and various other therapeutic properties. While researchers extensively explore plant sources for new therapeutic compounds; endophytic microbes also represent a crucial avenue for drug discovery. Microbes in nature exhibit various relationships with their hosts, including mutualistic, parasitic, symbiotic, or pathogenic interactions. Within plant microbiota, the nature of plant immunity dictates whether the interaction with microbes is beneficial or harmful. A positive interaction, termed plant-endophyte mutualism or symbiosis, involves microorganisms like fungi, bacteria, and actinomycetes residing within the robust tissues of plants. Research indicates that nearly all plant species studied to date host one or more endophytes. These endophytes confer benefits to their host plants by synthesizing diverse secondary metabolites, which hold promise in agriculture and medicine. Endophytes represent a rich source of novel bioactive compounds such as steroids, tannins, terpenoids, quinones, alkaloids, saponins, and phenolic acids, offering potential applications in anticancer, antibiotic, antioxidant, anti-inflammatory, antiviral, and antidiabetic therapies. As such, endophytes continue to be a promising reservoir for the discovery of various pharmaceutical compounds. This review aims to highlight the roles and potential medical applications of endophytes as a promising source of medications for a wide range of illnesses and other medical purposes.

Keywords: Bioactive compounds, endophytes, foodborne disease, secondary metabolites, microbes.

Demystifying Pharmacokinetics of Novel drug Delivery System for Management of Diverse Disorders

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ABSTRACT

The pharmacokinetics of a certain drug delivery system have a substantial impact on therapeutic efficacy and safety. Novel drug delivery system (NDDS) increases therapeutic potential by increasing a drug's-controlled release, targeted distribution, and bioavailability while minimizing side effects. The pharmacokinetics of these devices would involve an examination of the ADME of the drugs loaded or encapsulated within the delivery mechanism. Optimizing the drug's release profile to ensure that it reaches the target site at the right timing and concentration is one of the main objectives. The drug's permeability and solubility may be enhanced by the delivery system's frequent modifications to the drug's absorption, especially for substances that are not very soluble in water. Common examples that improve cellular absorption and enable sustained release include polymeric systems, liposomes, and nanoparticles. The delivery system's properties, including its size, surface charge, and circulatory stability, can impact tissue penetration and bio-distribution, which in turn affects distribution. Because the formulation can be designed to protect the medication from enzymatic breakdown and increase its half-life, metabolic stability is still an important factor. Furthermore, formulation factors such as particle size or surface modifications influence renal or hepatic clearance, altering the excretion profile. Considering all aforementioned factors, revealing pharmacokinetics of the NDDS enables the fruitful development of medication formulations that are suited to particular clinical requirements, promising for both efficacy and safety in drug therapy.

Keywords: Liposomes, Pharmacokinetics, clearance, Nanoparticles, Bioavailability, Targeted, Hepatic.

Advances in Smart Nanocarriers and Nano-formulation Strategies for Targeted Drug Delivery: Innovations in Precision Medicine and Enhanced Therapeutic Outcomes through Targeted Therapy

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ABSTRACT

The development of smart nanocarriers and nano-formulation strategies. These innovations are revolutionizing targeted drug delivery, allowing for enhanced precision and improved therapeutic. Smart nanocarriers, engineered at the nanoscale, provide the ability to deliver therapeutic agents directly to diseased cells or tissues, thereby minimizing off-target effects and reducing systemic toxicity. These nanocarriers can be functionalized with ligands, antibodies and biomarkers associated with disease, such as those found in cancer, neurological disorders, and cardiovascular diseases. Nano- formulations, which incorporate nanoparticles, liposomes, dendrimers, and other nanostructures, offer several advantages, including controlled drug release, improved bioavailability, and enhanced stability of drugs. Integrating stimuli-responsive features such as pH, temperature. Further optimizing therapeutic efficacy. Additionally, these innovations contribute to the development of personalized treatments tailored to individual patients' needs, advancing the field of precision medicine.

I have created the latest developments in smart nanocarriers particles. The highlight the keyword design principles behind nano-formulations, mechanisms of targeted drug release, and the clinical potential of these technologies in achieving better therapeutic. These approaches hold great promise for transforming the landscape of modern medicine, offering new avenues for treating complex and stimulating diseases.

Keywords: Smart Nanocarriers, Nano-formulations, Targeted Drug Delivery, Precision Medicine, Drug Release, Personalized Therapy, Drug Targeting.

Introduction to Computer Aided Drug Design

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ABSTRACT

Computer-Aided Drug Design (CADD) is a powerful and interdisciplinary field that plays a pivotal role in modern drug discovery. It combines computational techniques with biological knowledge to identify and optimize potential drug candidates. This integration of diverse methodologies contributes to the versatility and effectiveness of CADD in the pharmaceutical industry. Several approaches of CADD are evaluated as promising techniques according to their need, in between all these structure-based drug design and ligand-based drug design approaches are known as very efficient and powerful techniques in drug discovery and development. These both methods can be applied with molecular docking to virtual screening for lead identification and optimization. Computer-aided drug design (CADD) comprises a broad range of theoretical and computational approaches that are part of modern drug discovery. CADD methods have made key contributions to the development of drugs that are in clinical use or in clinical trials. Such methods have emerged and evolved along with experimental approaches used in drug design. In this study, we discuss the major CADD methods and examples of recent drugs that have advanced applications in clinical trials or that have been approved for clinical use. We also comment on representative trends in current drug discovery that are shaping the development of novel methods, such as computer-aided drug repurposing. Furthermore, In this study we discuss the challenges of traditional and novel CADD methods to increase their positive impact in drug discovery.

Keywords: Computer aided Drug design, Computational Approaches, Drug Repurposing, Drug Discovery.

Enhancing Solubility of BCS Class II Drugs: Bridging Traditional and Modern Techniques

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ABSTRACT

The solubility of poorly water-soluble drugs is a critical determinant of their bioavailability, therapeutic efficacy, and clinical success. BCS Class II drugs, characterized by low solubility and high permeability, face substantial challenges in achieving effective absorption and desired therapeutic outcomes. This review highlights the crucial role of solubility in drug development and examines key factors influencing solubilization, such as chemical structure, pH, and environmental conditions.

Traditional methods, including particle size reduction, solid dispersion, pH modification, and the use of surfactants and cosolvents, have been extensively employed to enhance solubility. However, recent advancements have introduced innovative approaches like nanotechnology (e.g., nanocrystals and nanosuspensions), cyclodextrin complexation, and lipid-based drug delivery systems, which offer significant improvements in drug dissolution and stability.

Emerging techniques, such as nanostructured lipid carriers, and supercritical fluid technology, are paving the way for revolutionary solutions to overcome solubility barriers. These advanced methodologies provide distinct advantages, including increased surface area, enhanced dissolution rates, and improved drug stability, leading to better drug absorption and therapeutic outcomes.

Combining traditional and modern techniques addresses the limitations of poorly water-soluble drugs, particularly those in the BCS Class II category. This integrated approach not only improves the effectiveness of these drugs but also advances pharmaceutical science, ensuring better treatment options and enhanced patient compliance.

Keywords: Solubility Enhancement, Bioavailability, Therapeutic Efficacy, Drug Absorption

Pre-formulation Considerations in Trends and Challenges in Drug Design, Discovery, and Pharmaceutical Sciences

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ABSTRACT

Preformulation studies assess the physicochemical, mechanical, and biopharmaceutical characteristics of drug candidates, laying the groundwork for effective drug design and development. By directing the choice of suitable formulation techniques and dosage forms, these investigations guarantee the pharmaceutical products' efficacy, safety, and manufacturing viability. Nonetheless, there are advantages and disadvantages to the changing tendencies in pharmaceutical sciences and drug discovery. The development of novel chemical entities (NCEs) is often hindered by poor permeability, low solubility, and chemical instability. Biologics, including proteins and nucleic acids, add challenges in maintaining stability and integrity. Advances in nanotechnology, targeted drug delivery, and personalized medicine demand innovative preformulation strategies. High-throughput screening, computational modeling, and advanced analytics are crucial, alongside solubility-enhancing techniques like lipid-based systems, co-crystals, and amorphous solid dispersions. Sustainable manufacturing, regulatory compliance, and scalability further complicate preformulation. Integrating emerging technologies with traditional methods is essential to optimize drug performance, streamline development, and meet growing therapeutic demands.

Keywords: Preformulation studies, Physicochemical properties, Drug development, Formulation techniques, Novel chemical entities (NCEs), Biologics, Nanotechnology, Personalized medicine, Targeted drug delivery, High-throughput screening, Computational modeling, Solubility enhancement, Bioavailability improvement, Sustainable manufacturing, Pharmaceutical industry.

AI and nanotechnology in Drug Design and Discovery: Revolutionizing Cancer and Alzheimer's Treatments

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ABSTRACT

The convergence of Artificial Intelligence (AI) and Nanotechnology is transforming the landscape of drug design and discovery, providing innovative strategies for addressing intricate diseases like cancer and Alzheimer's. Through the examination of extensive datasets derived from clinical trials, molecular interactions, and patient genetic information, artificial intelligence facilitates the swift identification of potential compounds, thereby improving the accuracy of drug therapies. Simultaneously, nanotechnology is pivotal in tackling significant challenges associated with drug delivery, particularly in the targeted treatment of cancer cells and the traversal of the blood-brain barrier in Alzheimer's therapy. Nanoparticles, meticulously engineered for optimal size, stability, and surface attributes, promote precise drug delivery, which helps to decrease side effects and increase the efficacy of treatments. In addition, the integration of AI with nanotechnology enables the creation of advanced nanomedicine platforms that can smartly release medications in response to designated stimuli, which significantly enhances the effectiveness of treatments. The integration of these two advanced technologies is set to address numerous existing challenges in the treatment of cancer and Alzheimer's disease, including inadequate drug bioavailability, treatment resistance, and negative side effects. This comprehensive approach not only expedites the creation of innovative therapeutics but also heralds a new era of personalized, sustainable, and effective treatment alternatives for individuals afflicted by these debilitating conditions.

Keywords: AI, Nanotechnology, Drug Design, Drug Discovery, Nanomedicine.

Innovative Approaches in Diabetes Management: Herbal Drug-Infused Nano-formulations

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ABSTRACT

Diabetes mellitus poses significant health challenges due to poor drug bioavailability, limited targeting, and side effects from conventional treatments. Herbal drug-infused nanoformulations present a promising solution by enhancing the efficacy and delivery of antidiabetic agents. Integrating herbal medicines with nanotechnology improves solubility, stability, and controlled drug release. Nanocarriers, such as nanoparticles, liposomes, and dendrimers, play a crucial role in targeted drug delivery. They help reduce systemic side effects, enhancing drug absorption and cellular uptake. Herbal compounds like Berberine, Curcumin, Ginseng, and flavonoids such as Quercetin and Leucopelargonidin have shown potential in regulating blood glucose, combating oxidative stress, and reducing inflammation. Found in foods like onions, apples, and berries, Quercetin and Leucopelargonidin help manage blood sugar, improve insulin sensitivity, and reduce oxidative stress, supporting diabetes prevention and management. The integration of herbal drugs with nanotechnology offers improved therapeutic outcomes, advancing diabetes treatment and patient care. This innovative strategy addresses traditional drug delivery limitations, providing a more effective approach to managing diabetes mellitus and its complications. Combining natural compounds with nanotechnology holds great promise for the future of diabetes care. The potential of these formulations to address multiple aspects of diabetes management makes them a valuable addition to current treatment options. Overall, herbal drug-infused nanoformulations represent a significant advancement in diabetes mellitus management, with the potential for substantial improvements in therapeutic efficacy and patient outcomes. The future of diabetes care looks promising with these innovative solutions at the forefront.

Keywords: Antidiabetic agents, Nanotechnology, Nanocarriers, Targeted drug delivery, Natural compounds.

Protective Action of herbal drugs as cardioprotective and its inhibitory action on TLR2 and TLR4 signaling pathways.

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ABSTRACT

Chemotherapy can have serious cardiovascular side effects, such as myocarditis, pericarditis, arrhythmia, vasospasm, heart failure and cardiomyopathy, which lowers the survival benefits. Cardiotoxicity genesis involves the involvement of Toll-like receptors (TLRs) 2 and 4. The ability to respond to molecular cues linked to harmful microbes is facilitated by TLRs, which belong to the interleukin-1 receptor family (IL1) and the TLR express in heart, kidney, brain, and lungs. Pathogens linked to molecular patterns such bacterial lipoproteins, peptidoglycan, lipopolysaccharides, and oligonucleotides are recognized by TLRs during the inflammatory response. TLRs are expressed on leukocyte membranes, including those of macrophages and dendritic cells. The downstream signaling proteins (MyD88-dependent pathway) utilized by the majority of TLRs, such as TLR2 and TLR4. An essential component of the innate immune system, the TLR4 receptor is a member of the TLR family and reacts to both endogenous and external stimuli, causing pathological processes in organs such as the heart. Pro-inflammatory cytokines like interleukin-1β (IL-1β), IL-6, and TNF-α are released in cardiac tissue as a result of TLR4 signaling, which also activates and increases NF-kβ. In vivo and in vitro, TLR2 also induces cardiotoxicity by activating the PI3K/Akt signaling, TLR2/TNFα Signaling Pathways, and TLR-2/NF-κB signal pathway. In this review we will focus on cardiovascular diseases and its risk factor and how herbal drugs act on the TLR2/4 receptor and ameliorates the cardiotoxicity by inhibiting oxidative stress, inflammation, apoptotic, effects on mitochondria, and modulation of calcium ions. For thousands of years, herbal remedies have been utilized as traditional and conventional treatments, especially in Eastern nations. They also directly or indirectly contribute to more than 60–70% of the development of modern medications.

Keywords: Cardiotoxicity, Cardio protection, TLR, Oxidative stress, Inflammation, Necrosis.

In silico approach using free software

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ABSTRACT

In-silico studies are used in drug development because they save time, reduce costs, and minimize the need for animal testing. They enable virtual screening, predict drug properties, and provide insights into molecular interactions. These methods optimize drug candidates and design better trials, accelerating research with ethical and practical benefits. In-silico studies are performed on a computer or via computer simulation. The results of earlier attempts to use a computer to predict an action are applied in these research efforts. In-silico studies of drugs involve computational methods to analyse and predict drug properties, behaviour, and interactions like physicochemical, pharmacokinetic, pharmaco-dynamic, toxicity and structural parameters. Quantitative structure-activity relationship (QSAR) parameters, descriptors calculations, fingerprints, homology models, molecular dynamics and other molecular modelling, machine learning, data mining, network analysis, and data analysis tools are the most popularly used techniques for carrying out in-silico studies. In this study, in-silico studies of albendazole, a marketed anthelmintic was performed using various tools such as Swiss ADME, AutoDock, ProTox, ADME lab, and ADMESAR. With the help of these tools, the prediction of drug properties, including ADMET profiles, docking interactions, and toxicity, allowing efficient evaluation and optimization of albendazole's pharmacokinetic and pharmacodynamic characteristics during drug development are evaluated. Swiss ADME predicts drug-likeness, GI absorption, and CYP inhibition. This in-silico studies play a crucial role in evaluating albendazole's pharmacokinetics, toxicity, and binding efficiency, offering a cost-effective and reliable approach for drug development and optimization.

Keyword: ADME, Albendazole, Docking, In-silico study, Toxicity.

The Rising Threat of Human Metapneumovirus: A Review of its Role in Respiratory Disease

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ABSTRACT

Human metapneumovirus (hMPV), identified in 2001, primarily leads to upper and lower respiratory infections in young children, it also poses risks for elderly individuals and those with weakened immune systems. hMPV is a significant cause of approximately 5% to 10% of hospital admissions for children experiencing acute respiratory infections. In children, hMPV infections can result in severe conditions like bronchiolitis and pneumonia, and the symptoms are similar to those produced by human respiratory syncytial virus. Usually, the first hMPV infection occurs during early childhood, but individuals may experience re-infections frequently throughout their lives. Because the virus grows slowly in cell cultures, molecular techniques are the preferred methods for diagnosing hMPV. Several vaccine candidates have shown promise in preventing the disease, but none are currently available for commercial use. Our knowledge of hMPV has significantly progressed in recent years, and additionally, we will examine the existing therapeutic approaches and methods being implemented to manage hMPV infections, particularly focusing on potential strategies for developing an effective vaccine against hMPV.

Keywords: Metapneumovirus, Respiratory infection, Pneumonia,

Natural cannabinoid receptor 1 (CB1) antagonists

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ABSTRACT

The cannabinoid receptor 1 (CB1) antagonist has gained significant attention as a natural behavioural-modifying compound with potential therapeutic applications in metabolic and substance use disorders. The endocannabinoid system (ECS) plays a crucial role in regulating appetite, body weight, and neurophysiological processes. Synthetic CB1 antagonists, such as Rimonabant, demonstrated remarkable anti-addictive, weight-loss properties but was withdrawn from clinical use in 2008 due to severe psychiatric side effects, including depression and suicidal ideation. This review aims to explore naturally occurring CB1 antagonists, particularly plant derived cannabinoids, which offer promising therapeutic benefits with fewer adverse effects. Key compounds include Cannabidiol (CBD), Beta-caryophyllene, Cannabichromene (CBC). Tetrahydrocannabivarin (THCV), and Cannabigerol (CBG). Unlike synthetic CB1 antagonists, these phytocannabinoids modulate the ECS without inducing significant psychoactive effects, making them a much safer alternative. Research indicates that CBD and THCV, in particular, exhibit CB1 antagonistic activity and hold potential in treating obesity and addiction. Additionally, beta-caryophyllene functions as a selective CB2 agonist with indirect CB1 modulation, contributing to its ant-inflammatory an anxiolytic effects. Beyond their CB1 antagonist properties, these natural compounds have demonstrated neuroprotective, anti-inflammatory, and anxiolytic effects, making them potential candidates for various therapeutic applications. Unlike synthetic counterparts, natural CB1 antagonists do not significantly interfere with central nervous system functions, reducing the risk of severe psychiatric side effects. Future research should further explore their mechanisms, pharmacokinetics, and long-term effects to support their clinical application.

Keywords: Cannabinoid receptor 1 (CB1), endocannabinoid system (ECS), Plant derived cannabinoids, Cannabidiol (CBD), Cannabichromene (CBC), Tetrahydrocannabivarin (THCV)

Bioavailability Enhancement

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ABSTRACT

The therapeutic effectiveness of medications taken orally is largely determined by their bioavailability, however many substances have poor absorption because of things like permeability and solubility. Through the creation of cutting-edge formulation technologies and excipients, this project investigates novel approaches for improving the bioavailability of medications with low bioavailability. To increase medication solubility, stability, and intestinal absorption, we concentrate on a number of strategies, such as permeability enhancers, lipid-based systems, and nanoparticle carriers. Furthermore, we look into how enzyme inhibitors and pH-sensitive polymers can help get beyond physiological obstacles like first-pass metabolism. Evaluations were carried out both in vitro and in vivo to see how different formulations affected pharmacokinetic parameters such overall drug exposure (AUC), time to maximum concentration (T max), and peak plasma concentration (C max). These methods may be used for a variety of poorly soluble medications, as our results show notable increases in the bioavailability of model compounds. The potential for bioavailability improvement strategies to transform oral drug delivery and improve patient compliance and therapeutic outcomes especially for medications with limited therapeutic indices is highlighted by this study.

Keywords: Bioavailability, Formulation Technology, Permeability Enhancer, Nanoparticle Carriers.

Microsponges: Redefining Herbal Therapies for Acne

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ABSTRACT

Acne is a prevalent dermatological condition affecting adolescents and young adults. It arises from a combination of factors, including excessive sebum production, clogged hair follicles, hormonal imbalances, and the proliferation of cutibacterium acnes (formerly Propionibacterium acnes), a bacteria that triggers inflammation. These factors collectively result in the formation of pimples, blackheads, and cysts. Conventional acne treatments like benzoyl peroxide, retinoids, and antibiotics aim to reduce inflammation, regulate sebum production, and inhibit bacterial growth. However, these therapies often come with drawbacks such as skin irritation, antibiotic resistance, and relapse after discontinuation. Herbal remedies have gained attention as alternatives due to their natural anti-inflammatory, antibacterial, and antioxidant properties. Despite their potential, their effectiveness is limited by poor skin penetration, instability of active compounds, and frequent application requirements, reducing their therapeutic impact and user adherence. The integration of microsponges as a drug delivery system presents a game-changing solution. These microscopic, porous polymeric particles can encapsulate herbal actives, ensuring controlled, sustained release and enhanced skin penetration. Microsponges stabilize sensitive compounds, improve bioavailability, and allow targeted delivery, minimizing side effects. By combining microsponges with herbal therapies, the efficacy and convenience of acne treatments can be significantly improved, addressing the limitations of conventional approaches. The combination of herbal efficacy and the advanced delivery mechanism of microsponges holds great potential in revolutionizing acne management, offering an alternative to traditional chemical treatments and improving patient outcomes.

Keywords: Microsponges, Acne, Herbal Therapies, Acne Treatments

Nanotechnology

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ABSTRACT

The manipulation of matter at the nanoscale (1–100 nanometres) to create new materials, tools, and applications for a variety of sectors is known as nanotechnology, and it is a rapidly developing discipline. This multidisciplinary field of study combines engineering, chemistry, biology, and physics to produce sophisticated solutions with better qualities including stronger reactivity, electrical conductivity, and strength. Carbon nanotubes, quantum dots, and nanoparticles are examples of nanomaterials that find extensive use in electronics, energy storage, medicine, and environmental preservation. Nanotechnology makes regenerative medicine, early illness detection, and tailored drug delivery possible in the medical field. It improves computation efficiency and power in electronics. Improved battery performance and nanostructured solar cells are examples of energy applications. Even with its enormous potential, issues like toxicity, the influence on the environment, and moral dilemmas need to be resolved to guarantee sustainable and safe growth. Nanotechnology is transforming industries as research progresses, with the potential for ground breaking discoveries that will impact science and technology in the future.

Keywords: Nanomaterials, Targeted Drug Delivery, Energy Storage, Environmental Impact

Artificial intelligence in Pharmaceuticals

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ABSTRACT

Artificial intelligence (AI) has become a potent instrument that uses anthropomorphic knowledge solve complicated problems quickly. Significant developments in artificial intelligence and machine learning offer a game-changing prospect for pharmaceutical dosage form testing, formulation, and medication discovery. Researchers can find disease-associated targets and forecast how they will interact with possible treatment options by using AI algorithms that evaluate vast amounts of biological data, such as proteomics and genomics. This increases the possibility of successful drug approvals by enabling a more focused and effective approach to drug research. Additionally, by streamlining research and development procedures, AI can help lower development costs. In addition to predicting the pharmacokinetics and toxicity of potential drugs, machine-learning techniques aid in the design of experiments. By prioritizing and optimizing lead compounds, this capability lessens the need for expensive and time-consuming animal testing. Artificial intelligence (AI) algorithms that evaluate actual patient data can support personalized medical strategies, improving patient adherence and treatment results. Drug research and discovery have a significant impact on the pharmaceutical industry and several facets of human health. However, because medication research and development (R&D) is a lengthy and intricate process, investments in new drugs sometimes go unrewarded. Recent developments in computer hardware and experimental technologies have made artificial intelligence (AI) a key instrument for processing large amounts of high-dimensional data.

Keywords: Artificial intelligence, drug discovery, pharmaceutical market, algorithm, patient data

Formulation and Assessment of Novel *Enicostemma littorale* Effervescent Granules

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ABSTRACT

Traditional herbal medicines often suffer from poor solubility, low bioavailability, and poor patient compliance due to bitterness and inconvenient dosage forms. This study addresses these challenges by formulating effervescent granules of *Enicostemma littorale*, a medicinal herb with anti-diabetic and antioxidant properties. Using citric acid, tartaric acid, and sodium bicarbonate, the granules provide rapid dissolution and taste masking through effervescence. The wet granulation method ensured uniformity and stability, while systematic evaluations assessed flow properties, effervescence time, pH, moisture content, and dissolution kinetics. Comparative solubility studies demonstrated enhanced bioavailability over crude extracts, and stability tests confirmed robustness. The effervescent system significantly improved solubility, dissolution, and taste, making herbal treatment more patient-friendly and commercially viable. This study integrates modern pharmaceutical techniques with traditional medicine, paving the way for broader acceptance. Future in vivo studies will further validate the pharmacokinetic advantages of this novel formulation.

Keywords: *Enicostemma littorale*, Effervescent granules, Bioavailability enhancement, Taste masking, Herbal innovation

Green Synthesis of Benzimidazole: Sustainable Drug Development

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ABSTRACT

Benzimidazole derivatives are widely used in pharmaceuticals due to their antimicrobial, anticancer, and antiviral properties. However, conventional synthesis methods involve hazardous solvents, toxic reagents, and energy-intensive conditions, contributing to environmental pollution and safety concerns. This study explores green chemistry approaches for benzimidazole synthesis, emphasizing solvent-free techniques, aqueous-phase reactions, and deep eutectic solvents. Sustainable methods such as microwave- and ultrasound-assisted synthesis offer high yields (85–95%), faster reaction times, and minimal waste production. A comparative analysis demonstrates that green methods enhance atom economy, lower the E-factor, and reduce toxicity, making them superior to traditional approaches. These findings highlight the potential of eco-friendly pharmaceutical synthesis, aligning with global sustainability goals. Future research may focus on biocatalysis and CO_2-mediated processes to further advance green drug manufacturing.

Keywords: Green chemistry, benzimidazole synthesis, sustainable drug development, microwave-assisted synthesis, deep eutectic solvents, eco-friendly pharmaceuticals.

Study on Phytochemical extraction of Piperine

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ABSTRACT

Phytochemical extraction of piperine, the active alkaloid present in black pepper (Piper nigrum), is of significant interest due to its potential health benefits, including antioxidant, anti-inflammatory, and anticancer properties. This study focuses on optimizing extraction techniques to efficiently isolate piperine while preserving its bioactive properties. Various extraction methods such as solvent extraction, supercritical fluid extraction (SFE), and microwave-assisted extraction (MAE) were evaluated for their efficiency in extracting piperine from black pepper fruits. Solvent extraction, employing organic solvents such as ethanol, methanol, and acetone, was compared with SFE using CO2, and MAE using microwave energy for enhanced solvent penetration. Key parameters such as solvent concentration, extraction time, temperature, and particle size were optimized for maximum piperine yield. The piperine content was quantified using high-performance liquid chromatography (HPLC), and the antioxidant activity was assessed using DPPH radical scavenging assays. Results demonstrated that solvent extraction with ethanol yielded the highest piperine content, whereas SFE provided a cleaner extract with minimal solvent residue. MAE, though less efficient in terms of yield, showed promising results for rapid extraction with energy-efficient benefits. This study underscores the importance of selecting the right extraction method based on the desired purity and yield of piperine for pharmaceutical and nutraceutical applications. The findings also highlight the potential of environmentally friendly extraction techniques like SFE and MAE, which may offer superior sustainability over traditional solvent-based methods. Future research will focus on refining these methods for industrial-scale extraction and investigating the bioactivity of piperine extracts in various therapeutic contexts. The optimization of piperine extraction techniques holds promise for enhancing the value of black pepper as a functional ingredient in health supplements.

Keywords: Phytochemical extraction, DPPH , black pepper, microwave-assisted extraction.

Exploring the Medicinal Properties of Malabar Spinach (Basella Alba L.): A Review of Its Therapeutic Potential and Nutritional Benefits

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ABSTRACT

Malabar spinach (*Basella alba* L.), also known as Ceylon spinach, Indian spinach, or vine spinach, belongs to the family Basellaceae. Malabar spinach thrives in warm and humid environments, requiring temperatures between 20–30°C for optimal growth. It can grow in a variety of soils, although it prefers loamy, well-drained soils rich in organic matter. The plant is drought-tolerant but performs best with consistent moisture, making it ideal for tropical and subtropical regions. Malabar spinach (Basella Alba L.), a perennial vine native to tropical Asia, has gained popularity for its rapid growth, high nutritional value, and potential medicinal properties. Basella alba is a nutrient-rich leafy vegetable with numerous health benefits attributed to its diverse bioactive compounds. This leafy vegetable, belonging to the Basellaceae family, is rich in vitamins (A, C, and B-complex), minerals (calcium, magnesium, iron, and potassium), dietary fibre, and bioactive compounds such as flavonoids, phenolic acids, and saponins. The potassium and magnesium content, along with dietary fibre, contribute to maintaining cardiovascular health by regulating blood pressure and cholesterol levels Malabar spinach's nutrients and phytochemicals provide strong antioxidant properties, reducing oxidative stress and chronic disease risk. Flavonoids, phenolics, and saponins support cardiovascular health by regulating blood pressure and heart function. Bioactive compounds in Malabar spinach, including saponins, flavonoids, phenolics, and alkaloids, provide anti-inflammatory, antioxidant, anti-carcinogenic, and cardioprotective benefits. Its phenolics help inhibit pro-inflammatory enzymes, aiding in conditions like arthritis.

Keywords: Malabar Spinach, Basella Alba, minerals, phytochemicals, anti-inflammatory, medicinal properties.

Hepatoprotective Potential of Mirabilis jalapa (Aerial Part) Against Gentamicin-Induced Hepatotoxicity

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ABSTRACT

In traditional medicine, herbs have been used extensively as raw materials and are essential to many therapeutic formulations. However, precise pharmacognostical analyses are necessary to ensure the efficacy and authenticity of these raw materials, and they also aid in the detection of adulteration. Identifying and gathering these medicinal plants according to their therapeutic potential is the responsibility of traditional practitioners, who frequently inherit knowledge of herbal medicine and Ayurveda. Mirabilis jalapa, also referred to as the four o'clock plant, is one such plant that has long been utilized for its hepatoprotective, antioxidant, and anti-inflammatory qualities. Mirabilis jalapa, which is abundant in bioactive substances like triterpenoids, alkaloids, and flavonoids, has been shown to have important therapeutic benefits for liver diseases. The objective of this study is to assess the pharmacognostical and pharmacological characteristics of Mirabilis jalapa's aerial parts, with an emphasis on their capacity to protect the liver against gentamicin-induced hepatotoxicity. The study will cover a number of topics, such as the collection and verification of plant material as well as qualitative evaluations using physicochemical, microscopic, and macroscopic studies. Furthermore, fluorescence analysis, extractive value determination, and phytochemical screening will be carried out. To find the bioactive substances in the plant extract, sophisticated analytical methods such as GC-MS will be used. An in vivo animal model will be used to evaluate its hepatoprotective effects, and biochemical and histological investigations will be carried out to assess liver function and structural integrity. The goal of this study is to provide scientific support for Mirabilis jalapa's traditional hepatoprotective use, laying the groundwork for possible therapeutic use in liver-related conditions. The results could further stimulate pharmacological study in the future and support the incorporation of herbal medicine into contemporary medical procedures.

Keywords: Pharmacognostical analysis, Mirabilis jalapa, Hepatoprotective, Herbal medicine, Traditional medicine, Phytochemical

Natural Ways to Treat Diabetes Mellitus

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ABSTRACT

Herbal medicine, also known as phytomedicine or botanical medicine, involves the use of plants for therapeutic purposes. It has been employed for centuries to prevent and manage diseases, including diabetes. Diabetes mellitus (DM) is a major global health concern characterized by persistent hyperglycemia, which, if uncontrolled, can lead to severe complications such as kidney disease, cardiovascular issues, vision impairment, and limb amputations. Despite advances in conventional treatments, including lifestyle changes, oral medications, and insulin therapy, optimal glycemic control remains a challenge. Natural remedies, including medicinal plants, have gained attention for their potential role in diabetes management due to their affordability, safety, and minimal side effects. The choice of herbal treatments depends on factors such as diabetes progression, existing comorbidities, and herb availability. Various plants have been identified for their antidiabetic properties, particularly in India, where herbal medicine plays a significant role in healthcare. Some notable medicinal plants with proven hypoglycemic and antioxidant effects include Allium sativum, Eugenia jambolana, Momordica charantia, Ocimum sanctum, Phyllanthus amarus, Pterocarpus marsupium, Tinospora cordifolia, Trigonella foenum-graecum, and Withania somnifera. The antioxidant properties of these herbs help mitigate oxidative stress, a key factor in diabetes complications. This review highlights the mechanisms by which these natural remedies contribute to blood glucose regulation and their potential to complement conventional diabetes therapies. Understanding these medicinal plants offers new possibilities for safer and more effective diabetes management.

Keywords: medicinal plant, India, antidiabetic, antioxidant, diabetes.

Role of Microbiome and Gut Physiology in Bioequivalence Outcomes

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ABSTRACT

Research into the gut microbiome has gained precedence, and almost every disorder has been linked to alterations in microbiome composition. The microbiome, commonly studied through faecal samples, is highly heterogeneous, with many environmental factors that have already been identified as contributing to the composition. Bioequivalence (BE) studies are essential to ensure that generic and reference medication formulations have therapeutic equivalence. However, there is growing evidence linking interindividual variability in BE outcomes to changes in gut flora and gastrointestinal (GI) function. The gut microbiome refers to a varied and dynamic community of bacteria, which plays a critical role in the metabolism, absorption, and systemic bioavailability of medications. The enzymatic activity of the microbes may result in the activation, inactivation, or biotransformation of drugs; therefore, all the PK parameters such as Cmax and AUC may also be affected. The physiological parameter of the gut like gastric emptying time, intestinal pH, bile salt concentration, enzymatic activity, and mucosal permeability also influences significantly the drug solubility, absorption, and transport through the intestinal wall. The variability in these parameters is important particularly for orally administered BCS Class II and IV drugs, where solubility as well as permeability issues impact bioavailability. There is a need for better in vitro -in vivo correlation models and physiologically based pharmacokinetic modelling to enhance BE prediction when gut microbiota composition interacts with host physiology. The integration of microbiome profiling and personalized medicine methodologies into BE assessments should strengthen regulatory frameworks to better evaluate generic medication performance in diverse patient populations.

Keywords: Bioequivalence, Gut Microbiome, Gastrointestinal Physiology, Personalized Medicine, Cmax, Pharmacokinetics

Understanding Drug Design: A Simple Approach

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ABSTRACT

Drug design is the process of creating new medications that can effectively treat diseases. It involves understanding the biology of diseases and finding molecules that can interact with the body in ways that help cure or manage these conditions. The goal is to design drugs that are safe, effective, and cause as few side effects as possible. The process starts by studying the disease and identifying which part of the body or system needs to be targeted. Once the target is found, scientists design molecules that can bind to that target and influence it in a way that treats the disease. This might involve blocking harmful proteins, enhancing the effects of helpful ones, or changing how cells behave. Computer models and laboratory experiments help predict which drug designs will work best. Drug design has become more advanced with the help of technology, like computer simulations, which allow scientists to design and test drugs faster and more accurately. However, creating a successful drug can take many years of research, testing, and safety checks before it reaches patients. This abstract highlights the importance of drug design in developing new treatments. It explains how scientists work to understand diseases and create drugs that can help improve health, and how technology is speeding up the process. Ultimately, drug design is about finding the best solutions to improve health and quality of life for patients.

Keywords: Drug design, New medications, technology

Triazole Based Iron-Chelating Agents: An Analytical Methods

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ABSTRACT

Chelating agents or chelants are compounds having two or more donor atoms that can form cyclic coordination complexes or chelates with acceptor metals. They are used to remove toxic metals from the body. They are also being studied in the treatment of cancer, Iron overload syndrome, Myelodysplastic Syndrome, Thalassemia, aplastic anaemia. They are chemically categorized into various classes like benzene derivatives, acids, carbocyclic, Iron Chelating activity and triazoles. Iron-chelating agents with triazole nucleus are Deferasirox, Deferiprone and Deferoxamine. These possess some adverse effects such as Renal toxicity, Respiratory Distress Syndrome, Auditory & ocular toxicity etc. The spectrum of conditions that may be successfully treated with chelating agents has increased. Triazoles are a new emerging range of iron chelators that will enable clinicians to apply iron chelation methodology to other disease states and to begin to design personalized chelation regimes. After detailed literature survey, it was observed that only few HPLC methods till date are reported for the estimation of these drugs and none of the method is highly accurate, precise and sensitive. So, it can be potential area for analyst to develop a fast, accurate and sensitive method for these triazole based iron-chelators.

Keywords: Chelating Agents, triazoles, cancer, Iron overload syndrome, Myelodysplastic Syndrome, Thalassemia, aplastic anaemia

Applications of Nanotechnology in Nanomedicine

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ABSTRACT

Nanotechnology has become a transformative force in medicine, transforming diagnosis, drug delivery, and therapeutic interventions. Nanomedicine is a type of medicine that uses nanotechnology to diagnose, treat, and prevent diseases.

The application of nanomedical applications can provide effective treatment, reduce side effects, and improve patient outcomes. Nanoparticles such as liposomes, dendrimers, and polymer carriers are widely used for drug delivery by providing controlled release and enhanced bioavailability. Advances in nanotechnology in cancer treatment are focusing on therapeutic methods, photothermal therapy, and quantum dot imaging to improve diagnosis and clinical follow-up. Nano sensors and lab-on-a-chip devices have also increased the sensitivity of disease detection, while magnetic nanoparticles have improved imaging techniques such as MRI. Nanotechnology also plays a major role in regenerative medicine, immunotherapy, and gene therapy. Despite its potential, challenges such as toxicity, biocompatibility, and large material volumes remain significant. Advances in nanomedicine continue to drive innovation, paving the way for personalized medicine and better treatments.

In recent years, nanomedicine has become so popular that a publishing house has been established specifically for it. The Iranian Society of Nanomedicine (ISNM) owns, manages, and publishes the worldwide, open access, double-blind, peer-reviewed, electronic quarterly Nanomedicine Research Journal (abbreviated as Nanomed Res J). Tehran University of Medical Sciences (TUMS) Journals Publishing House is the journal's publisher.

Keywords: Nanotechnology, Nanomedicine, Nano sensors, Regenerative medicines, immunotherapy, Personalized medicine.

A Review on Analytical and Pharmacological Description of Ornidazole

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ABSTRACT

Ornidazole is a well-known antibacterial drug associated with the Nitroimidazole class. It's a class II BCS compound with poor solubility in inorganic solvents. Hoffmann-La-Roche synthesized ornidazole in 1966. Anaerobic bacteria are susceptible to the antibacterial and antiprotozoal effect of ornidazole. This review mainly focuses on various analytical estimations techniques of ornidazole and compares it with other drug compounds. This is a comprehensive review of previous research on the drug ornidazole. Other than its potency in combating anaerobic infections, ornidazole has been shown to treat specific protozoal diseases like infections caused by Trichomonas vaginalis and Giardia lamblia. Therapeutic applications are widening because the medication is also quite effective at conditions that have not been readily possible to handle through other methods. Despite extensive application, one limitation of ornidazole has remained in that its poor solubility directly influences its bioavailability and therapy results. Consequently, pharmaceutical companies are currently interested in further developing advanced formulations of drugs including oral tablets, which have greater solubility, or intravenous preparations, for example. Analytical procedures for the quantitative determination of ornidazole are becoming increasingly critical, especially when it comes to proper dosing and avoiding any adverse effects from the drug. Techniques like HPLC, UV spectrophotometry, and capillary electrophoresis are commonly used in both clinical and research environments to monitor drug levels in biological fluids. The future of the research will focus on refining these methods for higher accuracy and efficiency, thus optimizing therapeutic use. This article mainly provides an overview of different techniques while underlining the need for these methods in sustaining the potency and quality of ornidazole in clinical therapy.

Keywords: Ornidazole, Drug, Techniques, Solubility, Antibacterial, Anaerobic bacteria.

The role of AI in detecting adverse events of medical devices

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ABSTRACT

Medical devices play a crucial role in modern healthcare; they require constant oversight to identify adverse events (AEs) of these devices to mitigate risks and harm to patients. Post-market surveillance often relies on manual reporting, which can be incomplete, critically prone, and slow to underreporting. Automated, real-time detection of AEs from multiple data sources, such as electronic health records, social media, clinical reports, and patient feedback, is possible because the medical device vigilance process is being transformed by Artificial Intelligence (AI). Materiovigilance is a harmonized process consisting of the recognition, reporting, and analysis of unexpected events related to medical devices, thereby aiming at patient safety and health. Materiovigilance plays a crucial role in enhancing the efficiency of medical devices and preventing their failures and further complications, as well as raising the alarm regarding simulated and substandard medical devices. Through the analysis of large datasets, AI-driven technologies—which include machine learning (ML) and natural language processing (NLP)—improve the detection of safety signals, identify patterns, and forecast potential risks. Conventional methods of adverse event reporting waste human resources and delay regulatory actions, whereas automated methods increase the precision and speed of reporting. Furthermore, AI-powered predictive analytics facilitate early detection of device malfunctions and safety issues, leading to proactive risk management and improved patient safety. This poster describes how AI can transform medical device surveillance by proactively identifying adverse event signals earlier and more efficiently. However, in addition to potential technological disruptions and challenges to implementing this more effective healthcare monitoring systems, including data integrity, regulation compliance, and algorithmic bias, artificial intelligence still must improve itself and continue working on its great accuracy, speed, cost-effectiveness, and efficiency.

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

Nano Lipid Carrier: A novel approach for enhancing herbal treatment efficacy

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ABSTRACT

As an alternate treatment approach to achieve more acceptances, there is a need to explore natural treatments to mitigate their ailments. Herbal medicine has been used for centuries to treat various ailments, but its efficacy is often limited by poor bioavailability and solubility of active phytoconstituents. Nanotechnology has revolutionized various fields, including drug delivery system. Nano lipid carriers (NLCs) have emerged as promising solution to overcome these challenges NLCs were found to be effective in delivering a range of herbal active, including curcumin, quercetin, and resveratrol. NLCs, which are composed of a solid lipid core and a liquid lipid phase, offer several advantages, such as enhanced stability, controlled release, and improved bioavailability. This novel approach is particularly beneficial in herbal medicines, which often faces challenges like poor solubility, rapid degradation, and low bioavailability of active compounds. By encapsulating herbal extracts or their active ingredients within NLCs their therapeutic effects are enhanced while minimizing side effects. Furthermore, NLCS enable targeted delivery to specific tissues, improving the efficacy of herbal treatments. The flexibility of NLCs to encapsulate a wide range of herbal actives, including, makes them an alternative delivery system for herbal medicine. The integration of NLCs with herbal medicine could lead to the development of more efficient and effective of more efficient and effective therapeutic strategies, bridging the gap between traditional herbal knowledge and modern pharmaceutical technologies.

Keywords: Nano lipid carriers, herbal medicine, bioavailability, solubility, phytoconstituents, curcumin, quercetin, resveratrol

Bioequivalence and Bioavailability Studies

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ABSTRACT

Bioequivalence is a term used in pharmacokinetics to evaluate the expected in vivo bioequivalence of two formulations of a drug. When two drugs are bioequivalent, it means that they are identical in all respects. In order to determine the bioequivalence of two drugs, such as a reference drug (brand name) and an investigational drug (brand name), a pharmacokinetic study is performed in which each drug is administered to volunteers (healthy subjects) in a crossover study. Serum/plasma samples are collected periodically to identify the parent drug (metabolites). If the blood pressures of the two drugs are not comparable or similar, a pharmacodynamic endpoint is used for comparison instead of a pharmacokinetic endpoint. For pharmacokinetic comparisons, plasma concentration data were used to measure key pharmacokinetic parameters such as area under the curve (AUC), peak concentration (Cmax), time to peak concentration (Tmax), and duration of absorption (tlag). Testing should be performed on multiple doses, especially if the drug has nonlinear pharmacokinetics.

Bioavailability refers to the rate at which a drug reaches the human body and is an important aspect of medicine. When administered intravenously, bioavailability is by definition 100%. Bioequivalence studies compare the cost and absorption of multiple multisource drug formulations with an innovator (reference) product, based on the assumption that if two formulations have similar drug concentration time profiles in blood/serum, they should have similar drug properties.

Keywords: Bioequivalent, Pharmacokinetic, Bioavailability

Nanotechnology For Target Drug Delivery System

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ABSTRACT

Nanoparticles present significant promise as a highly efficient system for delivering drugs. In this review, we explored the latest advancements in nanotechnology related to drug delivery. To address the challenges associated with gene and drug delivery, there has been a growing interest in nanotechnology over the past few years. Various Nano systems with unique compositions and biological characteristics have been thoroughly researched for applications in drug and gene delivery. For successful drug delivery, it is crucial to comprehend how nanomaterials interact with the biological environment, target cell-surface receptors, manage drug release, facilitate multiple drug administration, ensure the stability of therapeutic agents, and understand the molecular mechanisms of cell signaling relevant to the disease's pathobiology. Several anti-cancer medications, such as paclitaxel, doxorubicin, 5-fluorouracil, and dexamethasone, have been effectively formulated using nanomaterials. Quantum dots, chitosan, polylactic/glycolic acid (PLGA), and PLGA-based nanoparticles have also been employed for in vitro RNA interference delivery. Brain cancer remains one of the most challenging types of cancer to identify and treat, primarily due to the difficulty in transporting imaging and therapeutic agents across the blood-brain barrier and into the brain. Anti-cancer drugs like loperamide and doxorubicin, when attached to nanomaterials, have been demonstrated to penetrate the intact blood-brain barrier and release at therapeutic levels within the brain. The application of nanomaterials, including peptide-based nanotubes, to target the vascular endothelial growth factor (VEGF) receptor and cell adhesion molecules such as integrins, cadherins, and selectins represents a novel strategy for managing disease progression.

Keywords: Nanotechnology, drug delivery. Design of nanotechnology-based drug delivery system, Nano systems in inflammation.

A Review on Etiology and Treatment of Liver Disease: Hepatoprotective Activity

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ABSTRACT

Liver diseases are a major worldwide health problem, with high endemicity in developing countries. They are mainly caused by chemicals and some drugs when taken in very high doses. Despite advances in modern medicine, there is no effective drug available that stimulates liver function, offer protection to the liver from damage or help to regenerate hepatic cells. There is urgent need, therefore, for effective drugs to replace/supplement those in current use. The plant kingdom is undoubtedly valuable as a source of new medicinal agents. The present work constitutes a review of the literature on plant extracts and chemically defined molecules of natural origin with hepatoprotective activity. The review shows 107 plants, their families, geographical distribution, plant parts utilized, type of assay and inducer of liver damage. The development of new drugs consists of a variety of steps, ranging from the discovery of the pharmacological effects in cellular and animal models, to finally demonstrate their efficacy and safety in humans. Chronic alcohol consumption, exposure to toxic chemicals and certain drugs like paracetamol, tetracycline, antitubercular drugs, chemotherapeutic agents, NSAIDS, damage the liver cells (hepatocytes) in long run. Drug induced liver injury is a major health problem, the manifestations of which are highly variable, ranging from asymptomatic elevation of liver enzymes to fulminant liver failure. Modern medicine has provided us many drugs that alleviate liver diseases but compared to it herbal medicine is preferred because the latter is cost effective and considered to be a safe approach for treatment with minimal side effects.

Keywords: Liver, liver disease, hepatoprotective activity, natural products, Liver Hepatocuration, Hepatotoxicology Hepatoprotection, Hepatotoxicity, Herbal drugs.

Use of Artificial Intelligence and Machine Learning in the Optimization of Bilayer Tablet Formulation

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ABSTRACT

The application of Artificial Intelligence (AI) and Machine Learning (ML) in the optimization of bilayer tablet formulations is transforming pharmaceutical development. Bilayer tablets, which consist of two distinct layers with different release profiles, require precise formulation to ensure optimal drug release, stability, and bioavailability. AI and ML techniques enable predictive modelling, process optimization, and pattern recognition to streamline this process. By analyzing large datasets, these technologies can predict the effects of formulation variables and processing conditions, reducing the time and cost of trial-and-error approaches. However, challenges such as data quality, limited labelled datasets, model overfitting, and lack of interpretability hinder the effectiveness of AI/ML models. To overcome these limitations, strategies like improving data collection, employing hybrid models that combine traditional and AI methods, leveraging transfer learning, and advancing explainable AI (XAI) techniques are essential. These solutions help enhance model robustness, transparency, and applicability to real-world formulations, thus improving the efficiency of bilayer tablet development and ensuring better patient outcome. By automating and predicting formulation variables and manufacturing conditions, AI/ML methods promise faster, more efficient development of these advanced drug delivery systems.

Challenges such as limited data and model interpretability can be mitigated with hybrid models, improved data collection, and explainable AI, enabling more accurate predictions and regulatory acceptance.

Keywords: Bilayer tablet, Artificial intelligence, Machine learning, Data quality, sustainable practices.

Exploring the Medicinal Properties of Malabar Spinach (Basella Alba L.): A Review of Its Therapeutic Potential and Nutritional Benefits

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ABSTRACT

Malabar spinach (*Basella alba* L.), also known as Ceylon spinach, Indian spinach, or vine spinach, belongs to the family Basellaceae Malabar spinach thrives in warm and humid environments, requiring temperatures between 20–30°C for optimal growth. The plant is drought-tolerant but performs best with consistent moisture, making it ideal for tropical and subtropical regions. Malabar spinach (Basella Alba L.), a perennial vine native to tropical Asia, has gained popularity for its rapid growth, high nutritional value, and potential medicinal properties. Basella alba is a nutrient-rich leafy vegetable with numerous health benefits attributed to its diverse bioactive compounds. This leafy vegetable, belonging to the Basellaceae family, is rich in vitamins (A, C, and B-complex), minerals (calcium, magnesium, iron, and potassium), dietary fibre, and bioactive compounds such as flavonoids, phenolic acids, and saponins. The potassium and magnesium content, along with dietary fibre, contribute to maintaining cardiovascular health by regulating blood pressure and cholesterol levels. The presence of these nutrients and phytochemicals contributes to Malabar spinach's strong antioxidant properties, which help reduce oxidative stress and lower the risk of chronic diseases. Bioactive compounds in Malabar spinach, such as saponins, flavonoids, phenolic compounds, and alkaloids, contribute to its medicinal properties, including anti-inflammatory, antioxidant, anti-carcinogenic, and cardio protective effects. Malabar spinach exhibit significant anti-inflammatory effects, potentially useful in managing conditions like arthritis. The plant's anti-inflammatory effects, with phenolic compounds inhibiting pro-inflammatory enzymes.

Keywords: Malabar Spinach, Basella Alba, minerals, phytochemicals, anti-inflammatory, medicinal properties,

Synthesis and In Vitro Anti-Rheumatic Study of Novel 4-Substituted Quinazolines Encompassed With Thiazolidinone and Azetidinone

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ABSTRACT

A series of novel 4-substituted quinazoline derivatives incorporating thiazolidinone (4a-e) and azetidinone (5a-e) rings were synthesized and characterized using IR, 1H NMR, and mass spectrometry. The compounds were evaluated for their anti-rheumatic potential using the paw edema model induced by carrageenan, a well-established inflammatory agent. These derivatives demonstrated significant reduction in paw edema, indicating potent anti-inflammatory effects. Furthermore, the compounds were tested for their impact on pro-inflammatory cytokines, including tumor necrosis factor-alpha (TNF-α), and other key markers of inflammation. The results revealed a notable suppression of TNF-α and other inflammatory mediators, further supporting the anti-inflammatory potential of these compounds. Additionally, they exhibited antioxidant activity and DNA-binding affinity, suggesting a multifactorial mechanism of action. These findings highlight the therapeutic potential of these quinazoline derivatives as novel anti-rheumatic agents for the treatment of inflammatory diseases.

Keywords: Quinazoline derivatives, Thiazolidinone, Azetidinone, Anti-rheumatic activity, Paw edema, Inflammation, Antioxidant activity, DNA-binding, Inflammatory cytokines

Preliminary Synthetic Method Towards the Novel Azine Derivatives As Antifungal Activity

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ABSTRACT

Antifungal activity refers to the ability of a substance to inhibit or kill fungi that can cause infections. Novel azine derivatives work by target disrupting fungal cell membrane function. Diphenylhydrazine derivatives were prepared with synthetic method from commercially available or self-prepared hydrazide. Novel Derivatives showed the inhibition of enzyme, which is responsible for synthesis of fungal cell membrane. Designed new compounds showed better comparable inhibition of enzyme than that of the standard drug. Synthetic approach was performed to investigate the potential antifungal drugs.

Keywords: Azine derivatives, MOA, Synthetic method, Antifungal activity.

Unlocking The Potential of AI In Applications of Phytopharmaceuticals

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ABSTRACT

Artificial intelligence integration into plant-based medicines becoming a boon in revolutionizing drug discovery, formulation, and clinical applications. AI extracts valuable information from ancient texts, digitizing traditional medicinal knowledge for application in modern research. AI helps bring together global ethnopharmacological data, accelerating the discovery of new therapeutic applications. The synergy between AI and phytopharmaceuticals has great potential for fast-tracking drug development, ensuring quality control, and enabling personalized herbal medicine. It enhances the efficiency, accuracy, and innovations of all aspects of phytomedicine research and development with AI-driven approaches. AI models analyze massive datasets from ethnobotanical sources, scientific literature, and chemical databases to identify bioactive compounds. AI maps the interaction of phytochemicals with biological pathways, accelerating lead compound identification. AI-assisted molecular docking and simulations help predict phytochemical efficacy and interactions with target proteins. AI models optimize the formulation of plant-based drugs to enhance bioavailability by designing nanoparticle-based delivery systems for controlled drug release. It is also used in tailoring phytopharmaceutical formulations based on patient-specific data, ensuring precision medicine in herbal therapies. AI algorithms are also used in analytical chemistry (NMR, FTIR, LC-MS) to ensure phytochemical consistency in herbal formulations. Secure, AI-based blockchain systems help to track the authenticity and quality of herbal drugs. Machine learning models analyze toxicological data predicting adverse effects due to plant-based drugs. AI-powered wearables monitor real-time patient responses to treatments with phytopharmaceuticals.

Keywords: Artificial Intelligence, Phytopharmaceuticals, Personalized Herbals, Scientific methodologies, Block-Chain, Machine Learning

AI in Pharmaceutics: A New Era in Drug Development & Delivery

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ABSTRACT

Artificial Intelligence (AI) is changing the world, and pharmaceutics is no exception! AI is like a smart assistant that helps scientists and pharmacists make better medicines, faster and safer. This poster explores how AI is transforming the field of pharmaceutics in exciting ways.AI plays a key role in drug formulation, where it helps researchers design new medicines by predicting how different ingredients will work together. It speeds up the discovery of effective drugs, reducing time and cost. In drug delivery, AI ensures medicines reach the right place in the body with precision, making treatments more effective and reducing side effects. Quality control is another area where AI shines automated AI systems quickly detect impurities and ensure medicines meet safety standards before reaching patients. Looking ahead, AI is expected to bring revolutionary changes to pharmacy practice. From AI-powered chatbots providing instant drug information to AI assisting in vaccine development (such as during the COVID-19 pandemic), the future of pharmaceutics is smarter and more efficient than ever before. This presentation features simple visuals like AI-driven pill illustrations and pharmacist-assisting chatbots. A QR code links to an interactive AI demo, making learning more engaging. Join us to explore how AI is shaping the future of pharmacy one smart step at a time.

Keywords: Artificial Intelligence (AI), Pharmaceutics, Quality Control, Future of Pharmacy, Drug Formulation

A Review on Herbal Nano-emulsion Gels for Faster Wound Healing

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ABSTRACT

The development of herbal nano-emulsion gels offers a promising approach for treating wounds of skin due to their enhanced drug delivery and wound-healing properties. This review work focuses on the herbal nano-emulsion gels prepared and evaluated till date incorporating plant-based bioactive compounds with anti-inflammatory, antioxidant, and healing properties. The study also summarizes all the potential herbs having wound healing properties and the different methods for preparation and evaluation. Nano-emulsions those have been prepared particularly using a high-energy emulsification method were able to reduce the droplet size, thereby enhancing the bioavailability and skin penetration of the herbal actives. The nano-emulsions were then converted into a gel matrix using natural gelling agents, thus improving their stability, spread-ability, and controlled release. Key physicochemical parameters evaluated, included particle size, zeta potential, viscosity, *in-vitro*-drug release, skin permeation, stability and *in-vivo efficacy and skin irritations*. *In-vitro* release studies were done to demonstrate release and release kinetics of the bioactive compounds, while skin irritation tests confirmed the safety and biocompatibility of the formulation. The outcome of this literature review suggested that the herbal nano-emulsion gel significantly promoted wound healing in burn models by accelerating tissue regeneration, reducing inflammation, and providing localized therapeutic action.

Keywords: Herbal, Nano-emulsions Gel, Wound Healing, Transdermal, Skin Care.

In Silico Design Studies of Limonene Derivatives Exploring Novel Anti-Depressant Potential

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ABSTRACT

The study focuses on the *in-silico* design of limonene derivatives exploring its novel antidepressant activities. Limonene is a naturally occurring monoterpene found in citrus fruits like lemon and oranges. Limonene has previously shown various bioactivities like anti-inflammatory and antioxidant effects. The research employs computational methods to design new limonene analogs by modifying its chemical structure, optimizing potential interactions with key receptors involved in mood regulation, particularly serotonin and norepinephrine pathways. Virtual screening, molecular docking, and pharmacokinetic assessments were utilized to predict the bioactivity and stability of these derivatives. Following *in silico* analyses, selected compounds can be synthesized and evaluated for their antidepressant potential through *in vivo* models. The study aims to identify novel, more effective, and safer antidepressant candidates derived from limonene, potentially offering an alternative to current treatments. The findings provide insights into the therapeutic potential of limonene-based derivatives and contribute to the growing field of natural product-based drug design for mental health disorders.

Keywords - Limonene, analogues, Antidepressant, Molecular docking, phytochemical

AI in Pharmacovigilance Program of India – A New Era of Automated Drug Safety Surveillance

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ABSTRACT

Pharmacovigilance Programme of India (PvPI) is an important programme that it takes care of the safety of drugs by monitoring ADRs (Adverse Drug Reaction) and assess the risk of medicinal products. However, traditional pharmacovigilance methods often struggle with high data volume, delay of signal detection and manual reporting inefficiency. The adoption of Artificial Intelligence (AI) is revolutionising PvPI through automation of adverse event detection, optimization of data analysis and improvement of decision-making process. Real time monitoring of ADRs is enabled by AI powered algorithms such as natural language processing (NLP) and machine learning (ML) from various sources e.g. electronic health records, social media, and medical literature. Signal detection and risk assessment are made more automated resulting accuracy and efficiency of pharmacovigilance and reducing the burden on the healthcare professionals and regulatory bodies. Predictive analytics also help in proactive risk management through timely interventions. In this paper, we lay out where AI has been integrated in PvPI and to what extent it is transforming drug safety surveillance in India. Implementation of AI driven tools and future of pharmacovigilance towards patient safety but with a speedup in regulatory decision making. However, for the successful adoption of AI within pharmacovigilance there are challenges to be overcome such as data privacy, algorithm bias and capacity to be accepted by regulations.

Keywords: Pharmacovigilance Programme of India, Adverse drug reactions, Artificial intelligence, Natural language processing and Machine learning.

Analytical Method Development and Validation Estimation of Mupirocin in Bulk Drug and Ointment Formulation UV Spectrophotometry and HPLC

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ABSTRACT

Mupirocin is useful in the treatment of superficial methicillin-resistant *Staphylococcus aureus* (MRSA) infections. The primary objective was to develop simple, accurate and precise UV & HPLC method for estimation of Mupirocin in Bulk drug & Ointment formulation. The solvent was selected was Acetonitrile, Phosphate buffer for Spectroscopic study and for RP-HPLC method, selection of mobile phase orthophosphoric acid, acetonitrile (200:800 v/v). In UV Spectroscopic method, the linearity was proven in range of 2 - 10µg / mL of working concentration with linear regression curve (R^2 = 0.9966) with limits of detection (LOD) and quantitation (LOQ) being 1.37 and 4.15µg / mL respectively. In HPLC technique, the linearity was proven in range of 25100µg/mL of working concentration with linear regression curve (R^2=0.9995) with LOD and LOQ being 2.42 & 7.35 µg/mL respectively. The retention time observed for mupirocin was 3.277 min.

Keywords: Mupirocin, UV, HPLC, validation, Analytical method etc.

Impact Of Gut Microbiota on Hypertension and Atherosclerosis

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ABSTRACT

Cardiovascular health is impacted by the gut microbiota and its metabolites, including trimethylamine-N-oxide (TMAO), lipopolysaccharides (LPS), and short chain fatty acids (SCFA). In this review, we address the potential effects of gut metabolites and microbiota on atherosclerosis and hypertension. It was discovered that hypertensive individuals had more gram-negative bacteria, which are a source of LPS, and less alpha diversity and SCFA-producing microbiota. Studies on animals demonstrate that LPS has pro-inflammatory effects and that SCFAs directly regulate blood pressure. Increased intestinal permeability leads to the translocation of LPS into the systemic circulation. The gut microbiota influences atherosclerosis, a complex disease, in a number of ways. Although TMAO's pro-atherogenic effect has been the subject of several investigations, it is unclear if this is a causative element. Furthermore, bile acid metabolism is significantly influenced by gut microbiota, and atherosclerosis can be reduced by some treatments that target bile acid receptors. In conclusion, the gut microbiota influences atherosclerosis and hypertension via a variety of routes, offering a large number of possible treatment targets. Translation of results and methods to people and the creation of therapeutic approaches that modify gut microorganisms and metabolites to target cardiovascular risk are among the challenges that lie ahead.

Keywords: Hypertension, Atherosclerosis, cardiovascular diseases, Gut microbiota.

Formulation, Development, and Evaluation of Transdermal Patches of Vicia Faba (Fava Bean) Extract for the Management of Parkinson's Disease: A Comprehensive Methodology

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ABSTRACT

Parkinson's Disease (PD) is a progressive neurodegenerative disorder marked by both motor and non-motor symptoms, primarily resulting from the degeneration of dopaminergic neurons in the substantia nigra. Current treatments emphasize symptom management, synthetic Levodopa frequently utilizing in oral formulation that can exhibit systemic side effects and inconsistent bioavailability into the brain target site. This research investigates the efficacy of Vicia faba (fava bean) extract, a natural source of L-DOPA (levodopa), as a potential alternative treatment for Parkinson's Disease via transdermal patches. Transdermal delivery provides multiple benefits, such as sustained and controlled release, Bypass hepatic circulation, diminished gastrointestinal side effects, and enhanced patient compliance. The research focused on the development and analysis of transdermal patches incorporating Vicia faba extract, subsequently conducting both in-vitro (Drug release kinetic, entrapment efficiency, Drug loading) and in- vivo assessments (Pharmacodynamic and pharmacokinetic study). The patches exhibited sustained and controlled release of L-DOPA, resulting in prominent enhancements in motor function in a Parkinson's disease animal model. The findings indicate that transdermal patches containing Vicia Faba extract may serve as a viable therapeutic approach for the management of Parkinson's Disease, offering a more reliable and user-friendly method for L-DOPA administration. Additional clinical studies are necessary to confirm these findings and enhance the formulation for human application.

Keywords: Parkinson’s disease, Levodopa, Transdermal Patches, Sustained release.

Bioavailability Enhancement Techniques for Poorly Aqueous Soluble Drugs and Therapeutics*:*

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ABSTRACT

The low water solubility of pharmacoactive molecules limits their pharmacological potential, but the solubility parameter cannot compromise, and so different approaches are employed to enhance their bioavailability. Pharmaceutically active molecules with low solubility convey a higher risk of failure for drug innovation and development. Pharmacokinetics, pharmacodynamics, and several other parameters, such as drug distribution, protein binding and absorption, are majorly affected by their solubility. Among all pharmaceutical dosage forms, oral dosage forms cover more than 50%, and the drug molecule should be water-soluble. For good therapeutic activity by the drug molecule on the target site, solubility and bioavailability are crucial factors. The pharmaceutical industry's screening programs identified that around 40% of new chemical entities (NCEs) face various difficulties at the formulation and development stages. These pharmaceuticals demonstrate less solubility and bioavailability. Enhancement of the bioavailability and solubility of drugs is a significant challenge in the area of pharmaceutical formulations. According to the Classification of Biopharmaceutics, Class II and IV drugs (APIs) exhibit poor solubility, lower bioavailability, and less dissolution. Various technologies are discussed in this article to improve the solubility of poorly water-soluble drugs, for example, the complexation of active molecules, the utilization of emulsion formation, micelles, microemulsions, cosolvents, polymeric micelle preparation, particle size reduction technologies, pharmaceutical salts, prodrugs, the solid-state alternation technique, soft gel technology, drug nanocrystals, solid dispersion methods, crystal engineering techniques and nanomorph technology. This review mainly describes several other advanced methodologies for solubility and bioavailability enhancement, such as crystal engineering, micronization, solid dispersions, nano sizing, the use of cyclodextrins, solid lipid nanoparticles, colloidal drug delivery systems and drug conjugates, referring to a number of appropriate research reports.

Keywords: Bioavailability; dissolution; nanoparticles; encapsulation; BCS dispersion; crystal engineering.

Strong Scaffold for 1,3,4-Thiadiazole: Synthesis and Integration in Biological Activity

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ABSTRACT

1,3,4-thiadiazole is a versatile heterocyclic scaffold recognized for its diverse biological activities. Due to its unique structural features, such as electron-rich nitrogen and sulphur atoms that boost stability and reactivity, it serves as a valuable framework in drug discovery.To synthesize 1,3,4-thiadiazole, thiosemicarbazides, dithiocarbamates, or acylthiosemicarbazides are typically subjected to cyclization under oxidative or dehydrative conditions. Common reagents include phosphorus oxychloride ($POCl_3$), sulphuric acid, and polyphosphoric acid. Research has been conducted into green chemistry techniques, including ionic liquid-mediated reactions and microwave-assisted synthesis, to boost productivity and reduce environmental impact. 1,3,4-Thiadiazol-Derivate weisen bedeutende pharmakologische Eigenschaften auf, darunter antituberkulöse, antikanzerogene, entzündungshemmende, antikonvulsive und antimikrobielle Wirkungen. Their engagement with DNA, enzymes, and receptors amplifies the possibility of therapeutic effects. As an example, anticancer medications such as tizoxanide aim at pathways of tumor development, whereas thiadiazole-based carbonic anhydrase inhibitors are utilized for glaucoma treatment. Moreover, thiadiazole moieties improve drug bioavailability and metabolic stability. The 1,3,4-thiadiazole core is considered a privileged scaffold in medicinal chemistry due to its biological significance and versatility in synthetic chemistry. Future research aims to enhance the functionalisation in order to develop robust and precisely targeted therapeutic agents.

Keywords: Thiadiazole, Thiosemicarbazides, Dithiocarbamates, Acylthiosemicarbazides, Pharmakologische, Eigenschaften.

Harnessing AI to uncover Novel Therapeutic Targets emphasizing Drug Repurposing Strategies in Drug Discovery and Development

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ABSTRACT

The application of artificial intelligence (AI) in medicine, particularly through machine learning (ML), marked a significant progression in drug discovery. Harnessing AI as a transformative tool in the pharmaceutical industry is narrowing the gap between disease understanding and identifying potential therapeutic agents. There are difficulties in identifying and developing new drug candidates that target increasingly complex biochemical associations. The emergence of AI tools can automatically scan large datasets. AI can revolutionize the pharmaceutical sector by speeding up medication research and discovery. AI models like drug target identification, De-Novo drug design, virtual screening & molecular docking, clinical trial optimization, pharmacokinetics & toxicity prediction, and drug repurposing are in use. These tools and techniques will set a benchmark in natural product drug discovery, find prospective drug candidates, foretell drug-target interactions, and improve drug design by analyzing massive information from clinical trials, academic literature, and biological databases. The benefits, challenges, and drawbacks of AI in this field are reviewed, and possible strategies and approaches for overcoming the present obstacles are proposed. The use of data augmentation, and the integration of AI with traditional experimental methods, as well as the potential advantages of AI in pharmaceutical research, academic literature, and biological databases can lead the way toward a fair, effective, and technologically advanced generation.

Keywords: Artificial Intelligence, Machine learning, De- Novo drug design, virtual screening, molecular docking, Drug Repurposing

Exploring Novel small molecule-based acetylcholinesterase (AChE) inhibitors: *In-silico* Investigation against Alzheimer

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ABSTRACT

AChE inhibitors are commonly used to treat Alzheimer's disease. Alzheimer Disease can be prevented by inhibiting the excess secretion of Acetylcholinesterase enzyme. Alzheimer's disease is an advancing neurodegenerative disorder that impairs memory, thinking, and behavior, leading to cognitive decline and loss of independence. It is the most common cause of dementia, marked by the buildup of amyloid plaques and tau tangles in the brain. It is linked with abnormal levels of the human cholinesterase enzymes, namely acetylcholinesterase (AChE). According to the World Health Organization (WHO), the number of people living with dementia worldwide is predicted to increase from over 55 million in 2021 to 139 million by 2050. Introducing Hydrazone moiety alongside aryl esters that can enhance the binding affinity of the compound for the targeted enzymes. Hydrazone fragments bound to heterocyclic systems exhibit increased activity as their ability to form hydrogen-bonding interactions with molecular targets. Computational investigation showed that Hydrazide derivate of Nicotinic and Isonicotionic nucleus-based compound have binding energy between -9.1-8.6 kcal/mol, which is higher than marketed drug Donepezil -8.51 kcal/mol. So, this may conclude that incorporation of Hydrazide with heterocyclic system may lead to potential drug against Alzheimer as AChE inhibitors.

Keywords: In-silico, Dementia, Neurodegenerative Disease, Acetylcholinesterase, Nicotinic Acid, Hydrazide-Hydrazone.

Formulation, Optimization, and Evaluation of Saxagliptin-Loaded Lipospheres for Enhanced Pharmacokinetic Performance: In Vitro and In Vivo Studies

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ABSTRACT

"Osteoarthritis (OA) is a prevalent condition that affects nearly half of the population at some point in their lives, leading to chronic pain and decreased functional capacity. Conventional treatments, including nonsteroidal anti-inflammatory drugs (NSAIDs) and physical therapy, provide limited relief, while more invasive options like joint replacement carry significant risks. As a result, emerging conservative treatments are being explored to provide symptomatic relief and delay or even prevent the need for surgical intervention. This study aimed to evaluate the safety and efficacy of a novel liposomal boundary lubricant, administered via intra-articular injection, in patients with moderate knee OA. In addition to assessing the safety, the study also examined the impact of this treatment on joint functionality, pain management, and overall quality of life."

Keywords: knee osteoarthritis, liposomal lubricant, safety, functional outcomes.

Lipid Nanoparticles: Revolutionizing Wound Healing with Cutting-Edge Precision

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ABSTRACT

Lipid nanoparticles have emerged as a promising solution in the field of wound healing, offering innovative approaches to enhance therapeutic efficacy and patient outcomes. These nanoparticles improve drug bioavailability by enhancing the solubility and stability of therapeutic agents, while their targeted delivery systems minimize systemic side effects. Their controlled release mechanisms ensure prolonged drug retention at the wound site, and their ability to form protective barriers contributes to increased patient compliance and comfort. This review explores the advantages of lipid nanoparticles, including their role in addressing the challenges of conventional wound care therapies. It also highlights future perspectives, including next-generation formulations with advanced targeting capabilities, innovations for chronic wound management, and the integration of lipid nanoparticles with other therapeutic modalities such as phototherapy and hydrogels. By addressing current limitations and embracing new technological advancements, lipid nanoparticles hold the potential to revolutionize wound healing treatments and improve overall patient care.

Keywords: Lipid Nanoparticles, Wound Healing. Drug Delivery Systems, Solid Lipid Nanoparticles (SLNs)

Strategies And Approaches for Designing of Press-Coated Tablets for Chrono Drug Delivery System

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ABSTRACT

Chronotherapeutic drug delivery systems (CDDS) are innovative approaches designed to optimize the timing of drug release to align with the body's natural circadian rhythms. The physiological and biological states of the human body fluctuate significantly throughout the day, leading to variations in both the condition of diseases and the levels of drugs in the plasma. In the development of CDDS, press-coating technology-an inventive method of controlled drug release - has gained concern. By applying a coating around a drug core, this technique gives exact control over the drug's release profile. One special benefit of the press-coating process is that it guarantees the release of the active pharmaceutical ingredient (API) at specific times that correspond with the body's biological rhythms, particularly in conditions where symptoms vary over time (e.g., hypertension, asthma, arthritis).The press-coating method is a perfect match for chronotherapy because it uses compressive pressures to encapsulate the medicine in a multi-layer structure that can be made to react to different stimuli like pH, enzymes, or pressure. The coating's thickness and composition can be altered to create systems that can delay release, shield the medication from deterioration, and ensure targeted delivery. The methods of press-coating drug delivery and its production in chronotherapeutic drug delivery are the main focus of this review. It examines the different coating materials, the variables influencing press-coated delivery systems' performance and drug release. The possible advantages of these systems are also covered, including increased therapeutic efficacy, decreased side effects, and better patient compliance. In order to prepare the way for next-generation chronotherapeutic systems, the paper ends with future perspectives on combining press-coating technology with other modern drug delivery techniques.

Keywords- Chronotherapy, Circardian rhythm, Press-coating technology, CDDS.

A Review of Biomatrix Tablets Formulated with Natural Polymers

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ABSTRACT

The creation of controlled release systems enables drugs to be delivered at a specific and expected rate in a programmed manner, thereby regulating the therapeutic level and ensuring a constant concentration at a particular site or receptor. Matrix tablets represent a widely used type of controlled release drug delivery system, which releases medication through mechanisms of diffusion or dissolution control. The active ingredients are evenly integrated within the material that regulates the release rate, such as polymers, which can be hydrophilic, plastic, lipid-based, or mineral compositions, among others. Polymers can be either synthetic or natural, but the appeal of natural polymers in pharmaceutical uses lies in their cost-effectiveness, accessibility, and non-toxic nature. Chitosan, alginate, starch, and collagen are examples of naturally occurring polymers that are used in tissue engineering matrix, regenerative pharmaceuticals, detergents, adhesives, packaging, biodegradable plastics, textiles, and rubber. Because they are relatively safe, biocompatible, and readily metabolized by the body's enzymes. The organic materials found in natural sources are called biopolymers. Because the biopolymers are biocompatible and biodegradable, they can be used in a variety of applications, including the food industry for edible films and emulsions, as well as in the pharmaceutical industry for wound healing, tissue scaffolds, dressing materials, drug transport materials, and medical implants such as organs. Since natural polymers are essentially polysaccharides, they have no negative effects and are biocompatible. The advantages of natural polymers over synthetic ones, as well as their use in creating innovative drug delivery systems, are covered in this paper.

Keywords: Controlled release, Matrix tablets, Agar, Sodium Alginate, Biopolymer, Natural Polymer

Impact of Air Pollution on Asthma Exacerbations: A Longitudinal Study

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ABSTRACT

Asthma exacerbations are a significant public health concern, often triggered by environmental factors, particularly air pollution. This longitudinal study aims to investigate the relationship between exposure to air pollutants and the frequency and severity of asthma exacerbations over a 12-month period. A cohort of 200 asthma patients from urban and suburban areas was monitored. Daily air quality data, including particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), and ozone (O3) levels, were collected from local monitoring stations. Patient health data, such as peak expiratory flow rate (PEFR), symptom severity, and hospital visits, were recorded monthly. The results indicated a strong correlation between elevated levels of PM2.5 and NO2 with increased asthma exacerbations. Patients living in urban areas with higher pollution exposure experienced a 35% higher incidence of severe exacerbations compared to their suburban counterparts. Seasonal variations were also observed, with winter months showing the highest exacerbation rates due to stagnant air conditions. This study underscores the critical role of air pollution in worsening asthma outcomes and highlights the need for stringent air quality control measures. Public health initiatives focusing on reducing pollutant exposure and increasing patient awareness can significantly mitigate the impact of environmental triggers on asthma management.

Keywords: Exacerbations, Particulate Matter, Nitrogen Dioxide, Longitudinal Study, Environmental Health, Urban Pollution,

Role Of Herbal Nanoparticles in Treatment of Inflammation

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ABSTRACT

Inflammation is a response to an injurious stimulus, which is caused by a wide variety of noxious agents involving four basic principles i.e. Calor, dolar, rubor and tumor. A distinctive feature of inflammatory response in relation to other facts of anti-parasite defense is that damage to the self is unavoidable. Several synthetic pharmaceutical products in various dosages form are available in the market for Inflammation treatment but are less preferred because of their elevated allergic reactions, repeated therapy, and side effects. Herbal products provide relief with comparatively less side effects. Now a day, for effective treatment, more and more search are diverted towards herbals. Although a number of herbal products are available for topical Administration like creams, ointment, gel etc., and these conventional formulations have less effect to the body and have little percutaneous absorption. In this respect, the newer approaches like silver nano formulations are developed as these formulations are stable and with high drug loading capacity and increased percutaneous absorption. Alcoholic extract of peel of Citrus lemon were screened for the presence of phytochemical constituents. Silver nanogel of Citrus lemon and peel extract can overcome the problems related with conventional formulations such as low uptake, poor penetration and high cost.

Keywords: Silver nano particles, Inflammation, Citrus lemon, Herbal products, polymer, Phytochemical Screening.

Artificial Intelligence: The New Doctor in Personalized Medicine

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ABSTRACT

Personalized medicine (PM) offers a significant possibility for enhancing the future of tailored healthcare. This article offers a global overview of common promises and obstacles that are facing in the field of multi-omics research, and evaluates them in developing the field of personalized medicine. AI has improved the healthcare possibilities for emerging innovations including artificial intelligence (AI), and it initiates a discussion amongst important projects in this field. Without an inquiry, artificial intelligence (AI) is the most widely debated topic in healthcare imaging studies, both diagnostically and therapeutically. AI has remained applied toward radiation oncology image modalities for objectives such as therapy evaluation and tumor delineation. It provides considerable promise for increased effectiveness and efficiency, as well as in the pharmaceutical sector is no exception. In the past few decades, there has been a significant increase in interest in the application of AI technology for evaluating and interpreting various critical disciplines of pharmacy, including as drug development, dosage form design, poly-pharmacy, and pharmacy in hospitals. The difficulty is in efficiently evaluating large volumes of data to provide specific treatment strategies. The infrastructure of healthcare requires modifications in order to integrate AI into personalized care. With authorization, patient's personal information and clinical data—such as imagery, electrophysiological results, genetic details, arterial pressure, medical records, etc.—are incorporated into the AI system upon their accession. The AI system then makes use of this individual patient's information to provide advice for healthcare, enabling healthcare staff in making clinical assessments. AI also enables predictive modeling, drug discovery, and precision medicine, ultimately revolutionizing how healthcare is delivered.

Keywords: artificial, healthcare, intelligence, machine learning, medicine, predictive analysis.

A Comprehensive Review of Antidandruff Shampoos: Efficacy and Formulation Strategies

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ABSTRACT

The main objective of this present study was to prepare and evaluate an antidandruff Shampoo and determine physiochemical function that emphasizes on safety, Efficacy and quality of the product. The preparation and evaluation of an antidandruff shampoo were carried out to develop an effective and safe formulation for treating dandruff. The shampoo was formulated using commonly used Antidandruff agent (Salicylic acid), Anionic surfactant (Sodium lauryl) pH adjuster (Sodiumhydroxide), Conditioner (glycerin, dimethicone, simethicone, polyvinlpyrrolidone, propylene glycol), Preservative (Methyl paraben and Sodium benzoate), Colorant (Safranin) Antioxidant (thiols or ascorbic acid (vitamin C) Caffeine and water. Various formulations were prepared and their physicochemical properties such as pH, viscosity, foamability, Surface tension, Solid content, Foaming ability and foaming stability, spreadability, conditioning performance were evaluated. Salicylic acid is known for its keratolytic action, helping to break down the scales and flakes associated with dandruff by exfoliating the scalp. This helps in reducing the buildup of dead skin cells, which can cause irritation and flaking. The combination of salicylic acid with mild surfactants ensures that the shampoo is both effective and gentle. The product's stability and pleasant texture suggest it could be an effective solution for dandruff treatment. Overall, the shampoo proved to be both functional and user-friendly, offering an effective solution for dandruff control while maintaining scalp health.

Keywords: Antidandruff, Shampoo, surfactant, Antioxidant.

Nanotechnology

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ABSTRACT

Nanoparticles are tiny materials with sizes ranging from 1 to 100 nanometers, possessing distinctive physical, chemical, and biological characteristics that differ from those of their larger-scale equivalents. Their significant surface area-to-volume ratio and adjustable properties have led to their widespread use in numerous domains, such as medicine, electronics, energy, and environmental science. In the realm of biomedical research, nanoparticles play a crucial role in drug delivery, imaging, and targeted therapies, thereby improving treatment effectiveness while minimizing adverse effects. In the fields of material science and industry, they facilitate progress in coatings, catalysis, and electronic devices. However, despite their potential benefits, issues concerning toxicity, environmental effects, and the challenges of large-scale production persist, necessitating further investigation. This summary underscores the critical role of nanoparticles in contemporary technology and emphasizes the importance of ongoing research to safely and effectively unlock their full capabilities.

Keywords; Nanotechnology, electronic devices, drug delivery, targeted therapies.

Role of Trace Elements in Multiple Myeloma

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ABSTRACT

Trace Elements also termed as micronutrients or essential minerals such as iron, manganese, copper, iodine, zinc, cobalt, fluoride, and selenium, are of great physiological significance. They are the key regulators of cellular proliferation and differentiation. The concentration of these trace elements in serum might be considered as a biomarker for the detection/prognosis of malignancy. In multiple myeloma (MM) the proliferation of plasma cell clones in the bone marrow markedly dysregulated due to the imbalance in these trace elements. Multiple myeloma occurs with the CRAB (Calacemia, renal failure, Anemia and Bone disease) symptoms, with these symptoms MM don't occur. Myeloma is still mostly incurable despite advancements in therapeutic techniques. These cancerous plasma cells can accumulate in the bone marrow, leading to various health complication. Along with conventional medicine, the treatment of MM is going towards less expensive alternative. Dietary supplements is one of the alternative treatment for MM. By using some Trace elements (Iron, zinc and selenium) in combination with some approved drugs patient recovery speed will increase. Trace elements are required by adults in 1-100mg/day and constitute less than 0.01% of total body weight. Trace element also used as therapeutic tool especially in reducing inflammation in cancers such as multiple myeloma.

Keywords: Trace elements, micronutrient, Multiple Myeloma, CRAB symptoms,MM Treatment Strategy.

Formulation and in-vitro Evaluation of anti-aging cream by using orange peels

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ABSTRACT

Agro-food wastes have been shown to be renewable sources of beneficial chemical compounds, according to new research. The objective of the present research was to apply citrus peel extracts from natural sources as antiaging agents. Two peels of orange have been studied for their biological action using total phenolic, flavonoid, and antioxidant activity measurements. Fruits containing citrus obtained as essential oils (EOs) have been obtained through the process of peels from Citrus sinensis (sweet orange) into hydro distillation, a concentration procedure that employs a Clevenger-type instrument for 3 to 4 hours. These EOs and related flavonoids are widely utilized as culinary flavors and cosmetic components. They are also showing a range of biological actions involving antimicrobial, cytotoxic, and antioxidant activities. The primary goal of this work is to manufacture nanosized emulsions using orange oils that are essential (EO) from remaining peels of orange and study their physiological effects as cytotoxic, anti-oxidants, and antimicrobial agents. Hydro distillation was used to extract the decadent orange peels after they were originally removed (eliminated), dried using air, and crushed (blended).

Keywords: Orange peels use Orange Peel, Emulsion, Facial Care, Skincare, Moisturization, Skin Brightening.

Chalcones Unveiled: "A New Era in Antimicrobial Drug Development

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ABSTRACT

A class of flavonoids called chalcones is promising chemical moiety for having broad-spectrum antibacterial properties. Chalcones are α, β-unsaturated ketones with a 1,3-diphenyl-2-propen-1-one core structure. Acetophenone and benzaldehyde undergo Claisen-Schmidt condensation to create them. They are very useful in medicinal chemistry and drug development because of their reactivity, which enables a variety of functionalization and contributes to biological activities like antioxidant, antibacterial, and anticancer qualities. Their antibacterial properties have been investigated against a range of viruses, fungi, and bacteria. New antimicrobial agents are developed in response to the emergence of drug-resistant microorganisms. Research efforts to combat drug resistance using innovative scaffolds and techniques have been sparked by the rise in resistance among multidrug-resistant microorganisms. Chalcones, which are identified by their 1,3-diphenylprop-2-en-1-one chemical structure, have demonstrated a wide range of biological activity, most notably antibacterial and antiviral qualities. The structure of chalcones can be modified by adding substituent groups to the aromatic ring, to increase potency, decrease toxicity, and broaden pharmacological effects.

Keywords: Antibacterial, Antifungal, Micro-organisms, Antimicrobial drug-resistance, Synthesis

Scientific Update on the Pharmacognostic and Pharmacological Properties of *Dioscorea villosa*

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ABSTRACT

Dioscorea villosa, commonly referred to as wild yam, is one of the medicinally used plants in traditional and herbal medicine because of its different pharmacological properties. The following review is based on the up-to-date analysis of the pharmacognostic characteristics, bioactive constituents, and pharmacological potential. The phytochemical studies indicated that steroidal saponins, mainly diosgenin, along with alkaloids, flavonoids, and tannins, are present and contribute to the medicinal effect of the plant. Traditionally, *Dioscorea villosa* is used in managing inflammatory conditions, menstrual disorders, and menopausal symptoms. Recent pharmacological studies highlight its anti-inflammatory, antispasmodic, analgesic, estrogenic, and antioxidant activities. Its hormonal modulatory effects make it an important candidate in the treatment of estrogen-related disorders such as osteoporosis and menopause. Further, anti-diabetic, hepatoprotective, and neuroprotective activities are currently being explored for potential therapeutic use. Despite its extensive use, scientific evidence regarding its efficacy and safety is limited, and more clinical trials and toxicological studies are needed. This review critically evaluates recent advances in the pharmacognostic and pharmacological aspects of *Dioscorea villosa*, focusing on its potential for drug development. Future research should focus on elucidating its mechanisms of action, standardizing extracts, and evaluating its long-term safety profile. Integration of the traditional knowledge and scientific approach has significant promise for the plant *Dioscorea villosa* as a natural therapeutic agent for many health conditions.

Keywords: Dioscorea villosa, Pharmacognosy, Phytochemicals, Pharmacological properties, Diosgenin, Anti-inflammatory activity.

Diabetes And Natural Plants

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ABSTRACT

Diabetes mellitus is a significant global health issue, with rising incidence and mortality rates. Poor blood sugar regulation can lead to severe health complications. While conventional antidiabetic medications are effective, they often come with unavoidable side effects. In contrast, medicinal plants offer a promising alternative source of antidiabetic agents. These plants contain a variety of biologically active compounds that works synergistically to provide therapeutic benefits. Preclinical and clinical studies have highlighted the antidiabetic potential of several medicinal plants, underscoring their value in managing diabetes mellitus. As early as 700-200 BC, diabetes was a known disease in India and was divided as occuring genetically and occuring due to dietary factors. Plants are a good source of drugs whether directly or indirectly. The ethnobotanical information reports around 800 plant which have antidiabetic activities. *Portulaca oleracea, Polygonatum sibiricum, Pisonia grandis, Nelumbo nucifera, Lactuca gracilis, Sesbenia aegyptiaca, Viola odorata, Tephrosia purpurea, Sphaeranthus indicus, Rubia cordifolia, Chlorophytum borivilianum* are some medicinal plants which are having antidiabetic activities and can be a better option then conventional medicines which have many side effects. They are also less expensive and have less to no side effects.

Keywords: Diabetes, Natural plants, Antidiabetic plants, Diet, Sugar level.

Exploring FFAR1 Agonists as Potential Therapeutics for Type 2 Diabetes

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ABSTRACT

The rising prevalence of type 2 diabetes mellitus (T2DM) has necessitated the development of innovative therapeutic strategies with enhanced efficacy and reduced adverse effects. Among the emerging drug targets, G protein-coupled receptor 40 (GPR40), also known as free fatty acid receptor 1 (FFAR1), has gained significant attention due to its role in glucose-stimulated insulin secretion (GSIS). Expressed predominantly in pancreatic β-cells, GPR40 is activated by medium- and long-chain fatty acids, leading to enhanced insulin release in a glucose-dependent manner, thereby minimizing the risk of hypoglycemia. The development of GPR40 agonists has shown promising results in preclinical and clinical studies. Synthetic agonists such as TAK-875 (full agonist) and AMG 837 (partial agonist) demonstrated improved glucose tolerance and metabolic homeostasis in T2DM models. TAK-875 progressed to phase III clinical trials, showing significant glycemic control benefits; however, its development was halted due to hepatotoxicity concerns. Despite this setback, the potential of GPR40-based therapies remains promising, with ongoing research focusing on optimizing drug safety and efficacy. This review will provide a comprehensive overview of GPR40's physiological role, the structural evolution of its agonists, and recent advancements in developing safer and more effective GPR40-targeted therapies. With the continuous need for novel antidiabetic drugs, GPR40 agonists represent a viable alternative, either as monotherapies or combined with existing treatments, to improve diabetes management and patient outcomes.

Keywords: FFAR1, Diabetes Mellitus, TAK-875, Phenolic compound.

Nanotechnology: A Neoteric Approach for the management of Atopic Dermatitis

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ABSTRACT

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by impaired skin barrier function and immune dysregulation. Current treatments have limitations, including low skin bioavailability and severe adverse events. There is a need for targeted and efficient medication delivery systems to manage AD, particularly recalcitrant forms. Recent advancements in nanotechnology offer a promising solution. Nanocarriers, including nanoparticles, liposomes, nano-gels, and nano-emulsions, enable targeted and controlled delivery of therapeutic agents to the skin. This approach improves bioavailability and targeted delivery to the inflammation site, enhancing skin retention and localization in the stratum corneum. The benefits of nanotechnology-based treatments for AD are numerous. They reduce adverse events and improve safety profiles while maintaining skin barrier function. By providing targeted and efficient medication delivery, nanocarriers can improve clinical symptoms, immune responses, and quality of life for patients with AD. Furthermore, nanotechnology-based treatments can be tailored to individual patient needs, providing personalized therapy. Combination therapies using nanotechnology and existing treatments will also be explored, offering new hope for patients with recalcitrant AD. Additionally, personalized nanomedicine approaches will become more prevalent, allowing for tailored treatments that address the unique needs of each patient. Finally, nanotechnology-based diagnostic tools will be developed, enabling earlier and more accurate diagnosis of AD. Recent advances in nanotechnology have led to the development of novel treatments for atopic dermatitis, including nanoparticle-based topical delivery systems and nanofiber-based dressings. These innovations offer improved efficacy, targeted delivery, and enhanced patient outcomes.

Keywords: Atopic Dermatitis, Nanotechnology, Targeted drug delivery, Skin barrier function, inflammation, nanocarriers.

Nanomedicine and drug delivery system

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ABSTRACT

Nanomedicine comprises nanotechnology for the development of nanometer-scale drugs ranging from 0.1to100nm. Nano word is taken from the Greek word dwarf means small. The application of nanotechnology in the pharmaceutical field includes the formulation of nanoparticles, nanosuspension, nanosphere, and nanoemulsion. Nanosuspension: colloid dispersion of nanosize drug. Nanoparticles: 30-100nm colloid solid particles. Nanospheres: polymer matrices in which a drug is dissolved or dispersed. Nanocapsules: consist of a polymer wall entrapping an oily core where the drug is dissolved. Objective/need: Compared to conventional drugs it delivers the drug at a sustained period with increased bioavailability, it is most important in BCS-1 and BCS-2 type drugs. The need for nanotechnology in drug delivery: 1) Improve bioavailability by improving dissolution and release. 2) Site-specific drug delivery e.g. cancer by active and passive targeting. 3) Lesser dose-related side effects by decreasing dose and decreasing dose frequency. 4) Provide sustained release controlled release and prolonged release. Nanocarriers of drug delivery: Nanocarriers are tiny particles that carry drugs to their specific location in the body. Some nanocarriers for drug delivery in the body are as follows: 1) polymeric nanoparticles 2) solid lipid nanoparticles 3) polymeric micelles 4) dendrimers 5) magnetic nanoparticles 6) liposomes. The fundamentally different and novel physical and chemical properties of some nanomaterials compared to materials on a larger scale (i.e., their bulk counterparts) can create a unique set of opportunities as well as safety concerns that have only recently been investigated, in addition to the usual challenges associated with drug development. Their distinct size and surface makeup make it challenging to characterize them physicochemically.

Keywords: Nanomedicine, nanosuspension, polymeric micelles, nanocapsules, nanocarriers.

Nanoparticle-Based Drug Delivery Systems in Cancer Therapy

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ABSTRACT

Nanoparticle-mediated drug delivery systems (NDDS) have emerged as an innovative paradigm in oncological treatment, offering augmented therapeutic efficacy while concurrently minimizing systemic adverse effects. These systems exploit the distinctive characteristics of nanoparticles, which include their diminutive dimensions, substantial surface area, and capacity to encapsulate a diverse array of therapeutic agents such as chemotherapeutic agents, nucleic acids, and proteins. A principal advantage of NDDS lies in their capacity to enhance the bioavailability and solubility of poorly water-soluble pharmacological compounds, thereby amplifying their therapeutic potential. Furthermore, nanoparticles can be meticulously engineered to selectively target neoplastic cells, thereby mitigating the detrimental impacts on adjacent healthy tissues. This targeted delivery mechanism is commonly realized through the functionalization of nanoparticles with specific ligands that bind to overexpressed receptors present on tumour cells. Recent innovations in the architecture of NDDS have culminated in the creation of stimuli-responsive nanoparticles capable of releasing their therapeutic payloads in response to specific environmental stimuli such as pH, temperature, or enzymatic activity. Current scholarly investigations are centered on the utilization of materials such as chitosan, silica, and poly (lactic-co-glycolic acid) to engineer nanoparticle drug delivery systems (DDS). Researchers are concurrently examining methodologies to augment drug loading capacity, enhance stability, and mitigate potential adverse effects to facilitate clinical applicability. The amalgamation of nanotechnology and medicine has ushered in novel pathways for oncological therapy; however, extensive and rigorous research is imperative to surmount existing obstacles and refine these systems.

Keywords: Nanoparticles, Drug delivery, Oncology, Bioavailability, Stimuli-responsive, Chemotherapeutic agents

Marine Algae in Psoriasis Therapy: Unveiling the Bioactive Molecules

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ABSTRACT

Management of the psoriasis remains the greatest challenge after many years from its description owing to the highly complex pathogenesis of this inflammatory disease of skin. A research interest is evolving for natural-based drugs and from the sea environment, there was an interesting proposal by scientists relating marine algae such as seaweed and micro-algae. Some bioactive substances including polysaccharides, polyphenol, fatty acid, and peptide from the extract of these have anti-inflammatory properties, antioxidants and immunomodulators. These bioactive compounds may counteract the hyperactive immune response and proliferation of skin cells seen in psoriasis. This review discusses the various bioactive molecules present in marine algae and their mechanisms of action in the therapy of psoriasis. Polysaccharides, such as fucoidan, have been demonstrated to modulate the immune response and decrease the production of pro-inflammatory cytokines. Polyphenolic compounds, such as phlorotannins, have strong antioxidant activities that help reduce oxidative stress, a major factor in the pathogenesis of psoriasis. Additionally, essential fatty acids, such as omega-3s, which are abundant in marine algae, have anti-inflammatory effects that can soothe the skin and reduce symptoms. Several in vitro and clinical studies indicate the potential of algae-based treatments, including topical applications of algal extracts and oral supplementation, in improving skin conditions and reducing flare-ups. This abstract is a promising role of marine algae in psoriasis therapy and underlines the necessity for further clinical research to understand their efficacy and safety profiles in dermatological applications.

Keywords: Psoriasis, Marine algae, Bioactive molecules, Anti-inflammatory, Fucoidan, Omega-3 fatty acids.

Hydrazones: Synthesis, Reactivity, and Applications in Medicinal Chemistry and Materials Science

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ABSTRACT

Hydrazones, organic compounds featuring the general structure $R_1R_2C=NNH_2$, are typically synthesized through a condensation reaction between hydrazine derivatives and carbonyl compounds. These compounds exhibit remarkable versatility in organic chemistry due to their broad reactivity, which includes both nucleophilic and electrophilic interactions. This makes hydrazones valuable intermediates in synthetic pathways. In medicinal chemistry, hydrazones have attracted considerable interest due to their promising biological properties, including antimicrobial, anticancer, and anti-inflammatory activities. Additionally, hydrazone derivatives are increasingly employed as ligands in coordination chemistry, where they form metal complexes with potential applications in catalysis and chemical sensing. The physical and chemical behavior of hydrazones, including their stability and reactivity, is largely determined by the structure of their substituents and the conditions under which they are studied. Advanced spectroscopic methods, such as NMR and IR, play a critical role in characterizing these compounds. Furthermore, hydrazones are being explored for their utility in designing molecular switches and functional materials, particularly in the development of smart drug delivery systems. This review will explore the synthesis, reactivity, and various applications of hydrazones, with a focus on their roles in medicine and materials science.

Keywords: Hydrazone, Organic Synthesis, Medicinal Chemistry, Coordination Chemistry, Biological Activities, Metal Complexes, Spectroscopic Techniques.

Investigation Of Wound Healing Property of *Schleichera Oleosa* (Lour.) Leaves Extract on Mice Model

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ABSTRACT

Wound healing is a complex process that involves various cellular and molecular mechanisms. Schleihera oleosa (Lour) is a traditional medicinal plant known for its wound healing properties. The ethyl acetate extract gel of S. oleosa leaves has been previously reported to exhibit antioxidant, anti-inflammatory, and antimicrobial activities. However, it's potential as a wound healing agent and its mechanism of action remain poorly understood. The present study aimed to investigate the angiogenic and wound healing activities of the ethyl acetate extract gel of S. oleosa leaves in in ovo and in vivo models, respectively. Additionally, the study aimed to compare the wound healing activity of the extract gel with a marketed form of colloidal silver gel (Megaheal)**.** A total of 15 mice were divided into three groups (N=5), including test, standard, and control groups. The test group was treated with the ethyl acetate extract gel of S. oleosa leaves, while the standard group was treated with Megaheal gel. The control group received no treatment. The in ovo model was used to evaluate angiogenic activity, while the excision and incision wound models were used to assess in vivo wound healing activity in mice.The ethyl acetate extract gel of S. oleosa leaves exhibited good angiogenic activity in the in ovo model and demonstrated significant activity in the excision and incision wound models in vivo in mice. The observed increase in wound contraction, tensile strength, and collagen deposition indicates that the extract gel may be effective in promoting the healing process of both acute and chronic wounds. Moreover, the extract gel exhibited comparable wound healing activity to Megaheal gel in the excision and incision wound models, suggesting its potential as a natural wound healing agent.

Keywords: wound healing, Angiogenesis, Schleihera oleosa, in ovo model

Bilayer Tablets: An Innovative Approach for Potential Drug Delivery System

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ABSTRACT

Over the past three decades, focus is increased in field of sustained, controlled or delayed release drug delivery system because of their advantages over the conventional drug delivery system. The controlled release mechanism has entered a new era with the bilayer tablet. Bilayer tablet technology, which has a controlled release layer for maintenance doses and an immediate release layer for loading doses, aids in the separation of two incompatible substances. To release the medication at an interval other than just after delivery, a delayed-release dosage form is used. These tablets are used as advanced technique to subdue the problem of conventional single-layered tablet because they improved bioavailability of drug and fewer doses are needed. Bilayer tablets is an innovative formulation which allow the controlled drug release, targeted delivery and combination therapies. They are mainly used to manage the chronic diseases, such as diabetes and hypertension. Many times, people with hypertension find it difficult or impossible to manage their blood pressure with just one medication or a drug. It has been shown that mono-therapy is very useful in treatment of patients with type 1 hypertension but it did not show the desired therapeutic effects in some patients or with the type 2 hypertension patients, therefore combination of an antihypertensive drugs is required to achieve a desired therapeutics effects and the different drugs are combined to formulate a bilayer tablet for treating a hypertension. A combination of two or more antihypertensive drugs is significantly more successful or effective at lowering blood pressure than either one would be alone. This is due to the complementary types of action of the drugs. The introduction of techniques, advantages of the bilayer tablet, its components, and its benefits were the main topics of this review article. It also provided an explanation of the product quality.

Keywords: Bilayer tablets, techniques, tablet press, controlled drug release, delayed release, enteric- coated.

Artificial Intelligence in Drug Discovery and Drug Development

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ABSTRACT

AI is transforming pharmaceutical research by dramatically streamlining drug discovery and development. Cutting-edge technologies like machine learning and advanced data analytics are reshaping how new medicines are conceived, tested, and brought to market. Modern AI techniques enable researchers to process and interpret massive biological datasets quickly and precisely. By identifying complex molecular patterns and potential drug candidates more efficiently, these technologies significantly reduce the traditional time and cost barriers to pharmaceutical innovation. The approach goes beyond mere computational power. AI supports personalized medicine by analyzing individual patient data, allowing for more targeted and effective therapeutic strategies. Machine learning algorithms can predict molecular interactions, optimize drug compounds, and even anticipate potential side effects with remarkable accuracy However, this technological revolution isn't without challenges. Data quality, regulatory compliance, and ethical considerations remain critical hurdles. Successful implementation requires robust interdisciplinary collaboration between technology experts and pharmaceutical researchers. Emerging case studies demonstrate AI's transformative potential, highlighting how intelligent systems can accelerate drug development cycles and improve success rates. As technology evolves, the synergy between artificial intelligence and pharmaceutical research promises to unlock groundbreaking medical solutions, potentially revolutionising healthcare delivery and patient outcomes. Machine learning is revolutionizing drug discovery by leveraging carbon nanotubes (CNTs) as an innovative research tool. Advanced AI algorithms and deep learning models are now enabling researchers to quickly analyze, refine, and assess potential drug candidates with unprecedented speed and precision. These computational techniques help scientists explore complex molecular interactions, predict drug efficacy, and streamline the traditionally time-consuming drug development process. By harnessing the unique properties of carbon nanotubes and combining them with intelligent computational strategies, researchers can now tackle intricate pharmaceutical challenges more efficiently. The synergy between AI-driven analytics and nanomaterial science is opening new pathways for developing targeted, personalized medical treatments with greater accuracy and reduced development timelines.

Keywords: Machine learning, biological datasets, Molecular patterns, Carbon nanotubes, Nanom science

A Critical Review on Preparations, Characterization, Applications and Recent Development of Carbon Nanotubes in Pharmaceutical Sciences

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ABSTRACT

Carbon nanotubes (CNTs) are nanoscale cylindrical structures made from carbon atoms arranged in a distinctive hexagonal lattice. Typically ranging in diameter from 1-100 nanometers, these tubes can extend several micrometers to even millimeters in length. Due to their exceptional properties, such as remarkable strength, electrical conductivity, and an extensive surface area, CNTs are being explored for various medical and pharmaceutical uses. One of the most promising applications of CNTs is as drug delivery systems, where they can transport therapeutic molecules to precise locations within the body. Their large surface area allows for efficient drug loading, and their surfaces can be modified to improve drug targeting and enable controlled release mechanisms. CNTs have also shown potential in enhancing imaging modalities, including MRI, CT scans, and fluorescence imaging, due to their non-toxic nature and superior fluorescence capabilities. In cancer treatment, CNTs are functionalized with ligands that target specific cancer cell receptors, enhancing both the precision of drug delivery and imaging. The fundamental structural strength, thermal conductivity, and ease of chemical modification of CNTs, combined with their high surface-to-volume ratio and excellent biostability, make them highly effective drug carriers. This study aims to provide an overview of the preparation methods, evaluation techniques,

benefits, drawbacks, and diverse pharmaceutical applications of CNTs, with a particular focus on their role in cancer management.

Keywords: Carbon nanotubes, Cancer, MRI, CT-scan.

Report the Pharmacognosy & Phytochemistry Along with Formulation of Oil Inclusion Complex from *Cymbopogon citratus* & *Allium sativum* to Explore Antidiabetic Potential of the Drug

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ABSTRACT

The present study aimed to develop and evaluate an oil inclusion complex from Cymbopogon citratus and Allium sativum for enhanced antidiabetic activity. The oil inclusion complex was formulated using β-cyclodextrin and characterized for its physicochemical properties, in vitro release, and antidiabetic activity. Phytochemical analysis revealed the presence of bioactive compounds, including citral, geraniol, and allicin. The results showed improved solubility, stability, and bioavailability of the bioactive compounds. In vitro antidiabetic activity was evaluated using α-amylase and α-glucosidase inhibition assays, demonstrating significant inhibition of the enzymes. The oil inclusion complex exhibited enhanced antidiabetic activity compared to the free oil, highlighting its potential as a herbal-based antidiabetic formulation.

Keywords: Cymbopogon citratus, Allium sativum, oil inclusion complex, β-cyclodextrin, antidiabetic activity, phytochemical analysis.

Synthesis and Pharmacological Activities of Newly Synthesized 1,3,4-Oxadiazoles

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ABSTRACT

Derivatives of 1,3,4-oxadiazole are significant heterocyclic compounds that possess a diverse array of biological activities. They demonstrate notable antimicrobial, anti-inflammatory, anticancer, anticonvulsant, and antioxidant effects, making them attractive candidates for drug development. Their capacity to inhibit enzymes, influence receptor activity, and disrupt microbial cell membranes has been extensively studied. Numerous compounds based on oxadiazole have exhibited strong anticancer properties by triggering apoptosis and hindering tumor cell growth. Moreover, their antimicrobial efficacy against resistant bacterial and fungal strains underscores their therapeutic importance. Reports have also indicated anti-inflammatory and pain-relieving effects, with certain derivatives functioning as COX-2 inhibitors. In addition, their neuroprotective and anticonvulsant properties suggest possible uses in the treatment of neurological conditions. Given their adaptability and favorable pharmacokinetic characteristics, research on 1,3,4-oxadiazoles as potential leads for new therapeutic agents across various disease areas persists.

Keywords: 1,3,4-Oxadiazole, antimicrobial, anticancer, anti-inflammatory, drug development.

Evolving Drug Discovery Models: A Look at Trends and Challenges

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ABSTRACT

Medical research and development are advancing rapidly, driven by advances in technology and scientific understanding. Innovations such as artificial intelligence, machine learning, and model-based drug design are changing the way we identify and optimize drugs, allowing us to improve drug utilization and safety processes more quickly and accurately. Technologies such as high-throughput screening, drug fragment discovery, and omics technologies are providing greater insight into disease processes and therapeutic targets, enabling us to update our knowledge. However, challenges remain, including the complexity of diseases, the high risk of clinical trials, regulatory issues, and increasing vaccine-related issues. In addition, the growing demand for personalized medicine and the increasing need to treat rare diseases are adding complexity to the research process. Despite these challenges, the integration of new technologies and methodologies has the potential to overcome these issues. By leveraging innovation and strengthening interdisciplinary.

Keywords: Drug Discovery , Artificial Intelligence , Machine Learning ,Drug Resistance, Personalized Medicine.

Smart Drug Design: How AI is Reshaping Pharmaceutical Sciences

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ABSTRACT

The integration of Artificial Intelligence (AI) in pharmaceutical sciences has revolutionized drug discovery and development, significantly reduced time and cost although enhancing precision. Conventional drug design is more time-intensive, with high slow destruction rates and unpredictable results.AI-effectively approaches, such as machine learning (ML), deep learning (DL), and generative algorithms, are now expediting lead identification, molecular docking, and predictive modeling, paving the way for personalized medicine and data-driven therapeutics.

AI transforms the ability to analyze complex biological data, predict drug-target interactions, and optimize pharmacokinetics and pharmacodynamics. Neural networks, quantum computing, and AI-assisted high-throughput screening are redefining hit-to-lead optimization, accelerating the path from bench to bedside. Additionally, natural language processing (NLP) and bioinformatics tools are facilitating literature mining, aiding the drug repurposing, and enhancing clinical trial models.

Despite these advancements, challenges persist, including data bias, regulatory hurdles, ethical apprehensions, and interpretability of the AI models. Ensuring transparency and validation of the AI-produced insights is crucial for clinical translation and regulatory approvals. The future aspect of pharmaceutical sciences will be driven by AI-human collaboration, hybrid models, and real-world evidence-based learning, ensuring the safer and more therapeutics effective.

These abstract highlights the transformative role of AI in smart drug design, addressing current trends, challenges, and future prospects in reshaping modern pharmaceutical sciences.

Keywords: Machine Learning, Personalized Medicine, Drug Discovery, High-Throughput Screening, Predictive Modelling, Computational Pharmacology, AI in Pharma

Potential of AI in the Advancement of the Pharmaceutical Industry

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ABSTRACT

Artificial intelligence (AI) has revolutionized all sectors of industries all over the world and it has the potential to improve healthcare as well. It is used to examine patients' data while they visit the hospital, prescribed medication, lab tests, and procedures performed. AI applications help in the management of the huge amounts of data generated in the medical field and reveal novel information which would otherwise be hidden in large medical data. AI is a machine learning system that responds to and analyzes data in real time, allowing researchers to acquire data more efficiently. These technologies are also used to find new drugs for healthcare management and patient treatment. Diseases like neurology, cancer, diabetes, and cardiology mainly use AI. Furthermore, the more data AI responds to, the smarter it becomes, propelling the pharmaceutical sector forward. This chapter describes the role of AI in the 108healthcare and pharma industry. It also focuses on the various applications of AI in the pharma industry which enhances its efficacy. AI applications in the pharma industry must be adopted for further use in the future.

Keywords: Pharmaceutical industry, Machine learning, Medical data, Drug discovery, Disease diagnosis.

Formulation and Evaluation of Niosomal Drug Delivery System for Improved Anti-Cancer Activity

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ABSTRACT

Niosomes are non-ionic surfactant-based vesicles that enhance drug delivery by improving bioavailability, stability, and targeted delivery of chemotherapeutic agents. This study aims to develop and evaluate a niosomal formulation containing 5-Fluorouracil (5-FU) and Leucovorin for improved anti-cancer activity. 5-FU is a widely used chemotherapeutic agent, but its clinical use is limited by rapid metabolism, systemic toxicity, and drug resistance. Leucovorin, a folinic acid derivative, enhances the therapeutic efficacy of 5-FU by stabilizing its binding to thymidylate synthase, thereby improving its anti-cancer effects. The formulation was prepared using the thin-film hydration method and characterized for particle size, entrapment efficiency, morphology, in-vitro drug release, and cytotoxicity against cancer cell lines. The developed niosomes exhibited nanoscale particle size with a narrow distribution, high entrapment efficiency, and sustained drug release over 48 hours. The in-vitro cytotoxicity assay confirmed that niosomal 5-FU and Leucovorin exhibited enhanced anti- cancer activity compared to free drug formulations, demonstrating improved cellular uptake and prolonged drug retention. These findings suggest that

niosomal drug delivery can improve the therapeutic potential of 5-FU and Leucovorin while minimizing toxicity and overcoming drug resistance. Further in-vivo studies are necessary to validate these results for potential clinical applications.

Keywords: Niosomes, Cytotoxicity, Drug delivery, Paricle Size, Leucovorin

Polyherbal Gel: Crafting relief for Arthritis

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ABSTRACT

Combining several excerpts from medicinal shops, polyherbal gels are getting a feasible result for reducing the symptoms of arthritis. By combining the remedial rates of sauces with anti-inflammatory, analgesic, and antioxidant goods, these gels give a natural way to treat arthritis-related pain, stiffness, and swelling. Popular sauces like Boswellia (Boswellia serrata), gusto (Zingiber officinale), and turmeric (Curcuma longa) are constantly added to these phrasings because of their strong anti-inflammatory parcels and capacity to ameliorate common mobility. Targeted relief is handed by polyherbal gels that access the skin to give active constituents to the tormented areas. These factory- grounded substances work together in gel form to increase their bioavailability, which guarantees faster immersion and relief. For people looking for non-pharmacological treatments, polyherbal gels are a promising supplemental treatment for arthritis because of their natural constituents, low side goods, and simplicity of use. In order to manage arthritis, this review examines the remedial eventuality, expression ways, and clinical effectiveness of polyherbal gels, pressing their donation to common health and general well-being.

Keywords: Anti-inflammatory, bioavailability, polyherbal, arthritis.

Redefining Sebopsoriasis Therapy: Herbal-Loaded Nanoparticles for Targeted Treatment

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ABSTRACT

Nowadays, skin problems are more common; people suffer from redness, itching, rashes, and major skin sensitivity issues more commonly. Causes can be multiple, but the thing is the majority of the population has one or another kind of skin issue or problem. One of such issues is Sebopsoriasis; it is a chronic inflammatory skin issue that gives symptoms like redness, itching, and flaking in areas of body parts like the face and scalp, which are richly made up of sebaceous glands. Treatments available for this are corticosteroids, calcineurin inhibitors, antifungal agents, and synthetic retinoids, but such conventional treatments cause other issues and side effects like skin thinning, stretch marks, and irritation; also, longer use of antifungal agents causes contact dermatitis or resistance. Such limitations can be treated using herbal remedies such as neem, curcumin, and aloe vera, which contain anti-inflammatory, antifungal, and calming properties. Poor skin penetration, instability, and frequent applications of herbal formulations are also limitations. Analyzing all these limitations in both conventional and herbal treatments, we have developed herbal phytoconstituent-loaded nanoparticles. These nanoparticles provide a synergistic therapeutic effect. This nanoparticle system increases the stability of active ingredients, ensures controlled and prolonged drug release, and also improves skin penetration. Through this type of formulation, fungal overgrowth and inflammation can be effectively targeted. Due to its unique design, the drug releases only at that area where its action is needed so that it's localized efficacy increases and systemic exposure decreases. This research highlights the potential of nanoparticle-based drug delivery systems, which can be a game changer for Sebopsoriasis treatment.

Keywords: Nanoparticles, Dermatology, Skin problems, Herbal formulations, Sebopsoriasis.

Advanced Controlled Drug Delivery Systems: Recent Innovations and Emerging Technologies

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ABSTRACT

The drug delivery system enables the release of the active pharmaceutical ingredient to achieve a desired therapeutic response. Conventional drug delivery systems (tablets, capsules, syrups, ointments, etc.) suffer from poor bioavailability and fluctuations in plasma drug level and are unable to achieve sustained release. Without an efficient delivery mechanism, the whole therapeutic process can be rendered useless. Moreover, the drug has to be delivered at a specified controlled rate and at the target site as precisely as possible to achieve maximum efficacy and safety. Controlled drug delivery systems are developed to combat the
problems associated with conventional drug delivery. There has been a tremendous evolution in controlled drug delivery systems from the past two decades ranging from macro scale and nano scale to intelligent targeted delivery. The opening section of this review offers a foundational overview of drug delivery systems, focusing particularly on the pharmacokinetics associated with the drug. It also examines traditional drug delivery systems along with their inherent limitations. Subsequently, there is an in-depth discussion on
controlled drug delivery systems, addressing design considerations, classifications, and illustrative diagrams. Moreover, the review explores advancements in nano-drug delivery, as well as targeted and smart drug delivery methods that utilize stimuli-responsive and intelligent biomaterials, highlighting recent significant discoveries. The paper concludes by outlining the challenges encountered and potential future developments in the field of controlled drug delivery.

Keywords: Drug Delivery System, Pharmaceutical Ingredient, Bioavailability, Nano-Drug Delivery, Targeted Delivery, Future Developments.

Synthesis and Biological Evaluation of Some New Isoxazole Derivatives

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ABSTRACT

To investigate the potential analgesic and anti-inflammatory effects of novel isoxazole compounds, they were synthesized and biologically assessed. Several isoxazole compounds were produced using a straightforward procedure that involved condensation reactions between appropriate precursors. Spectroscopic techniques like NMR and mass spectrometry were employed to validate the structural characterization of the synthesized derivatives. In vitro biological tests were performed to assess the compounds' anti-inflammatory efficacy by assessing the reduction of significant inflammatory mediators. The analgesic effects were evaluated using standard rodent pain models. One compound proved as effective as popular non-steroidal anti-inflammatory drugs (NSAIDs), and several of the synthetic derivatives showed significant analgesic and anti-inflammatory properties. The results suggest that isoxazole derivatives could be viable candidates for the development of new anti-inflammatory and analgesic medications. Further study is required to elucidate the precise mechanisms of action and optimize the structure-activity relationship of these compounds for enhanced therapeutic potential. Numerous novel isoxazole compounds were created and evaluated biologically to look into their potential anti-inflammatory and analgesic effects. After being produced by condensation processes, a range of isoxazole-based compounds were purified and structurally studied using techniques such as mass spectrometry, IR spectroscopy, and NMR spectroscopy. The biological examination included in vitro anti-inflammatory tests that looked at the inhibition of pro-inflammatory cytokines and enzymes including cyclooxygenase (COX). Additionally, the analgesic efficacy of the synthesized compounds was assessed using animal models of acute pain, including the tail-flick and formalin tests.

Keywords: Isoxazole derivatives, anti-inflammatory activity, analgesic, synthesis, biological evaluation, non-steroidal anti-inflammatory drugs (NSAIDs), pain models, structure-activity relationship.

Quality by Design Based Formulation, Optimization, Characterization and Invitro Evaluation of Cetirizine Loaded Nano-Hydrogel for Alopecia Treatment

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ABSTRACT

Alopecia is a widespread hair loss condition affecting millions globally, with few treatment options available. Levocetirizine, an antihistamine, has demonstrated potential in enhancing hair growth. Nano hydrogels have emerged as a promising method for delivering drugs topically. This study aims to develop and assess a nano hydrogel loaded with levocetirizine (LCH) for managing alopecia. Levocetirizine-loaded PLGA nanoparticles (NPs) were prepared using the double emulsion solvent evaporation technique. Optimization of the NP formulation was conducted using the Box-Behnken design approach of design of experiments (DOE). The optimized NP formulation was integrated into a Carbopol-based hydrogel and examined for physical properties, ex-vivo permeation, and kinetic behavior. Scanning electron microscopy (SEM) was utilized for surface morphological analysis, revealing spherical and smooth NPs within the nano size range. The optimized LCH formulation exhibited an average size of 175.10±12 nm, a zeta potential of -17.45±1.5 mV, and an entrapment efficiency of 79.875±1.2%. Compared to a plain drug solution, the encapsulation of levocetirizine within NPs significantly extended the in vitro drug release up to 7 hours. Further characterization via FTIR and DSC confirmed effective drug encapsulation without any drug-polymer interactions. The nano hydrogel was evaluated for pH, occlusion factor, spreadability, and viscoelasticity. Kinetic studies indicated that the nanogel system followed the Korsmeyer-Peppas model (R2=0.9959). This research contributes to advancing nanotechnology-based formulations for promoting hair growth and lays groundwork for future investigations into the therapeutic use of levocetirizine and other agents in alopecia management.

Keywords: alopecia, nanodrug delivery, drug repurposing, cetirizine, trans follicular delivery, QbD etc.

Need of More Effective Regulatory Guidelines in Pharma Industries

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ABSTRACT

Emerging pharma industries are an integral part of human society. Any kind of error at any step in this field can harm the whole society. To avoid such consequences several rules and guidelines are prepared and amended. From many years several kinds of standards, policies are generated and even commissions and organisations are generated such as GMP, GLP, ISO etc. But still incidents are happening. For instance, the South Asian nation is the largest supplier of generic drugs to the US and dozens of other countries. The $50 billion sector was under the spotlight after a number of recent scandals linked to smaller, privately-held Indian companies, including the deaths of dozens of children in Gambia and Uzbekistan from adulterated cough syrup, and supplying contaminated chemotherapy drugs to the US. There are still hundreds of cases like this. All this leads to the need of more efficient regulatory guidelines and inspections. Recently licenses of 64 pharma industries were cancelled due to non-compliance with regulatory guidelines. All pharma industries need to understand their moral duties and have to stick to right protocols and quality assessments to ensure the safety of the drug and drug products. Regular internal and external audits should be conducted to keep a check. Further different kinds of arrangements are developed like Personalized Medicine, introduction of AI to reduce such kinds of error, Training and awareness program, change in clinical trials rules RWE Integration (Real World Evidence) etc. However, these steps will become successful if the whole management of the industry works as whole and focuses on customer approach.

Keywords: GMP, Chemotherapy, Inspections, Protocols, RWE integration, Personalised Medicine, Approach

Calcium Carbonate Microparticles as a Drug Delivery System for Water Insoluble Drug Lamotrigine

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ABSTRACT

In the realm of pharmaceuticals, the delivery of water-insoluble drugs presents a significant challenge. Lamotrigine, a drug commonly used to treat epilepsy and bipolar disorder, falls within this category. To address the solubility and bioavailability issues associated with lamotrigine, calcium carbonate (CaCO3) microparticles emerge as a promising drug delivery system. This study explores the potential of CaCO3 microparticles as carriers for lamotrigine. This study presents the synthesis, characterization, and potential biomedical applications of CaCO3 microparticles as a versatile drug delivery platform. The microparticles were formulated via a facile precipitation method using calcium chloride (CaCl2) and sodium carbonate (Na2CO3) as precursors under controlled experimental conditions. Various characterization techniques including scanning electron microscopy (SEM), X- ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and Differential scanning calorimetry (DSC) were employed to analyse the morphology, structure, and composition of the synthesized microparticles. Furthermore, drug loading and release studies were conducted to evaluate the efficiency of lamotrigine encapsulation and release behaviour. The results demonstrate the uniform morphology and crystalline nature of the microparticles, with efficient drug loading and sustained release of lamotrigine bipolar studies warranted to explore the ex vivo drug delivery platform.

Keywords: Lamotrigine, Microparticles, Calcium carbonate, Layer-by-layer coating, bioavailability, Drug release.

Development And Evaluation of Nanoemulsion Based Vaginal Suppositories of Clindamycin for the Treatment of Polycystic Ovary Syndrome

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ABSTRACT

In the current investigation, clindamycin loaded gelatin-based suppositories were prepared using clindamycin-loaded nanoemulsions with varying ratios of oil, surfactant, and aqueous phase, along with a co-surfactant. However, Oral clindamycin has low bioavailability and is rapidly cleared by first-pass hepatic metabolism, necessitating the development of its novel formulations. Clindamycin using nanoemulsion was prepared using combination of probe sonication and high-speed stirring. Ternary phase diagram was constructed to optimized the value of phases. Nanoemulsion was evaluated for globule size, zeta potential, % content uniformity and surface morphology. Finally, the optimized nanoemuslion was loaded into gelatin supoositories for vaginal application. Particles as tiny as 82.85 nm and a poly dispersity index of 0.262 were present in the final formulation. The formulation demonstrated high stability, as evidenced by the nanoemulsion's zeta potential of 28.8 mV. The resulting nanoemulsion was created with a pH of 5.8, was transparent and clear, and contained 99.98% of the drug. Clindamycin suppositories had a constant weight range of 0.32017g to 0.92802g, content range of 48.58% to 54.57% and hardness of 4.6 to 7.3 kg. The suppository formulations A1–A3 need 8–9 minutes to dissolve, which is within the allowed range of 60 minutes for water-soluble suppositories. The optimized formulation showed the largest drug release as compared to the market formulation, achieving 51.72% release within 2 hours. The in-vitro release study of formulation A2 showed superior drug release, outperforming market formulations. The Higuchi model confirmed a diffusion-controlled release, making the formulation promising for sustained therapeutic effects. Clindamycin suppositories were successfully created for vaginal distribution using novel nanoemulsion-loaded gelatin substrate.

Keywords: Clindamycin, Nanoemulsion, Gelatin suppository, Ternary Phase diagram, Particle size analysis, polycystic ovarian syndrome.

Tomatoes to Wellness: Unlocking the Benefits of Lycopene

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ABSTRACT

There are many different plant species on Earth, including those that are useful and have healing properties. The use of herbal remedies for the treatment of a wide range of disorders, including hepatitis, arthritis, chronic heart conditions, skin conditions, wounds, and even cancer, has been described in our "ayurveda" and scientifically demonstrated by numerous researchers of the modern day. Due to their abundance in different phytochemical substances, recommendations for eating fruits and vegetables have been rising for decades. The majority of these compounds are bioactive and have significant nutritional impacts. The family of carotenoid compounds includes lycopene. Hydrocarbon carotenoids and xanthophylls are the two main categories of carotenoids. Carotenoids that include only hydrogen and carbon include lycopene. Fruits and vegetables, particularly tomatoes and tomato-based processed foods like ketchup, are the main food sources of lycopene in our diet. Though they provide less than tomatoes and their products do, red fruits like watermelon, grapefruit, and even seafood are sources. Lycopene has been linked to a reduction in the risk of developing chronic diseases such cancer, atherosclerosis, cardiovascular disease, and neurological disorders, according to previous in vitro and in vivo research. As an antioxidant, lycopene must be consumed in adequate amounts since it aids the body in combating off free radicals, which can damage blood vessels and cause cancer and other disorders of the heart and circulatory system. There is emerging proof that lycopene can support bone strength restoration. Lycopene and beta-carotene are the primary carotenoids discovered in both skin and plasma, according to study, that’s why they are frequently utilized in skin care products.

Keywords: Caretenoid, Cancer, Lycopene, Tomato, Radicals.

Comparative Study of Protective Role of Anti-Inflammatory, Anti-Hypertensive, Anti-Hyperlipidemic and Anti-Oxidant Agents in Combination with Antidiabetic Agent in Diabetic Nephropathy Rat

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ABSTRACT

Diabetic nephropathy (DN) is a progressive kidney disease caused by long-term diabetes mellitus, leading to renal dysfunction and increased morbidity. The present study evaluates the comparative protective roles of anti-inflammatory (Aspirin), anti-hypertensive (Olmesartan), anti-hyperlipidemic (Fenofibrate), and antioxidant (Pyridoxamine) agents in combination with the antidiabetic drug Pioglitazone in an experimental rat model of DN.

A total of six groups of streptozotocin (STZ)-induced diabetic rats were treated with Pioglitazone alone and in combination with the aforementioned agents for a defined period. Renal function parameters, oxidative stress markers, inflammatory cytokines, lipid profile, and histopathological analysis of kidney tissues were assessed to determine nephroprotective efficacy.

The results indicated that Pioglitazone alone provided moderate renoprotection, while its combination with anti-inflammatory, anti-hypertensive, anti-hyperlipidemic, and antioxidant agents significantly improved renal function markers. Aspirin reduced inflammation, Olmesartan effectively controlled blood pressure and reduced glomerular injury, Fenofibrate improved lipid metabolism, and Pyridoxamine alleviated oxidative stress, thereby protecting renal tissues. Histological evaluation confirmed reduced glomerular hypertrophy and tubular damage in combination therapy groups compared to monotherapy. Among all combinations, Pioglitazone with Pyridoxamine showed the most pronounced nephroprotective effects by reducing oxidative stress and fibrosis. These findings suggest that adjunct therapy targeting multiple pathophysiological pathways may be more effective in mitigating DN progression than Pioglitazone alone.

Keywords: Diabetic nephropathy, Pioglitazone, Oxidative stress, Inflammation, Renal protection, Combination therapy.

Conventional and Nanotechnology Based Antifungal Therapies for Scalp Seborrheic Dermatitis: A Comparative Analysis

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ABSTRACT

Scalp seborrheic dermatitis (SSD) is a prevalent inflammatory skin disorder that primarily affects the scalp, causing symptoms such as redness, flaking, and itching. Traditional treatment for SSD typically involves antifungal agents like ketoconazole, ciclopirox, and selenium sulfide, which target the *Malassezia* fungi thought to play a central role in the condition. While effective in controlling fungal overgrowth, these treatments have limitations, including potential side effects like skin irritation, stinging, and long-term safety concerns. Moreover, the need for frequent application may lead to poor patient adherence, hindering successful management.

In recent years, nanotechnology-based drug delivery systems have emerged as a promising alternative to conventional antifungal therapies. Nanoparticles, such as liposomes and solid lipid nanoparticles, can encapsulate antifungal agents, ensuring enhanced drug penetration, controlled release, and prolonged therapeutic effects. This approach not only reduces the frequency of application but also minimizes side effects by targeting the affected area more precisely and reducing systemic absorption. Additionally, nanotechnology improves the bioavailability of drugs, allowing for more effective management of SSD, a chronic and often recalcitrant condition.

This report reviews the limitations of standard antifungal treatments and explores the potential of nanotechnology-based therapies as a superior alternative. A comparative analysis reveals that while conventional treatments remain effective, nanotechnology offers distinct advantages, including targeted drug delivery, improved patient adherence, and reduced irritation. As research into nanomedicine advances, these innovative therapies are expected to revolutionize the treatment landscape for SSD.

Keywords: Scalp seborrheic dermatitis, antifungal treatments, nanotechnology, drug delivery system, Malassezia.

Design, synthesis, and biological activity of hydrazone and oxadiazole derivatives

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ABSTRACT

The five-membered oxadiazole ring is a significant and necessary structure in various medications and natural products. As one of the most well-known heterocycles, it serves as the backbone for a broad variety of pharmacological drugs, including those having antiviral, anticancer, antibacterial, anti-inflammatory, anti-tubercular, analgesic, and antiepileptic activities. The biological activity of heterocyclic compounds originates from their capacity to interact with diverse enzymes, either by binding to active sites or fitting into enzyme pocket structures. These interactions cover multiple intramolecular forces such as H bonding, electrostatic forces, hydrophobic contacts, and Metal (M) coordination bonds, making them crucial for the invention of innovative medical treatments. Heterocycles like oxazolidine, isoxazolidine, oxazole, and isoxazole are basic scaffolds in medicinal chemistry, with five-membered heterocycles containing sulphur, oxygen, or nitrogen playing especially prominent roles. Among them, 1,3,4-oxadiazole is notably interesting for its medicinal and biotechnological uses. Additionally, hydrazones, a family of chemical molecules, are crucial in medical biotechnology. They are applied to conjugate medications with particular antibodies, such as those targeting blood cancer cells. These conjugations stay stable at neutral pH but quickly dissolve in the acidic environment of lysosomes inside the cell, enabling the drug to be released and activated at the target location.

Keywords: Oxadiazoles, Biological activity, Antimicrobial, Heterocyclic compound, Pharmacophore.

Formulation and Evaluation of Mahonia Aquifolium Nanolipid Carrier Gel Extract

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ABSTRACT

The formulation and evaluation of *Mahonia Aquifolium* nanolipid carrier gel extract was investigated to enhance the skin penetration and therapeutic efficacy of the bioactive components. *Mahonia Aquifolium*, known for its antimicrobial and anti-inflammatory properties, was extracted using an appropriate solvent, and the extract was incorporated into a nanolipid carrier system. The nanolipid carriers, prepared using lipid-based materials, served to encapsulate the active compounds, improving their stability and bioavailability. A gel formulation was developed to provide a suitable delivery system for topical application. The gel was characterized for its physical properties, including pH, viscosity, spreadability, and texture. Additionally, the drug release profile was studied to assess the sustained release of the active compounds over time. The formulated nanolipid carrier gel was subjected to in vitro and in vivo evaluations, including skin irritation tests and antimicrobial activity, to determine its safety and efficacy. The results indicated that the *Mahonia Aquifolium* nanolipid carrier gel exhibited enhanced stability, improved skin permeation, and sustained therapeutic effects, suggesting its potential for use in dermatological applications.

Keywords: Nanolipid carrier, gel formulation, skin permeation, topical application, stability, dermatological applications.

Multi-Target Drug Design (MTDD) - A Promising New Approach to Drug Discovery

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ABSTRACT

Multi-target drug design (MTDD) indicates a changed way of thinking for pharmaceutical scientists since it has the ability to go beyond the general approaches of drug development that have traditionally been focused on single targets. Acting on more than one target at the same time enhances drug efficacy and decreases drug resistance and side effects, therefore representing a promising approach for treating multifaceted ailments such as cancer, neurodegenerative disorders, and infectious diseases. This abstract gives a review of the various perspectives over MTDD, designed multi-target ligands, combination therapy, and network-based drug discovery. Coupled with artificial intelligence and computational modeling, this is paving the road for personalized and precision medicine and driving the growth of MTDD. Case studies like Lapatinib against cancer treatment indicate the potential of MTDD in contemporary therapeutics. With the generation of new research within the field, MTDD stands as a strong candidate for designing safer and more effective drug therapies.

Keywords: Multi-target drug, neurodegenerative disorders, multi-target ligands, computational modeling, Lapatinib, cancer, multifaceted ailments.

Exploring Consumer Perceptions and Preferences Towards Anti-Aging Approaches: A Survey-Based Study

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ABSTRACT

Aging is an inevitable biological process marked by gradual cellular and physiological decline, leading to visible changes in skin elasticity, hydration, and overall appearance. With the increasing focus on combating these signs of aging, this research aimed to explore consumer perceptions, preferences, and experiences with various anti-aging approaches. A mixed-methods survey was conducted, targeting diverse age groups, to assess awareness, usage patterns, and the effectiveness of popular anti-aging strategies, such as serums, lifestyle changes, and conventional formulations. Quantitative findings from the survey revealed that a majority of participants had adopted at least one anti-aging approach, with serums emerging as the most commonly used product. Approximately half of the respondents preferred serums based on recommendations from peers or dermatologists, while the rest opted for products based on personal research and compatibility. Participants who consistently used serums over a long period reported noticeable improvements in skin texture, hydration, and reduction of fine lines. Notably, most users did not experience adverse effects, though a small percentage reported mild irritation. The study also revealed demographic differences in anti-aging preferences. Participants aged 20–30 were inclined toward innovative and advanced formulations, while the 30–40 age group prioritized sticking to a single product for long-term results. Respondents aged 40 and above favored conventional methods, valuing their familiarity and reliability. Across all age groups, the demand for products with minimal side effects and enhanced convenience was evident. Participants expressed a growing interest in holistic and lifestyle-based approaches, including proper hydration, balanced diets, and stress management, to complement topical treatments. This study underscores the evolving consumer demand for innovative, safe, and effective anti-aging solutions. skincare industry and pave the way for future research on sustainable, science-driven anti-aging innovations.

Keywords: Aging, Anti-aging, Approaches, Novel, Holistic, Quantitative Analysis.

The Future of Heart Health: Telemedicine's Growing Role in Cardiology

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ABSTRACT

Access to specialized cardiovascular care remains a global challenge, with telemedicine emerging as a transformative solution. Worldwide, overburdened healthcare systems, geographic disparities, and rising cardiovascular disease (CVD) cases necessitate innovative care models. Telemedicine enables remote monitoring, virtual consultations, and AI-driven diagnostics, improving accessibility, reducing hospital visits, and facilitating early interventions. The COVID-19 pandemic accelerated its adoption, proving its potential in preventive and emergency cardiac care. However, challenges such as data security, digital literacy, and integration with existing healthcare systems remain. In India, where CVDs are the leading cause of mortality, telemedicine is particularly crucial in bridging the urban-rural healthcare gap. A shortage of cardiologists and inadequate healthcare infrastructure in rural areas hinder timely interventions. The rise of government initiatives like the National Telemedicine Service (eSanjeevani, SEHAT, etc.) and increased smartphone penetration have expanded telehealth adoption. Remote ECG monitoring, AI-based diagnostics, and mobile health platforms are enhancing early detection and management. However, challenges such as internet accessibility, affordability, and regulatory frameworks must be addressed. As digital healthcare evolves, telemedicine is set to revolutionize cardiology by making specialized care more accessible, efficient, and patient-centric. This poster highlights the global and Indian perspectives on telemedicine's role in shaping the future of heart health.

Keywords: Telemedicine, cardiovascular disease, remote monitoring, AI-driven diagnostics.

Formulation and Evaluation of Tinidazole Microemulsion Loaded Gel

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ABSTRACT

Tinidazole is an antibiotic used to treat a variety of illnesses. To improve its therapeutic efficiency and skin penetration, a microemulsion-based gel was developed for topical application. Microemulsions are clear, thermodynamically stable mixtures of water, oil, surfactants, and co-surfactants that make it easier to distribute active pharmaceutical ingredients (APIs) under control. The gel formulation was created by combining the microemulsion into a gel matrix after tinidazole was added to the microemulsion system. The gel's physicochemical characteristics, such as its pH, viscosity, drug content, and spreadability, were assessed. Franz diffusion cells were used for in-vitro release studies to evaluate the drug release profile, and skin irritation and stability tests were carried out to make sure the formulation was safe and stable. Tinidazole's solubility and bioavailability were significantly improved by the formulation, which also had better skin penetration than traditional formulations. Its potential for topical use in the treatment of infections was suggested by the microemulsion-based gel's exceptional stability, lack of skin irritation, and prolonged controlled drug release. According to the findings, this formulation may provide a safe and efficient substitute for oral medication, particularly in cases with localized infections.

Keywords: Microemulsion gel, Tinidazole, topical application, Skin barriers, Skin penetration.

Nanophytomedicine in Wound Healing: A Cutting-Edge Therapeutic Strategy

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ABSTRACT

The treatment of wounds is a serious issue all over the world and imposes a significant financial burden worldwide. Wound healing is a systemic progression of events that helps regenerate the integrity of damaged tissue. Several natural compounds are shown to have antimicrobial, anti-inflammatory, and cell-stimulating properties, which helps to accelerate the healing process In spite of the fact that natural compounds possess infinite biological characteristics and are in general more economical than modern treatments, their application is restricted due to batch-to-batch variation that may deliver inconsistent therapeutic outcomes. However, nanophytomedicine, which integrates nanotechnology and phytotherapy, offers new frontiers in the field of wound healing. These nanoparticles possess some unique characteristics, such as their small size, huge surface area, and ability to penetrate through skin layers, which impart effective wound healing. The application of medicinal plant-derived nanoparticles improves bioavailability, controlled release, and drug stability, overcoming the drawbacks associated with traditional phytomedicines. In wound healing, nanophytomedicines have been shown to enhance epithelial growth, decrease oxidative stress, and have significant antimicrobial properties. These nanoparticles have demonstrated excellent potential in collagen formation, tissue regeneration, and preventing infection in chronic and acute wounds. In this chapter, we have focused mainly on types of plant-based nanoparticles, applications, their mechanism of action, and the effectiveness of diverse phytonanomaterials on different stages of wound healing.

Keywords: Antimicrobial, Anti-inflammatory, bioavailability, phytotherapy, oxidative stress

Bioavailability enhancement of poorly soluble anti- hypertensive drug using liposomal pastilles: Formulation and experimental design investigation

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ABSTRACT

The oral mucosa provides numerous benefits for delivering therapeutic molecules, as it bypasses presystemic metabolism. This study aims to develop liposomal pastilles with enhanced bioavailability. Felodipine liposomes (FL) were produced using different ratios of soya lecithin (SL) and cholesterol (CH) through the solvent injection method. RSM is used to determine the optimized formulation, as it offers a comprehensive understanding of the process and is highly effective in ensuring the robustness of the product. The main impact and interaction terms of the formulation variables were assessed quantitatively utilizing a mathematical-statistical approach indicating that both independent variables have significant ('*P'* value < 0.05) effects on particle size ('*P'* value: 0.0142), percentage entrapment efficiency ('*P'* value: 0.0120), percentage drug release through the dialysis membrane ('*P'* value: 0.0105), percentage drug release through porcine buccal mucosa ('*P'* value: 0.0171) and percentage zone of inhibition ('*P'* value: 0.0305). Optimal liposomal encapsulated in noticed in 15:10 lecithin: cholesterol concentration (FLP-6). In the liposome formulations, higher quantities of lecithin and cholesterol led to reduced drug entrapment efficiency and drug release, compared to formulations with moderate levels of lecithin and cholesterol. The pastilles were produced using the optimized liposomal formulation, following a modified method described in the British Pharmaceutical Codex, 1907.These liposomal pastilles were subjected to evaluation of physicochemical parameters, In vitro drug release studies, stability studies, and In vivo bioavailability studies in comparison with pure Felodipine pastilles (PFP). The statistical data analysis results indicated that there was a significant difference in T_{max}, K_a, $t_{1/2\ abs}$, $t_{1/2\ elim}$, $AUC_{0–24}$, $AUC_{0-\infty}$, $AUMC_{0–24}$ and $AUMC_{0-\infty}$, values among PVP and VLP-6. There was no significant difference in C_{max}, K_{el}, $MRT_{0–24}$ and $MRT_{0-\infty}$values among pure felodipine pastilles and optimized liposomal formulation.

Improvement of Solubility Through Solid Dispersion Technique of Vilazodone

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ABSTRACT

Vilazodone, a selective serotonin reuptake inhibitor (SSRI) with partial agonist properties at the serotonin 5-HT1A receptor, is used primarily in the treatment of major depressive disorder. However, its clinical application is limited due to its poor water solubility, which impacts its bioavailability. To overcome this challenge, the solid dispersion (SD) technique has emerged as an effective strategy to enhance the solubility and dissolution rate of poorly soluble drugs like Vilazodone. This technique involves dispersing the drug in a solid matrix composed of water-soluble carriers, thereby improving its dissolution properties and increasing its bioavailability. Various carriers such as Polyvinylpyrrolidone (PVP) PEG (Polyethylene Glycol) have been explored for the formulation of solid dispersions of Vilazodone. In this research, we discuss the principles, methods of preparation, and the advantages of solid dispersion systems, highlighting their potential in overcoming solubility issues of vilazodone. Additionally, the effects of different preparation techniques, such as fusion method, co-grinding method and solvent evaporation, on the solubility enhancement of vilazodone are examined. Finally, we explore the future prospects of solid dispersions in improving the therapeutic efficacy of vilazodone, emphasizing the need for further research to optimize these formulations for clinical applications.

Keywords: Vilazodone, Solid dispersion, Antidepression, Polymers, Solubility, Bioavailability.

Marine Pharmacognosy: Potential Sources of Novel Bioactive Molecules

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ABSTRACT

Marine pharmacognosy is a growing area that investigates the enormous potential of marine species as sources for novel bioactive chemicals. The ocean's environment, which occupies more than 70% of the surface of the planet, is home to a varied range of microbes, algal blooms, invertebrates, and other marine species that have developed unique biochemical adaptations to thrive under harsh conditions. These modifications have resulted in the development of structurally diverse and medicinally active secondary compounds with prospective uses in medicine, the field of biotechnology and other fields. Significant antibacterial, anticancer, antiviral, anti-inflammatory, and neuroprotective qualities have been demonstrated by substances obtained from marine sources. Notable examples include ziconotide, which is derived from the venom of Conus magus and is a powerful painkiller, and trabectedin, which is obtained from the sea squirt Ecteinascidia turbinata and is used as an anticancer medication. Promising antibacterial and anticancer compounds have also been found in marine bacteria and fungi, especially actinomycetes. Advances in biotechnology, genetics, and synthetic biology have aided the identification and production of marine-derived bioactive compounds. However, issues like as sustainable harvesting, complex structure elucidation, and scalability in medication manufacture remain significant obstacles. Despite these obstacles, marine pharmacognosy remains a potential area in drug discovery, providing new paths for the treatment of numerous diseases and tackling the evolving problem of antimicrobial resistance.

Future research initiatives that combine marine biodiversity, bioprospecting, and advanced biotechnological methods have the potential to uncover innovative treatments, strengthening the ocean's value as a resource for pharmaceutical innovation.

Keywords: Marine pharmacognosy, biotechnology, marine-derived bioactive compounds, biodiversity, bioprospecting, marine sources.

Formulation and Evaluation of Transdermal Patch of Nebivolol

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ABSTRACT

The objective of this study was to formulate and evaluate transdermal patches of Nebivolol, a beta-blocker used for the treatment of hypertension and heart failure. Transdermal drug delivery offers several advantages over oral administration, including sustained drug release, improved patient compliance, and reduced side effects. In this formulation, Nebivolol was incorporated into a polymeric matrix composed of hydrophilic and hydrophobic materials such as polyvinyl alcohol, ethyl cellulose, and acrylic-based adhesives to ensure controlled drug release. The patches were prepared using the solvent evaporation method and evaluated for various parameters, including drug content uniformity, weight, thickness, tensile strength, and drug release profiles. In vitro drug release studies were conducted using Franz diffusion cells, and skin permeation studies were carried out to assess the rate and extent of drug absorption. The formulated patches demonstrated a controlled release of Nebivolol over a prolonged period, and the in vivo performance showed a promising pharmacokinetic profile. The stability studies confirmed that the patches were stable under various storage conditions. This study highlights the potential of Nebivolol transdermal patches as a viable alternative to conventional oral formulations, offering sustained therapeutic effects with improved patient adherence.

Keywords: Transdermal Patch, Nebivolol, Antihypertension Polyvinyl alcohol, Ethyl cellulose.

A Review on Skin Cancer Therapies

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ABSTRACT

The primary cause of skin cancer is ultraviolet (UV) radiation exposure, either from the sun or artificial tanning sources. Other risk factors include fair skin, genetic predisposition, and a history of sunburns or excessive UV exposure. Skin cancer is one of the most common types of cancer worldwide, primarily divided into three main types: basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma. BCC and SCC occur more frequently and are less harmful, whereas melanoma is the most aggressive type, responsible for a large portion of fatalities linked to skin cancer. Diagnosis is achieved through a variety of methods, such as visual inspection, biopsy, and dermoscopy. Options for treatment include surgical excision, radiation therapy, and, specifically for melanoma, immunotherapy and targeted therapy. Due to high cost and extreme side effects people are looking for better alternates. Herbel remedies are leading the field now a days because of their low cost, easy availability and fewer side effects compared to the conventional mode of therapy. Many researchers have discovered potent anti-cancer phytoconstituents in various plant species. With the help of modern analytical techniques detection and extraction of potential therapeutic phytochemicals has become easier. Apart from that taking preventive measures like protecting oneself from the sun, using sunscreen, and steering clear of tanning beds can greatly lower the likelihood of developing skin cancer.

Keywords: Sun protection, Immunotherapy, Phytochemicals, Treatment, Prevention.

Liquisolid Technique Based Orodispersible Tablets of Bilastine

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ABSTRACT

The Liquisolid Technique offers an innovative approach in improving the dissolution rate and bioavailability of poorly water-soluble drugs. Bilastine, a second-generation antihistamine, is known for its limited solubility, which can impair its therapeutic effectiveness. To address this challenge, the development of liquisolid technique-based orodispersible tablets (ODTs**)** of Bilastine was formulated. In this formulation, Bilastine is dissolved in a suitable solvent mixture, creating a liquid drug formulation. This liquid is then converted into a powder using a carrier-coating system, which helps in enhancing its solubility and dissolution rate. The resulting liquisolid powder is compressed into orodispersible tablets, designed to rapidly disintegrate in the mouth, offering a convenient dosage form for patients with swallowing difficulties. The primary objective of this study is to evaluate the physicochemical properties, dissolution behavior, and bioavailability of Bilastine-loaded liquisolid ODTs. The findings suggest that the liquisolid technique significantly enhances the solubility and dissolution of Bilastine, leading to improved bioavailability compared to conventional tablet formulations. Additionally, the orodispersible tablet design offers ease of administration and better patient compliance. This approach holds promise for overcoming solubility challenges of Bilastine, providing an efficient, patient-friendly alternative for managing allergic conditions like urticaria, allergic rhinoconjunctivitis.

Keyword: liqui-solid technique, bilastine, urticaria, allergic rhinoconjunctivitis, carrier, coating, superdisintegrant.

Comparative Study of the Anti-Inflammatory Properties of Ethanolic and Aqueous Nettle Leaf Extracts

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ABSTRACT

This study investigates and compares the anti-inflammatory properties of ethanolic and aqueous extracts of Urtica dioica (nettles) leaves using the egg albumin denaturation method. Inflammation is a common physiological response to tissue injury, and the use of plant-derived compounds for its management has gained attention due to their bioactive potential. The ethanolic and aqueous extracts were prepared, and their effects on the heat-induced denaturation of egg albumin, a model for inflammation, were evaluated. The degree of denaturation was assessed by measuring the optical density of the albumin solution at various concentrations of the extracts. Results demonstrated a significant inhibitory effect on protein denaturation for both extracts, with the ethanolic extract showing superior anti-inflammatory activity compared to the aqueous extract. These findings suggest that both extracts possess anti-inflammatory properties, with the ethanolic extract potentially offering a more effective therapeutic option for managing inflammation. Further studies are recommended to explore the active compounds responsible for these effects and their mechanisms of action.

Keywords: Nettle leaf, anti-inflammatory, ethanolic, Urtica dioica, denaturation, egg albumin.

Antimicrobial Activity of *Capparis Decidua* Edgew Extract-Loaded Herbal Formulation for Wound Infection: In Vitro & In Silico Study

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ABSTRACT

Because of herbal formulations' medicinal advantages and low side effects, there has been a lot of interest in their development. The main focus of this investigation is the development and evaluation of an in-situ gel comprising root extract from Capparis decidua, which is well known for its anti-microbial, anti-inflammatory, antioxidant, and wound-healing qualities. The goal is to use *Capparis decidua*'s bioactive substances to administer drugs in a targeted, sustained manner. A variety of polymers, such as poloxamer 407 and Carbopol 390, which promote gelation when in contact with physiological circumstances, were combined to create the in-situ gel system. Different amounts of these polymers were tested to maximize the mucoadhesion profile, pH range, viscosity, gelation duration, and gelation temperature. To confirm the therapeutic action and optimization of the herbal extract with the gel matrix, the physicochemical characteristics of the gel were assessed utilizing rheological investigations, Fourier-transform infrared spectroscopy (FTIR), pH measurements, and the anti-microbial investigation, cytotoxicity and wound healing assay for wound healing assay. According to the findings, the in-situ gel formulation including root extract from *Capparis decidua* had favourable physicochemical characteristics, such as the right pH, mucoadhesion, viscosity, and gelation temperature for in situ gel formation. The extract showed a sustained release pattern over 24 hours in the in vitro release experiments, suggesting the possibility of long-term therapeutic activity. In summary, the in-situ gel formulation of *Capparis decidua* root extract that has been created offers a potential strategy for improving the efficacy and delivery of herbal remedies. Its invitro profile and prolonged release qualities point to its possible application in treating a number of illnesses while reducing the frequency of dosage and enhancing patient compliance. To confirm the therapeutic effectiveness and safety of this herbal in situ gel formulation, further in vivo research is advised.

Keywords: In-situ Gel, Capparis Decidua, Gel Formulation, Herbal, Wound Healing, Cytotoxicity, Cell Lines Study

The Implementation of Artificial Intelligence in Healthcare Medical Devices

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ABSTRACT

Artificial Intelligence (AI) is transforming the healthcare landscape, particularly in the realm of medical devices, by enhancing diagnostic accuracy, improving patient outcomes, and streamlining healthcare operations. The integration of AI technologies in medical devices, such as imaging systems, diagnostic tools, wearable health monitors, and robotic surgery assistants, is reshaping the delivery of care and opening new possibilities for precision medicine. AI-driven devices use advanced algorithms to process and analyze vast amounts of medical data, providing real-time insights that assist clinicians in decision-making, personalized treatment plans, and proactive patient management. One of the most significant advantages of AI in medical devices is its ability to detect patterns and anomalies in complex medical data, often with greater speed and accuracy than traditional methods. This has proven particularly beneficial in areas like radiology, where AI can assist in early detection of diseases like cancer, cardiovascular conditions, and neurological disorders. Despite these advancements, the implementation of AI in medical devices presents challenges related to data privacy, regulatory approval, and the need for ongoing algorithm validation. Ensuring the safety and efficacy of AI-powered devices through rigorous clinical trials and adherence to medical device regulations is crucial for building trust in these technologies. Moreover, there is a need for healthcare professionals to receive proper training in interpreting AI-driven data to maximize its potential in clinical settings. This abstract explores the current state and future potential of AI in healthcare medical devices, highlighting its impact on diagnostic capabilities, patient monitoring, and treatment planning. It also discusses the regulatory, ethical, and operational challenges that must be addressed to fully harness the power of AI in improving healthcare delivery.

Keywords: Artificial Intelligence, healthcare medical devices, advancements.

Nanorobotics in Medicine: The Future of Minimally Invasive Treatment

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ABSTRACT

Nanorobotics is an emerging and rapidly evolving field with the potential to revolutionize minimally invasive surgery and precision medicine. These nanoscale robotic devices are capable of navigating the human body with unprecedented accuracy, accessing remote and delicate regions that are difficult to reach using conventional surgical techniques. By integrating advanced engineering, artificial intelligence (AI), and nanotechnology, nanorobots offer transformative applications in targeted drug delivery, precision surgery, and real-time diagnostics. Recent advancements emphasize the role of nanorobotics in improving therapeutic precision, particularly in oncology, where nanorobots can directly interact with the tumor microenvironment to deliver therapeutic agents with high specificity. This targeted approach enhances treatment efficacy while significantly reducing systemic toxicity. Furthermore, nanorobots equipped with AI-driven algorithms can adapt to dynamic biological environments, make autonomous decisions, and optimize real-time responses to surgical challenges, minimizing human error and improving surgical precision. Beyond cancer treatment, nanorobots hold promise for repairing damaged tissues, clearing arterial blockages, and restoring normal physiological functions within the circulatory system, reducing the need for conventional invasive procedures. Additionally, the continuous advancement of nanorobotics, driven by interdisciplinary innovations in AI, material science, and biomedical engineering, is paving the way for safer, more efficient, and highly precise medical interventions. As research progresses, nanorobots are expected to play a crucial role in next-generation healthcare, transforming disease management, surgical outcomes, and overall patient quality of life.

Keywords: Nanobots, Artificial intelligence, precision, personalized medicine.

Sustainable Pharmaceutics: Ecofriendly Drug Manufacturing

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ABSTRACT

In today's world, sustainability has become a vital aspect of every industry, and the pharmaceutical sector is no exception. Sustainable pharmaceutics focuses on reducing the environmental impact of drug manufacturing while ensuring that medicines remain safe, effective and accessible. This approach blends innovation with responsibility and incorporates eco-friendly practices that not only protect human health but also sustain the planet and its resources. Sustainable pharmaceutics Key strategies include: minimizing the use of harmful solvents, opting for biodegradable excipients and adopting energy-efficient production methods. The use of renewable resources in drug production is also a major focus, reducing dependence on fossil fuels and promoting long-term sustainability. Waste management systems, including recycling, reducing the amount of waste and the proper disposal of pharmaceutical waste, play a crucial role in reducing environmental contamination. Sustainable packaging solutions, such as eco-friendly materials and designs that reduce waste, are also being prioritized. The goal of sustainable pharmaceutics is to create a balance between effective medicines and environmental responsibility. As the industry progresses, we imagine a future possibility where pharmaceutical practices not only prioritize patient health but also consider the well-being of the planet. This vision requires all of us—governments, corporations, scientists, and consumers—to work together towards a more sustainable, eco-friendly future for medicine. By adopting sustainable practices, the pharmaceutical industry can ensure that future generations inherit a healthier world, where healing extends beyond individuals to the environment itself.

Keywords: Eco-friendly, sustainability, waste management, environment.

Computational Approaches for Targeting Protein-Protein Interactions in Cancer Therapy

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ABSTRACT

Protein-protein interactions (PPIs) play a fundamental role in cellular processes, and their dysregulation is linked to various diseases, including cancer. Given their critical involvement in tumor initiation, progression, and metastasis, targeting PPIs has emerged as a promising therapeutic strategy in oncology. While traditional drug discovery has primarily focused on enzyme active sites, modulating PPIs offers a broader and more versatile approach to disrupting oncogenic signaling networks. Recent advancements highlight the role of computational approaches in identifying and characterizing PPIs, as well as in designing molecules that selectively disrupt these interactions. State-of-the-art deep learning algorithms, such as AlphaFold, have significantly enhanced the prediction and structural modeling of PPIs, providing valuable insights into interaction interfaces and the impact of cancer-associated mutations on binding affinity. These computational models facilitate the identification of binding hot spots, integrate chemical similarity and bioactivity data, and leverage homologous protein complexes to optimize drug design. Moreover, *in silico* techniques are increasingly employed for virtual screening of small-molecule inhibitors that can either selectively kill cancer cells or sensitize them to genotoxic therapies. By accelerating the discovery of PPI-targeted anticancer agents, these computational strategies pave the way for the development of personalized, precision-based treatments, ultimately improving therapeutic efficacy and patient outcomes.

Keywords: Protein, interaction, personalized, structural, model.

Review on 3D Printing and Its Impact on Drug Development

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ABSTRACT

3D printing, or additive manufacturing, has emerged as a transformative technology in the field of drug development. This paper reviews the integration of 3D printing into pharmaceutical sciences, with a focus on its applications in drug formulation, personalized medicine, and pharmaceutical manufacturing. The unique ability of 3D printing to create complex drug delivery systems has led to advancements in the customization of dosage forms, enhancing drug bioavailability and patient compliance. The paper explores the types of 3D printing technologies used in pharmaceutics, including fused deposition modeling (FDM), stereolithography (SLA), and selective laser sintering (SLS). Additionally, the challenges related to regulatory approvals, material properties, and manufacturing scalability are discussed. Furthermore, the potential future directions for 3D printing in drug development, including the creation of on-demand drug production systems and personalized treatments, are highlighted. The review concludes by emphasizing the need for interdisciplinary collaboration to overcome existing limitations and fully realize the potential of 3D printing in pharmaceutical manufacturing. Nevertheless, despite these challenges, new research will continue to be conducted and technological advancements will drive the incorporation of 3D printing into pharmaceutical development, indicating the possibility of more efficient and reasonably priced precision medicine in the future. The review will demonstrate the potential of 3D printing. alter the pharmaceutical industry's structure to provide more individualized, adaptable, and effective medication production while addressing significant problems in this sector. The present state of 3D printing's use in the pharmaceutical industry is reviewed, along with its benefits and drawbacks.

Keywords: 3D Printing, Drug Development, Personalized Medicine, Drug Delivery Systems, Additive Manufacturing, Pharmaceutical Sciences.

Influence of AI Tools for Self-Medication Among Adults

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ABSTRACT

The increasing dependence on Artificial Intelligence (AI) technologies in healthcare has substantially transformed how individuals navigate self-medication, especially among adults. Various AI tools such as health applications, virtual health assistants, and drug interaction checkers provide users with immediate medical guidance and tailored treatment solutions. This capability enables individuals to make well-informed health decisions. Nevertheless, this convenience brings about concerns regarding the correctness of AI-generated suggestions, reliance on unverified information, and possible errors in self-diagnosis. This research seeks to understand how AI tools affect the self-medication habits of adults. It examines the influence of these AI-driven resources on individual health-seeking behaviors related to medication management, symptom tracking, and independent decision-making without professional consultation. The study looks into elements like ease of use, trustworthiness of AI recommendations, digital health literacy levels, and awareness of potential dangers associated with unsupervised medication practices. Results indicate that despite providing a sense of independence and ease-of-use for users, AI tools can also lead to less-than-ideal health outcomes if individuals neglect to consult healthcare professionals. This underscores the necessity for enhancing digital health literacy so that users engage critically with AI offerings while remaining cognizant of their limitations. The study strongly recommends an integrated approach where AI tools are utilized alongside professional medical support while proposing strategies aimed at reducing risks related to safe self-medication practices.

Keywords: Artificial Intelligence, Self-Medication, Safety, Misuse, Medicines, Adults.

Current Treatment Approaches for Testicular Toxicity

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ABSTRACT

Male reproductive function can be influenced by many pharmaceutical agents and environmental substances, with the testis being the most susceptible target for some toxins. Nevertheless, pathological data regarding the male reproductive organs remains very scarce relative to other organs. The intricate cellular interactions among the diverse testicular cells complicate the interpretation of findings. To enhance comprehension, a comprehensive understanding of testicular characteristics, damage mechanisms, and histological alterations corresponding to spermatogenic stages is essential. Factors like active mitosis, the presence of a blood-testis barrier, the spermatogenic process, and hormonal regulation compound the toxicity issue. Nevertheless, the overarching pathways of testicular toxicity can be categorized as follows: 1) Direct-action on spermatogenic epithelia; 2) Hormonal indirect effects on spermatogenesis; 3) Direct or indirect mechanisms impacting sperms; 4) Circulatory disturbances affecting the testis; 5) Other miscellaneous actions. In the histopathological assessment of testicular toxicity. Therapies for testicular toxicity are contingent upon the underlying etiology. It encompasses hormone replacement therapy (HRT), antioxidant drugs, management of the underlying cause such as ceasing exposure to heavy metals, and, in certain instances, surgical therapies like varicocelectomy may prove beneficial. Nevertheless, there is no comprehensive data that consolidates all forms of current treatments in a single location. So, this study will provide a summary overview current recognized causes and therapeutic techniques for testicular toxicity.

Keywords: Testicular toxicity, Toxicity, Modern therapeutics, Toxicity treatments.

Nanotechnology Based Treatment Strategies in Preventing Osteoarthritis

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ABSTRACT

A prominent chronic joint disease, osteoarthritis (OA) is the leading cause of disability in adults and is characterized by joint pain, stiffness, and limitation of motion. The rapid advancement of nanotechnology in medication delivery systems in recent years has provided major rise to new innovations and drug delivery approaches for treating osteoarthritis. By improving drug targeting and delivery efficiency, increasing drug solubility and stability, preventing drug dispersion and degradation in bodily fluids, prolonging drug circulation and retention time in the body, increasing drug efficacy, and lowering adverse drug reactions, nanotechnology offers a distinct advantage for the delivery of therapeutics for osteoarthritis. Numerous pharmacologically active small-molecule medications have applications that are severely limited by their short biological half-lives. Various studies have indicated the advantageous characteristics of nanocarriers for prolonged release and targeted drug administration, making them a useful tool for improving the effectiveness of certain medications in the diagnosis of OA. The production and efficacy of six specific polymeric (PEG-b-PLA) nanoparticles for the treatment of OA as agonists of the adenosine receptor, indicates that the combination of biodegradable nanoparticles with adenosine might greatly increase the therapeutic effects. Hyaluronic acid (HA)-Liposomal (Lipo)-DIC/DEX is a new OA therapeutic combination that fights joint pain. DIC was created using DEX-loaded nanostructured lipid carriers to create the nanoparticles. Hyaluronic acid (HA) combined with lipo-DIC/DEX for long-term OA treatment. The combination of LIPUS and liposome-encapsulated rapamycin (L-Rapa) used to enhance rapamycin's anti-osteoarthritic properties. The anabolic and anti-catabolic benefits of this nanotherapeutic approach on spontaneous OA guinea pigs and human OA chondrocytes (HOACs) were the most reliable and efficient. However, nanotechnology and nanomaterials are developing rapidly to meet the needs for the treatment of osteoarthritis.

Keywords: osteoarthritis, synovial hyperplasia, nanocarriers, prolonged release, nanotherapeutic

Role of Phytoconstituents in Treatment of Breast Cancer

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ABSTRACT

Females with early-stage metastatic, estrogen-dependent breast cancer are usually treated with surgery, radiation, and chemotherapy, or with more focused treatments such aromatase inhibitors (letrozole) or anti-estrogens (tamoxifen). The main reasons of mortality for patients with breast cancer are still metastasis, cancer recurrence, and resistance, even with the extensive and effective use of these drugs for the treatment of the disease. The inability to effectively treat and significantly improve patient outcomes in females with hormone-refractory breast cancer, including triple negative breast cancer, is indicative of the current lack of understanding of the most important pathways involved in resistance, despite the fact that many groups have made significant contributions towards a better understanding of resistance mechanisms. Therefore, it is crucial to conduct further research on innovative therapeutic techniques in order to identify drugs that have not yet been thought of as potential treatments for metastatic disease. Plant extracts have been used to treat almost every illness for thousands of years, and breast cancer is no different. Herbal medicines are dependable for the treatment of cancer due to their low toxicity. Furthermore, because herbal remedies are easily accessible and reasonably priced, most women who have been diagnosed with breast cancer willingly adopt them. Over the past ten years, numerous plants and the compounds they contain have shown encouraging anticancer effects against breast cancer cells in both in vitro and in vivo investigations. Despite the promising pre-clinical results, natural compounds' poor stability, water solubility, and bioavailability typically hinder their clinical translation. Therefore, it is essential to sufficiently improve and formulate these medicines for successful therapeutic use and delivery in order to treat future hormone-refractory breast tumours. This article reviews the research on phytochemicals' current status, including their drawbacks and potential as targeted treatments for breast cancer.

Keywords: breast cancer, phytochemicals, therapeutic integration, cytotoxicity, drug resistance

Co-crystal: A novel approach to increase the solubility of drugs

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ABSTRACT

Cocrystals are multicomponent molecular crystals made up of two or more chemically distinct molecules with all of the components at a stoichiometric ratio. This includes modifying drugs to change their physical characteristics, particularly their solubility, without changing their pharmacological effect. Both solvent-based and solid-based techniques can be used to create co-crystals. The solvent-based techniques include cooling crystallization, precipitation, and solvent evaporation for slurry conversion. The solid-based techniques include sonication (which can be used on wet or dry solid mixtures) at 80 to 85° C, solvent-assisted grinding, and net grinding. The following are cocrystals and their commercial formulation: Celecoxib: Nicotinamide Cocrystal, Danazol: Vanillin Cocrystal, Carbamazepine/Succinic Acid Cocrystal, Indomethacin: Saccharin Cocrystal, and Ivabradine Hydrochloride: Cocrystal of (S)- Mandelic Acid. Numerous techniques, including salt creation, micronization, solid dispersion, amorphous medicines, and encapsulation, can be used to modify the physicochemical characteristics of medications. The cocrystals should have the benefit of existing in a stable crystalline form and not requiring additional excipients or additives in formulations, out of all of these. Any other method for improving the solubility and bioavailability of medications that are not very soluble in water is cocrystallization, particularly for substances that are neutral or weakly ionized by nature. Additionally, the melting point, tablet ability, solubility, stability, bioavailability, and permeability can all be improved with cocrystallization. The US FDA published guidelines for the pharmaceutical sector regarding cocrystal patenting in 2011. Cocrystals were categorized by the FDA as "API excipients," a molecular compound that is an intermediary in medicinal products rather than a novel API. However, according to EMA, cocrystals should be documented using the same guidelines as salt.

Keywords*:* Co-crystal, cocrystallization, amorphous, tablet ability, bioavailability, permeability.

Taxonomy, Phytochemistry, Pharmacology, And Potential Therapeutic Role of *Actaea Spicata* in Various Diseases: A Comprehensive Review

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ABSTRACT

Actaea spicata, often referred to as baneberry, has been used for centuries in traditional medicine, yet its full therapeutic potential remains largely unexplored in modern pharmacology. This comprehensive review aims to bridge the gap between traditional knowledge and contemporary scientific understanding of A. spicata. The study synthesizes current research on the plant's taxonomy, phytochemistry, pharmacology, and potential therapeutic applications in various diseases. Despite its historical significance, A. spicata lacks a comprehensive, up-to-date review of its properties and potential. This research addresses this gap by systematically analyzing the available scientific literature. A comprehensive literature search was carried out with the aid of databases including Google Scholar, Web of Science, and PubMed. The review critically examines peer-reviewed articles, focusing on taxonomic classification, phytochemical profiling, pharmacological studies, and potential therapeutic applications. Data synthesis provides a coherent overview of *A. spicata's* properties and potential. The review is expected to offer a detailed account of *A. spicata's* taxonomic status, phytochemical constituents, and their associated bioactivities. It elucidates the plant's potential therapeutic roles in various diseases, highlighting both traditional uses and modern scientific findings. By identifying knowledge gaps and potential research directions, this study aims to stimulate further investigations into *A. spicata's* medicinal properties and its possible applications in drug discovery and development. This comprehensive analysis serves as a foundation for future research, potentially leading to novel therapeutic strategies based on *A. spicata's* unique phytochemical profile.

Keywords: Actaea spicata, baneberry, phytochemistry, pharmacology, therapeutic potential, traditional medicine

Advanced Sunscreen Carriers: Microsponges to Improve Safety, Photostability, and Skin Retention

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ABSTRACT

Patients' lives are impacted differently by various dermatological conditions. Traditional topical delivery methods cause over- or under-medication, which reduces treatment efficacy and causes side effects. As a result, scientists have been working to create different delivery methods for dermatological applications. Microsponges have become a popular choice for topical administration within the past ten years. Microsponges are essentially tiny, spherical particles that resemble sponges and have a porous surface. They have a useful and appealing effect on topical distribution. There are ways to improve the drug's bioavailability, decrease its negative effects, and alter its release. Microsponges come in a variety of bases, including gel, lotion, ointment, and even powder. Nowadays, Microsponges are widely employed in sunscreen gel. They are better than modern microcarriers because of their unique particle size, which provides more advantages. Numerous medical problems, including skin burns, erythema, and skin carcinogenesis, are brought on by excessive UV exposure. In comparison to other sunscreens, the microsponge sunscreen gel has a significantly lower number of adverse effects while protecting our skin from all of these issues. Additionally, microsponges are relatively affordable, manageable, capable of delivering a small dosage of medication, and improve stability. The current study provides a thorough overview of the state of the art, significant variables influencing the efficacy and mechanism of drug release from topically applied microsponges, and sunscreen characterization methods. Additionally, a list of marketed products has been provided along with their uses for common dermatological conditions. Overall, this study is an effort to support future research in this area and provide a bibliographic basis for scholars working in this topic.

Keywords: Sunscreen, dermatology, nanotechnology, microspheres, skin.

Studies on seasonal Disease and Their Preventions

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ABSTRACT

Many infectious diseases follow a seasonal pattern due to favorable environmental conditions that facilitate their spread and transmission among humans. Implementing simple precautionary measures before the onset of seasonal diseases and using effective control strategies during illness can significantly reduce morbidity and mortality. Seasonal variations in the frequency of infectious diseases are common in both temperate and tropical climates.

In India, outbreaks of seasonal diseases such as Dengue, Malaria, Typhoid, and viral fever are on the rise. As one state after another gets affected, it becomes crucial to study these diseases, track their occurrence, monitor changes in viral strains, assess severity patterns, and ensure early detection and management. Several factors contribute to the increasing spread of these diseases, including population growth, rapid urbanization, increased global travel, and climate change. Timely intervention can lead to better recovery outcomes. Water plays a significant role in transmitting various illnesses. Poor water quality and inadequate sanitation contribute to waterborne diseases, especially in tribal regions. Implementing effective water purification techniques can help control the frequency of such illnesses. Dengue fever, in particular, poses a serious public health challenge due to its high morbidity and mortality rates. This abstract explores the virology, epidemiology, clinical manifestations, outcomes, and vaccine developments related to dengue infections. Strengthening preventive measures and public awareness is essential to curbing the spread of seasonal diseases and improving overall health outcomes.

Keywords: Seasonal change, water purification, disease outbreaks, vaccines, virology, global warming.

Revolutionizing Pharma: The Transformative Power of Artificial Intelligence

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ABSTRACT

The pharmaceutical industry is undergoing a significant transformation with the integration of Artificial Intelligence (AI). AI is revolutionizing the discovery, development, and delivery of medications, enhancing the efficiency, safety, and efficacy of pharmaceutical processes. This abstract highlights the applications of AI in pharma, including:

1. Drug Discovery: AI-driven approaches, such as machine learning and deep learning, are accelerating the identification of novel targets, optimizing lead compounds, and predicting drug efficacy.
2. Clinical Trials: AI is improving patient recruitment, optimizing trial design, and streamlining data analysis, leading to faster and more accurate trial outcomes.
3. Personalized Medicine: AI-powered analytics are enabling the development of tailored treatments, taking into account individual patient characteristics, genetic profiles, and medical histories.
4. Supply Chain Optimization: AI is enhancing supply chain management, predicting demand, and optimizing logistics, ensuring timely and efficient delivery of medications.
5. Adverse Event Detection: AI-driven systems are monitoring and analyzing large datasets to identify potential adverse events, enabling proactive safety measures.

The integration of AI in pharma has the potential to transform the industry, driving innovation, improving patient outcomes, and reducing costs. As AI continues to evolve, its applications in pharma will expand, revolutionizing the way medications are discovered, developed, and delivered.

Impact of AI on Pharma

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing the pharmaceutical industry by transforming multiple critical domains of drug development and healthcare. AI technologies are enhancing efficiency, precision, and innovation across various pharmaceutical processes. AI plays a crucial role in drug discovery and development by predicting new drug candidates, analyzing chemical interactions, and repurposing existing drugs. Companies like BenevolentAI and Insilico Medicine utilize AI to accelerate drug discovery. AI also optimizes clinical trials by identifying suitable patients, monitoring progress, and predicting trial outcomes, leading to cost reductions through automated data analysis. In personalized medicine, AI tailors treatments based on patient-specific factors like genetics and medical history, improving therapeutic efficacy. AI-driven tools enhance medical imaging and diagnostics, aiding in early disease detection from X-rays, MRIs, and CT scans. For example, AI-powered radiology tools facilitate early cancer detection.

Pharmacovigilance benefits from AI as it analyzes real-world patient data to detect adverse drug reactions and side effects efficiently. Additionally, AI contributes to drug manufacturing and quality control by predicting failures and optimizing production processes. Lastly, AI chatbots and virtual assistants offer medical guidance, assist patients, and support customer service in the pharmaceutical industry.

The integration of AI in pharma is paving the way for faster, more cost-effective drug development and improved patient outcomes, making it an indispensable tool in modern healthcare.

Keywords: Artificial Intelligence, Drug Discovery, Personalized Medicine, Clinical Trials, Healthcare AI

Advances in Controlled Drug Delivery Systems: Recent Innovations And Emerging Technologies

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ABSTRACT

The drug delivery system enables the release of the active pharmaceutical ingredient to achieve a desired therapeutic response. Without an efficient delivery mechanism, the whole therapeutic process can be rendered useless. Moreover, the drug has to be delivered at a specified controlled rate and at the target site as precisely as possible to achieve maximum efficacy and safety. Controlled drug delivery systems are developed to combat the problems associated with conventional drug delivery. There has been a tremendous evolution in controlled drug delivery systems from the past two decades ranging from macro scale and nano scale to intelligent targeted delivery. The opening section of this review offers a foundational overview of drug delivery systems, focusing particularly on the pharmacokinetics associated with the drug. Moreover, the review explores advancements in nano drug delivery, as well as targeted and smart drug delivery methods that utilize stimuli responsive and intelligent biomaterials, highlighting recent significant discoveries. The paper concludes by outlining the challenges encountered and potential future developments in the field of controlled drug delivery.

Keywords: Drug Delivery System, Pharmaceutical Ingredient, Bioavailability, Nano Drug Delivery.

Herbal Bioenhancers: Unlocking Nature's Potential to Improve Drug Bioavailability

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ABSTRACT

Herbal bioenhancers are natural compounds that enhance the absorption, efficacy, and bioavailability of drugs without exerting pharmacological effects of their own. These plant-derived molecules improve drug solubility, inhibit metabolic enzymes, and modulate efflux transporters, making them valuable in optimizing therapeutic outcomes. Key herbal bioenhancers include piperine (from black pepper), which enhances the absorption of curcumin and various drugs by inhibiting cytochrome P450 enzymes, and quercetin (a flavonoid), which improves bioavailability by modulating efflux transporters like P-glycoprotein. Other promising bioenhancers include gingerol (from ginger), allicin (from garlic), and glycyrrhizin (from licorice), which enhance drug absorption through multiple mechanisms. The integration of herbal bioenhancers in drug formulations presents an eco-friendly and cost-effective strategy to reduce dosage requirements, minimize side effects, and enhance therapeutic efficacy. Recent advancements in nanotechnology-based delivery systems, such as nanoformulations of herbal bioenhancers, further improve their efficiency in drug delivery. Despite their potential, challenges such as standardization, regulatory approval, and safety evaluation need to be addressed. This poster explores the mechanisms, applications, and future prospects of herbal bioenhancers in modern pharmaceutical research, highlighting their transformative role in improving drug therapy.

Keywords: Herbal Bioenhancers, Drug Bioavailability, Piperine, Phytochemicals, Drug Delivery.

Integrating 'Omics' Technologies: A Multidisciplinary Approach to Modern Drug Discovery and Precision Medicine

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ABSTRACT

The convergence of 'omics' technologies genomics, transcriptomics, proteomics, metabolomics, and lipidomics has revolutionized drug discovery and precision medicine by enabling a comprehensive understanding of disease mechanisms at the molecular level. Genomics and transcriptomics help identify disease-associated genes and expression patterns, while proteomics and metabolomics offer insights into protein interactions and metabolic pathways, leading to the identification of novel drug targets and biomarkers. Integrating these 'omics' disciplines with bioinformatics, artificial intelligence (AI), and systems biology enhances predictive modeling, accelerates drug screening, and facilitates personalized treatment strategies. AI-driven analysis of large biological datasets enables faster identification of potential therapeutics, as seen in the success of mRNA vaccines, targeted cancer therapies, and neurodegenerative disease research. Despite challenges such as data complexity, integration hurdles, and ethical considerations, the multidisciplinary application of 'omics' technologies is transforming pharmaceutical research. By leveraging these innovations, researchers can optimize drug development, enhance treatment efficacy, and move closer to the realization of truly personalized medicine. This poster explores the transformative potential of 'omics'-driven approaches and their role in shaping the future of healthcare.

Keywords: Omics, Multidisciplinary Approaches, Drug Discovery, Precision Medicine, Systems Biology, AI in Pharma.

Transforming Drug Design with Artificial Intelligence: A New Era in Pharma

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing drug discovery and design, offering unprecedented speed, accuracy, and efficiency in identifying potential therapeutics. Traditional drug development is time-consuming and costly, often taking over a decade with high failure rates. AI-driven approaches, including machine learning, deep learning, and neural networks, are transforming this landscape by accelerating hit identification, lead optimization, and toxicity prediction. AI-powered tools analyze vast chemical and biological datasets, enabling structure-based drug design, virtual screening, and de novo molecule generation. Machine learning models predict drug-target interactions, ADMET (absorption, distribution, metabolism, excretion, and toxicity) properties, and optimize pharmacokinetics, reducing experimental costs and failures. Additionally, AI enhances precision medicine by personalizing treatments based on patient-specific data. Recent advancements, such as AlphaFold for protein structure prediction and generative AI models for novel compound design, showcase AI's potential in revolutionizing pharmaceutical research. Integration of AI with high-throughput screening and quantum computing further enhances drug discovery capabilities. Despite challenges like data quality, model interpretability, and regulatory concerns, AI-driven drug design is paving the way for faster, cost-effective, and more efficient development of life-saving medications. As AI continues to evolve, its synergy with computational chemistry and biotechnology will redefine the future of pharmaceutical innovation.

Keywords: Artificial Intelligence, Drug Discovery, Machine Learning, Pharmaceutical Innovation, etc.

Advancements in Telemedicine for Mental Health and Chronic Disease Care

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ABSTRACT

Telemedicine has transformed the way that healthcare is delivered, especially in the areas of chronic illness management and mental health. Personalized treatment regimens, ongoing monitoring, and remote consultations have been made possible by the quick development of digital health technology and the wider availability of internet-based services. Virtual counselling and telepsychiatry have improved patient adherence and reduced stigma in the mental health field by filling gaps in access to therapy. Similar to this, wearable technology, mobile health apps, and remote patient monitoring (RPM) have improved the treatment of chronic diseases by allowing real-time surveillance of critical metrics and prompt actions. Telemedicine's potential to enhance healthcare outcomes while lowering hospital visits and expenses was highlighted by the COVID-19 pandemic, which hastened its implementation. However, for broad adoption, issues including data security, legal compliance, and digital literacy need to be resolved. The effectiveness of telemedicine in identifying, forecasting, and treating chronic diseases is further increased by combining artificial intelligence, machine learning, and big data analytics. Telemedicine will remain essential to provide patient-centered, effective, and equitable treatment as healthcare systems change. Future studies should concentrate on enhancing policy frameworks, ethical issues, and interoperability in order to maximize the benefits of telemedicine in the treatment of chronic illnesses and mental health.

Keywords: Telemedicine, Chronic Disease Management, Mental Health Care, Remote Patient Monitoring (RPM), etc.

Design and Evaluation of a Mucoadhesive in Situ Gel of Miconazole Nitrate for Localized Treatment of Aspergillus Sinusitis in Neutropenic Cancer Patients

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ABSTRACT

Aspergillus sinusitis is a severe infection in neutropenic cancer patients, requiring effective localized treatment. This study developed a mucoadhesive in-situ gelling system of miconazole nitrate (MCN) to enhance bioavailability and provide sustained antifungal activity. The optimized formulation (F8) incorporated Pluronic F-407, xanthan gum, and bael gum using a central composite design. The gel exhibited a gelation temperature of 37°C and gelation time of 2.5 minutes, ensuring suitability for nasal application. It achieved 96.81% drug release within 7 hours, following matrix kinetics. Higher polymer concentrations enhanced mucoadhesive strength and swelling index, while reducing drug release rates. In-vitro antifungal activity confirmed efficacy against Aspergillus fumigatus, comparable to marketed formulations. Stability studies showed the formulation's robustness over three months. This in-situ gel system offers a promising localized therapy for Aspergillus sinusitis, improving therapeutic outcomes and patient compliance.

Keywords: Aspergillus sinusitis, mucoadhesive in-situ gel, miconazole nitrate, sustained release.

Magento-Electric Nanofilm Targeting Breast Cancer

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ABSTRACT

Recent advances in nanotechnology have created a new option for cancer treatment, with magneto-electric nano-films (MENFs) emerging as a practical protection in the fight against a variety of tumours such as: breast, ovarian, lung, and colorectal cancer. MENFs provide accuracy targeting and regulated drug administration. Now, they have lowering systemic toxicity. Although, they have a unique capacity to create localised electric fields in response to external magnetic stimuli promotes increased cellular penetration and medication release within tumour microenvironments. Furthermore, they have promise in hyperthermia treatment, in which localised heating causes death in cancer cells while careful adjacent healthy tissues. In breast cancer, MENFs have showed effectiveness in overcoming medication resistance and which is a key barrier in treatment preparation. Similarly, in ovarian cancer, these nano-films are being studied for targeted treatment against chemo-resistant cancer stem cells. MENFs can increase variation and accuracy in magnetic resonance imaging (MRI) and positron emission tomography (PET). Now they have some future opportunities such as combining MENFs with immunotherapeutic techniques to boost the body's immunological response against tumours. New research also focusses on producing biodegradable MENFs to enable full clearance therapy, hence reducing long-term hazards. Furthermore, advances in bioengineering may enable MENFs to transport genetic material for cancer gene therapy. They may be modified to patient-specific medicines for targeted therapy by using artificial intelligence and machine learning. They have a multi-use characteristic to differentiate them as a improvement in advance cancer treatment.

Keywords: Magnetoelectric nano film, Breast Cancer, Stem Cell, Artificial Intelligence.

Nano-emulsions for ocular drug delivery

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ABSTRACT

Nanoemulsion drug delivery systems are sophisticated methods for administering and enhancing the bioavailability of water-insoluble drugs and medications with significant first-pass metabolism. These nanoemulsions can be produced using either high-energy or low-energy techniques. High-energy approaches include high-pressure homogenization, microfluidization, and ultrasonication, while low-energy methods encompass phase inversion emulsification and self-nanoemulsification. Low-energy techniques are generally preferred due to their reduced energy requirements, increased efficiency, and lack of need for complex equipment. Bacterial infections of the eye manifest in various forms, such as keratitis, conjunctivitis, blepharitis, and endophthalmitis. Bacterial keratitis (BK) is a corneal inflammation caused by bacteria, which requires immediate ophthalmic attention. When bacteria invade the cornea, they can disrupt the path of light entering the eye and damage the intact epithelial cells that cover the cornea. If left untreated, this condition may lead to permanent vision loss. The administration of ophthalmic drugs is considered one of the most crucial routes for medication delivery, yet it presents significant challenges for researchers in the pharmaceutical field. While the majority of eye-related conditions are managed through the application of topical eye drops, these formulations face various issues, including limited bioavailability.

Keywords: Nanoemulsion, Bacterial infection, Ocular, Formulation and drug delivery system.

Advancement in nano system for siRNA delivery to HER2+ breast cancer

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ABSTRACT

The HER2/neu oncogene plays a crucial role in the pathogenesis of certain breast cancers, making it a significant target for therapeutic intervention. This study explores the use of lipid-based delivery systems for the silencing of the HER2/neu gene in breast cancer cell lines. By leveraging the properties of lipids, we aim to enhance the delivery and efficacy of small interfering RNA (siRNA) targeting HER2/neu, ultimately assessing the impact on cell proliferation and apoptosis. Lipidic NPs have emerged as promising vehicles for the delivery of siRNA. One important property is the size and surface charge of the lipid nanoparticles. Generally, smaller nanoparticles have shown enhanced cellular uptake and improved penetration into tissues, making them desirable for efficient siRNA delivery. Additionally, the surface charge of lipid NPs influences their stability, interaction with biological barriers, and cellular Internalisation. Cationic lipids used in lipidic systems provide a positive charge, facilitating complex formation with negatively charged siRNA and promoting cellular uptake.

Keywords: Nano particles, liposomes, polymeric Michelle, iron oxide, Quantum dot, gold, RNA based therapy, HER2/neu.

Medical and pharmaceutical research using artificial intelligence

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ABSTRACT

Over the past decade, artificial intelligence (AI) and machine learning (ML) have become the breakthrough technology most anticipated to have a transformative effect on pharmaceutical research and development. This is partially driven by revolutionary advances in computational technology and the parallel dissipation of previous constraints to the collection/processing of large volumes of data. Meanwhile, the cost of bringing new drugs to market and to patients has become prohibitively expensive. In addition, notable companies and academic institutions that are at the forefront of these technological developments are emphasized, robotic solutions in pharmacy and medical fields are also explored. The most recent aspect of drug development where positive disruption from Artificial Intelligence/Machine learning is starting to occur, is in clinical trial design, conduct, and analysis. The COVID-19 pandemic may further accelerate utilization of Artificial Intelligence/Machine learning in clinical trials due to an increased reliance on digital technology in clinical trial conduct. Numerous research studies and advancements have demonstrated how these computational technologies are used in various pharmaceutical research and development aspects, including drug discovery, personalized medicine, drug formulation, optimization, predictions, drug interactions, pharmacokinetics/pharmacodynamics, quality control/quality assurance, and manufacturing processes. AI has come a long way in healthcare, having played significant roles in data and information storage and management – such as patient medical histories, medicine stocks, sale records, and so on; automated machines; software and computer applications like diagnostic tools such as MRI radiation technology, CT diagnosis and many more have all been created to aid and simplify healthcare measures.

Keywords: Artificial intelligence, Machine learning, Drug discovery, Clinical trials, Personalized medicine, Diagnostic tool.

Phytoconstituent from Fox Nut shows Potent Pharmacological Activity

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ABSTRACT

N-2-iodophenyl methane sulphonamide has recently garnered attention for its potential antimicrobial, antifungal and antioxidant properties. This compound, a derivative of sulphonamide, is characterized by the incorporation of an iodine atom on the aromatic ring, which significantly enhances its chemical stability and interaction with biological targets. The compound's antimicrobial, antifungal and antioxidant activity has been evaluated against a range of pathogenic fungal and microbial species, and promising results have emerged, particularly against strains that exhibit resistance to common antimicrobial, antifungal agents. The mode of action is believed to involve interference with the cell membrane integrity and inhibition of key enzymes in the biosynthesis of essential cellular components. In addition to its antifungal and antimicrobial efficacy, N-2-iodophenyl methane sulphonamide demonstrates favourable pharmacokinetic properties, including moderate solubility and bioavailability, making it a potential candidate for further clinical investigation. This abstract discusses the synthesis, characterization, and antifungal evaluation of N-2-iodophenyl methane sulphonamide, highlighting its potential as a novel therapeutic agent in the fight against microbial and fungal infections.

Keywords: -Antimicrobial, Antifungal, Antioxidant, Foxnut and Makhana

Organ-on-Chip model: A new era for Drug Development

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ABSTRACT

Organ-on-chip (OOC) models are revolutionizing drug development by offering a more accurate, ethical, and efficient alternative to traditional methods like animal testing and 2D cell cultures. Unlike conventional in vivo models, which often fail to replicate human-specific drug responses and toxicity profiles, OOC systems mimic human organ functions at the cellular and microphysiological levels. These models integrate tissue-specific architecture, dynamic microenvironments, and organ interactions, allowing for more reliable studies of drug metabolism, pharmacokinetics, toxicity, and efficacy. Compared to traditional 2D cell cultures, OOC platforms simulate 3D tissue structures and organ functions, overcoming the limitations of simpler models that cannot capture the complexity of human physiology. Additionally, OOC models reduce ethical concerns by minimizing animal usage, thus addressing animal welfare issues in drug testing. The Bio E3 policy (Ethical, Environmental, and Economical considerations) plays a key role in the development of OOC systems, ensuring that they are not only human-relevant but also sustainable and cost-effective. These models foster more ethical research practices by reducing animal testing, minimizing environmental impact, and lowering the costs associated with drug development. By providing more accurate data and enhancing the predictability of drug responses, OOC platforms help accelerate the drug development process, ultimately bringing us closer to more personalized, effective medicines.

Keywords: Drug Development, 2D cell cultures, toxicity, drug response, pharmacokinetics, ethical, animal testing, personalized medicines.

Transforming Antidiabetic Drug Discovery: Challenges, Innovations, and Patient-Centric Approaches

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ABSTRACT

New drug development for diabetes is evolving quickly because of the growing number of diabetes cases across the world. Conventional treatment models such as insulin therapy and oral hypoglycemics come with limited effectiveness, adverse effects, and an overall requirement for personalized therapy. Therefore, new insulin secreting agents, glucose sensitive insulin secretagogue (GSIS), and renal glucose reabsorbers need to be developed for the various biological pathways which maintain glucose levels in the body. On the other hand, there are still widespread issues and controversies regarding the most effective ways to combat diabetes. The multifaceted and troublesome nature of diabetes poses a lot of complications in the classification and verification of the factors which lead to diabetes, and this often has a negative effect during clinical trials because of the high attrition rate. In addition, the exact classification of diabetes requires a multi-faceted approach making it difficult to formulate a single solution which caters to all patients. The red tape and lengthy processes required for new anti-diabetic solutions often take a long time due to the extensive measurements which need to be taken as far as safety and effectiveness are concerned. In addition, suffering from insufficient resources means less focus would be placed on the innovation which requires funding. Addressing these challenges requires collaboration among academia, industry, and regulatory bodies to enhance the drug discovery pipeline, optimize clinical trial designs, and develop biomarkers for better patient stratification. Overall, a multifaceted approach is essential to overcome existing barriers and expedite the development of effective antidiabetic therapies, ultimately improving patient outcomes in diabetes management.

Keywords: Antidiabetic Drugs, Challenges, Future Prospectives, Regulatory Affairs, Novel Drugs

Chemico-Biological Investigation of *Digera Muricata* to unveil its Antioxidant and Antidiabetic Potential

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ABSTRACT

Traditional medicinal plants and herbs often serve as promising sources for drug discovery, particularly in combating various diseases. The present study focuses on the formulation of *Digera muricata* (L.) (family Amaranthaceae's) herbal preparations against diabetes. This plant is found as a weed throughout South Asia, Egypt, eastern Kenya and India. Plant's various parts contain vitamins, minerals, and trace elements, primary metabolites such as proteins, carbohydrates, amino acids, chlorophyll, carbohydrates, and lipids; and secondary metabolites phenols, flavonoids, terpenoids, saponins, tannins, alkaloids, anthraquinones, cardiac glycosides, fixed oils, and steroids in the leaf, stem and roots. Extensive analyses have already been reported, including phytochemical screening, to determine the plant's quality attributes and support its potential applications in formulations. The methanolic extract of leaves (MEDM-methanolic extract of *Digera muricata*; 200mg/kg) showed a significant anti-diabetic effect by decreasing blood glucose levels and plasma HDL rates due to the presence of presence of polyphenols and antioxidant constituents such as flavonoids. Methanolic extract of leaves is also proved as a potent anti-anthelmintic, antioxidant, protective, and antimicrobial. These reported results indicate that *Digera muricata* (L.) holds promise as a reliable source and a potential candidate for green anti-diabetic formulations.

Keywords: *Digera muricata* (L.), Antioxidant, Antidiabetic, Phytochemical Screening, Green formulations.

Novel Drug Delivery System: Helping Hands for Research & Development

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ABSTRACT

In recent trends of therapeutic system, medical professionals may face so many critical obstacles during treatment of diseases. So, in trends of elevating the therapeutic abundances and reducing the toxicity risk in the management of therapeutics. The scientist, medical professional used new tools for developed new drug in fields of Pharmacy (novel drug delivery system). This type of innovative tools applied to expends the boundary of conventional drug administration such as low solubility, half-life, inaccurate targeting of drug to definite receptors as well as drug-bioavailability. Here we are exploring the current development concern with pharmaceutical formulation and its delivery tactics in human body at different level of configurations. The ultimate development in this section divided into four areas; carrier based or coupling based target, and alongside is delivery devices and intelligence device delivery system, depends on independent and their approaches. Drug delivery system has several advantages over conventional such as elevate stability, drug distribution, enhance the target concentration and minimize adverse health risk to patients, furthermore it fix the location and easy release the drug for the target site by breaking the Blood brain barrier last but not least reduces drug dosages and modified the cellular toxicity. It also utilizes nanoscales having several benefits. The capacity for regulating nano carriers' size and surface activities to accomplish site-specific targeting is one of their features. Many researchers have reported their controlled and targeted drug release profiles. The novel drug delivery system attracts many of us to apply those techniques to modify the problems which alter the therapeutic index.

Keywords: Nanotechnology, Drug delivery system, Pharmaceuticals, toxicity.

Preparation and evaluation of nanoconstructs for targeting the colon

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ABSTRACT

Oxaliplatin (OHP) resistance is a major hurdle in the chemotherapeutic treatment of colorectal cancer (CRC). The concomitant administration of OHP and curcumin act synergistically in OHP resistant cell lines, leading to the reversion of their resistant phenotype. The present study was aimed to formulate Eudragit S-100 (ES-100) coated alginate beads bearing drugs loaded targeted liposomes for simultaneous delivery of OHP and curcumin (CUR) to exert a synergistic therapeutic effect on OHP resistant HT 29 cell line. The liposomes were fabricated by the film dispersion method and optimized using a Box-Behnken design (BBD) with the aid of Design-Expert® software. Hyaluronic acid (HA) was conjugated on the liposomal surface using carbodiimide chemistry to target CD44 receptors overexpressed on the CRC cells. The conjugated liposomes (i.e. OC-L-HA) depicted uniform vesicular size (132.4 ± 21 3.4 nm) and low polydispersity index (0.165 ± 0.070) and high entrapment of OHP and CUR. HA coupled drugs bearing liposomes (OC-L-HA) are exhibiting higher cellular uptake than unconjugated liposomes (UC-L), as evidenced by confocal laser microscopy. OC-L-HA were entrapped in the alginate beads and characterized for various *in vitro* parameters such as bead size, in vitro drug release, and % swelling. MTT assay demonstrated that OC-L-HA exhibited 2.76 and 2.58 fold higher cytotoxicity than targeted CUR liposomes and targeted OHP liposomes, respectively. The colon targeting ability of these liposomes entrapped Eudragit S 100 coated beads on oral administration were assessed by X-ray radiography. *The in vivo* X-ray images affirmed a good targeting ability of the targeted beads to the colon. The outcomes of the studies revealed that these surface-modified liposomes entrapped in Eudragit S-100 coated beads could be an effective strategy for the treatment of CRC.

Keywords: oxaliplatin, alginate beads, colon cancer, Eudragit S 100, curcumin

Understanding Mechanism, Effect & Strategies to Combat Opioid Addiction

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ABSTRACT

Opioid addiction is a chronic medical condition characterized by compulsive opioid use despite harmful consequences. It has become a public health crisis, in the U.S., due to the overprescription of opioid pain relievers and the rise of synthetic opioids like fentanyl. The opioid epidemic has led to significant increases in overdoses, emergency hospital visits, and deaths. To understand the neurobiological mechanism of opioid addiction, its physical, psychological, and social effects, and effective strategies—such as medical treatments, behavioral therapies, and policy interventions—to prevent and combat opioid misuse. Neurobiological Analysis – Examine how opioids affect the brain's reward system, leading to dependence and addiction. Comparative Analysis – Evaluate different treatment strategies, including medication-assisted treatment (MAT), behavioral therapies, and harm reduction approaches. Results: Mechanism: Opioids bind to brain receptors, triggering dopamine release, leading to euphoria, tolerance, dependence, and addiction. Effects: physical (respiratory depression, pain sensitivity), psychological (cravings, anxiety, depression), and social (financial, legal, and relationship issues) consequences. Strategies to Combat Addiction:

Medical Treatment: Medication-assisted treatment (MAT), Behavioral Therapies: Cognitive-behavioral therapy (CBT). Conclusion: Opioid addiction is a complex neurobiological disorder with severe physical, psychological, and social consequences. Its mechanism involves dopamine-driven reinforcement, leading to dependence and compulsive use. Effective strategies to combat addiction include medication-assisted treatment (MAT), behavioral therapies, harm reduction approaches, and policy interventions.

Keywords: Opioid addiction, neurobiology, dopamine, tolerance, withdrawal.

Exosome-Based Nanoformulations: Next-Generation Drug Delivery for Skin Disorders

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ABSTRACT

As a drug delivery platform for dermatological applications, exosome-based nanoformulations have the potential to revolutionize drug delivery due to their superior therapeutic efficacy, biocompatibility, and targeting. Recent years have witnessed a considerable amount of interest in exosome-based delivery systems for the treatment of skin diseases such as psoriasis, atopic dermatitis, and chronic wounds due to their degenerative and anti-inflammatory properties. Mesenchymal stem cell (MSC) derived exosomes possess potent wound-healing ability through the modulation of immune responses and tissue regeneration. Nanotechnology-based improvements to exosome-based platforms include surface modification and functionalization. These modifications allow the exosomes to be used for targeted drug delivery, especially to the tumor sites, and increase drug loading capacity and therapeutic efficiency. Plant, human, algae, and edible mushroom-derived exosomes are potentially significant actives for hyperpigmentation treatment and skin rejuvenation in the cosmetic sector. The exosomes produced from plant materials, which are environmentally friendly, have a perfect absorption capacity and low toxicity, are favorable candidates for the next generation of drug delivery systems. This suggests that they have significant anti-melanogenic and anti-aging effects, leading to skin brightening and skin rejuvenation by reducing melanin and free radicals, respectively.

Keywords: Exosome-based nanoformulations, Targeted drug delivery, Dermatological applications,

Artificial Intelligence (AI) in the Diagnosis and Management of Amnesia: Herbal Medicines

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative tool in healthcare, revolutionizing the diagnosis, prediction, and treatment strategies for amnesia. Amnesia, characterized by memory loss due to injury, aging, or neurodegenerative diseases like Alzheimer's, has been a significant challenge in medical science. AI-driven techniques, such as machine learning (ML) and deep learning (DL), facilitate early and accurate diagnosis by analyzing complex medical data, including neuroimaging scans, genetic markers, and patient history. By utilizing AI-driven bioinformatics and cheminformatics, researchers can identify potent herbal compounds extracts, such as *Bacopa monnieri* (Brahmi), *Ginkgo biloba*, *Curcuma longa* (Turmeric), and *Withania somnifera* (Ashwagandha), have demonstrated significant anti-amnesic effects by enhancing neuroplasticity, reducing oxidative stress, and modulating neurotransmitter levels. AI-driven computational methods, including network pharmacology and molecular docking studies, are expediting the identification of new herbal candidates for memory enhancement. Furthermore, AI assists in optimizing herbal formulations by simulating their pharmacokinetics, toxicity, and efficacy, thereby improving treatment outcomes. AI-based personalized medicine enhances the effectiveness of herbal interventions by tailoring treatment plans to individual patient profiles. In conclusion, AI is significantly contributing to the field of anti-amnesic research by enabling early diagnosis, optimizing herbal treatment strategies, and enhancing drug discovery. The synergy between AI and herbal medicine holds immense potential for developing effective, natural, and personalized therapies for amnesia and other cognitive disorders.

Keywords: Artificial Intelligence, Amnesia, Herbal Treatment, Neuroprotective, Cognitive disorders, Natural language processing.

Cosmeceuticals: New Generation of cosmetics with health benefits

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ABSTRACT

Cosmeceuticals, a rapidly growing segment in the personal care market, represent a fusion of cosmetics and pharmaceuticals, offering skincare products with both aesthetic and therapeutic benefits. These products, which include anti-aging serums, moisturizers, and sunscreens, contain bioactive ingredients like peptides and antioxidants, which are typically found in pharmaceuticals. While they aim to improve the appearance of the skin, cosmeceuticals also influence its biological functions, promoting health at a cellular level. This hybrid nature creates a challenge in the regulatory landscape, as cosmeceuticals do not clearly fit within the existing frameworks for either cosmetics or pharmaceuticals. Unlike pharmaceuticals, which undergo rigorous clinical trials, cosmeceuticals lack standardized regulations, leading to ambiguity in safety standards, efficacy claims, labeling, and marketing. The growing consumer demand for products that combine beauty and health has contributed to the rapid market expansion of cosmeceuticals. However, this demand underscores the need for clearer regulatory guidelines to balance consumer protection and foster innovation. This paper explores the regulatory challenges associated with cosmeceuticals and emphasizes the need for updated standards to ensure safety and efficacy while maintaining the momentum of this burgeoning market. Understanding this framework is essential for addressing the future of cosmeceuticals and their regulation in the personal care industry.

Keywords: Cosmeceuticals, Bioactive ingredients, Regulatory challenges, Consumer demand.

Role of Pharmacogenomics in Personalized Medicine

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ABSTRACT

It connects pharmaceutical innovation with clinical practice, enabling the creation of customized medicines and helping physicians select the optimal drug and dosage for each patient. This personalized approach significantly reduces adverse drug reactions, minimizes toxicity, lowers healthcare costs, and improves therapeutic outcomes. Advances in genomics have expanded pharmacogenetics, which originally focused on single gene-drug interactions, into the broader and more integrative field of pharmacogenomics. Genetic variations in enzymes, transporters, and receptors now serve as critical biomarkers for tailored therapies. The primary aim of pharmacogenomics is to assist healthcare professionals in diagnosing conditions and prescribing the appropriate drug and dosage tailored to an individual's genetic profile. Its main objective is to identify and catalog the genetic and epigenetic variations that influence drug response. Currently, pharmacogenomics data, testing, and drug labeling are available for only a limited number of drugs.

Keywords: Pharmacogenomics, Personalised Medicine, Genomics, Pharmacogenomics, Precision medicine.

Recent Advances of Stem Cell Therapy in Cancer Treatment

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ABSTRACT

In recent years, there has been growing interest in the potential of stem cells for cancer therapy. Stem cells possess unique properties, such as self-renewal and differentiation capabilities, which make them valuable in various medical applications. Different types of stem cells, including embryonic stem cells, adult stem cells, and induced pluripotent stem cells, have been investigated for their potential use in cancer treatment. They can differentiate into specific cell types, which may allow for the regeneration of damaged tissues and organs caused by cancer or its treatment. Stem cells can also serve as delivery vehicles for targeted therapies, enabling the precise delivery of therapeutic agents to tumor sites. Additionally, they can modulate the immune system and have the potential to stimulate anti-tumor immune responses. However, it is crucial to understand and monitor the potential side effects associated with these treatments and the pathways which regulate Cancer Stem cells, such as WNT, β-Catenin, hedgehog, Notch, NF-κB, JAK/STAT, TGF-β, PI3K/AKT, PPAR pathway, and their related mechanisms underlying the use of various types of stem cells in cancer treatment. In addition, we summarize recent progress in the clinical applications of stem cells, as well as common risks of this therapy.

Keywords: Cancer stem cells. Molecular pathway, Stem cell therapy, Chemotherapies, Pluripotent cells.

Immunity and Risk Factors for Tuberculosis

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ABSTRACT

Since the respiratory system is the primary entrance point for the causative agent, alveolar macrophages are crucial cell types that fight the infection. The possibility of getting tuberculosis depends on the likelihood of contracting the disease as well as the likelihood of infection progressing to active illness. The former is based upon the prevalence of tuberculosis in the community in which the person resides or works. The latter will rely on a variety of environmental and genetic factors that affect the individual. Concurrent HIV infection is the biggest risk factor for developing TB from infection. Only 5–10% of immunocompetent people are at risk for tuberculosis, and more than 85% of them only get it in their lungs. In contrast, individuals infected with the human immunodeficiency virus (HIV) may experience more rapid and fatal systemic illness. This is consistent with evidence indicating that susceptible humans develop Th1 immune response to Mycobacterium tuberculosis (Mtb) infection. Tuberculosis in mice, guinea pigs, and rabbits serves as a model for studying the disease in susceptible human populations. The failure to resolve infection and prevent disease may not be due to an insufficient number of Th1 cells but rather an inherent defect in macrophage function, which impairs their ability to mediate an effective immune response.

Keywords: Tuberculosis, Risk factor, HIV, Genetic, Environment, Th1 immunity, CD4 T cells.

Pharmaceutical Nanocrystals: An Extensive Overview

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ABSTRACT

In pharmaceutical development, pharmaceutical nanocrystals sized between 10 and 1000 nanometers have been found to hold promise in improving drug solubility. Since they comprise only the active pharmaceutical ingredient, nanocrystals have dramatically increased surface area-to volume ratios, ensuring improved in vitro dissolution and solubility profiles. In view of their strengths and limitations, different production strategies have been reviewed: methods of size reduction such as wet milling and high-pressure homogenization; the bottom-up approaches of controlled precipitation and supercritical fluid technology; and efficient ways to stabilize nanocrystal formulations aided by excipients like surfactants and polymers. Techniques used in this characterization of nanocrystals include size analysis, surface-charge measurement, and assessment of crystalline structure. The routes of administration, such as oral, injectable, inhaled, and topical application, are reviewed alongside commercially successful products and clinical trials. This work reviews dynamic regulatory scenarios and current challenges of large-scale production, long-term stability, and nanotoxicity evaluation. In addition, it addresses the emerging trends in nanocrystal technology in the field of personalized medicine, targeted drug delivery, and theranostic approaches associated with how nanocrystals can help optimize the outcome of a patient in drug delivery systems

Keywords: Pharmaceutical nanocrystals, Drug delivery, Bioavailability enhancement, Nanotoxicity, Stabilization strategies

Artificial Intelligence in Personalized Care Anxiety Disorders

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ABSTRACT

In the course of clinical therapy for anxiety disorders, medication and all sorts of psychotherapy treatments are administered as first line interventions. Artificial Intelligence is revolutionizing mental health care through diagnosis, treatment, and constant support for individuals with mental conditions. In the last few years, AI has transformed and changed the early identification and intervention in these widespread mental health disorders. AI tools can possibly transform behavioral healthcare services by facilitating psychiatrists to collect objective data concerning the progress and tasks on the patients. The innovations given by these technologies enhance accuracy, accessibility, and personalization through AI-powered diagnostic tools to offer real-time monitoring with instant analysis of data. Continuous monitoring can be done and predictive analytics can be there, providing seamless integration to digital health platforms such that mental care is always proactive and centered on patients. This review will try to put the spotlight on the current state of AI technology, keeping in mind the success, limitation, and future direction, to contribute towards the enhancement of the comprehensive understanding about the scope of AI as well as its potentiality to revolution in mental illness diagnosis and advancing research further.

Keywords: Artificial Intelligence, Personalized care, Anxiety disorders, AI

Robotics In Medicine: Advancing Surgical Precision and Patient Outcomes

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ABSTRACT

The COVID-19 pandemic further accelerated the use of hospital robots for tasks like delivering medicines, screening, and maintaining hygiene. Recent literature discusses popular surgical robots like the Da Vinci system and how they help doctors perform complex surgeries. Rehabilitation robots help people regain movement and strength after injuries or illnesses. This explains how robotic arms, legs, and training machines help patients recover and live more independently. Robotic Pharmacies; in hospital settings, robots can assist in dispensing medications, improving the accuracy of prescriptions, and reducing human error. Robots can also manage inventories, ensuring that medications are properly stocked and quickly available. Using robots in healthcare also brings challenges like ensuring safety, protecting patient privacy, and making sure everyone can afford these technologies. Robots are getting smarter with artificial intelligence and smaller with new technologies like nanobots. This shows how future robots might give us even better, personalized treatments. Robots are transforming healthcare by making it more advanced, efficient, and patient-friendly. From the above statement, it is amply clear that robotics can help to improve lives and solve challenges in the medical field.

Keywords: Rehabilitation, AI, Robotics, Medical, Surgery.

Nutraceuticals as an Alternative for Pharmaceuticals

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ABSTRACT

In recent years, with increasing concerns about the side effects of traditional medications, nutraceuticals have gained attention as a safer, more natural alternative or complement to pharmaceuticals. These bioactive compounds, which include functional foods, herbal supplements, and plant-based nutrients, are known for their potential to support overall health, prevent chronic diseases, and even manage conditions like heart disease, diabetes, and neurodegenerative disorders. The growing interest in nutraceuticals is driven by their ability to offer therapeutic effects with fewer side effects compared to conventional drugs. Ingredients such as antioxidants, anti-inflammatory compounds, and immune boosting substances are becoming more popular for their role in promoting well-being and preventing illness. Additionally, personalized nutrition, which tailors' supplements based on an individual's genetics and health needs, is opening up new possibilities for more effective and targeted health interventions. However, the path forward for nutraceuticals isn't without its challenges. This paper explores new ideas in nutraceuticals, highlighting their potential as a valuable alternative to pharmaceuticals and discussing the future of their role in healthcare.

Keywords: Nutraceuticals, natural health, chronic disease prevention, personalized nutrition.

Type 2 Diabetes Mellitus: A Review of Multi-target Drugs

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ABSTRACT

Diabetes Mellitus (DM) is a complex, chronic condition that affects a significant portion of the population, with the World Health Organization (WHO) projecting an increase in the number of adults diagnosed with diabetes. Type 2 Diabetes Mellitus (T2DM) represents the majority of these cases, affecting approximately 90-95% of individuals with diabetes. Mono-target therapies often fail to effectively manage blood glucose levels and associated comorbidities. This review highlights potential multi-target drugs for the treatment of T2DM, focusing on therapies that address the key systems involved in the disease and its comorbidities. Specifically, it examines agonists targeting the incretin and glucagon systems, as well as peroxisome proliferator-activated receptors (PPARs). Additionally, inhibitors of aldose reductase, tyrosine phosphatase 1B, and sodium-glucose transporters (SGLT1 and SGLT2) are discussed. The review also explores the role of phytocomplexes in multi-target approaches for managing T2DM.

Keywords: Diabetes Mellitus, multi-target compounds, multi-target drugs, type 2 diabetes mellitus.

Routes of Drug Administration: Benefits and Challenges

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ABSTRACT

The route of drug administration significantly influences the therapeutic efficacy, safety, and patient compliance of a medication. Selection of an appropriate route depends on the drug's physicochemical properties, target site, desired onset of action, and patient-specific factors. Common routes include oral, parenteral, topical, inhalational, and transdermal, each offering distinct advantages and challenges. Oral administration, the most prevalent route, is convenient and cost-effective but limited by poor bioavailability for some drugs due to first-pass metabolism and variable gastrointestinal absorption. Parenteral routes, such as intravenous and intramuscular, bypass these barriers, providing rapid and controlled drug delivery; however, they require sterile conditions and professional administration. Topical and transdermal routes enable localized or systemic delivery with minimal systemic side effects but may face challenges in permeating the skin barrier. Inhalational routes are highly effective for respiratory conditions, ensuring rapid drug action, though their efficacy is dependent on correct patient technique. Emerging technologies, such as nanoparticle delivery systems and microneedles, are addressing some of these limitations, offering innovative ways to enhance bioavailability, reduce side effects, and improve patient adherence. However, challenges such as formulation stability, regulatory hurdles, and cost remain key considerations in their broader adoption. Understanding the benefits and challenges associated with each route is essential for optimizing therapeutic outcomes. Ongoing research and advancements in drug delivery technologies continue to expand the possibilities, paving the way for more effective and patient-centric treatments.

Keywords: Drug Delivery, Bioavailability, Parenteral Administration, Oral Route, Transdermal Systems.

Artificial Intelligence in Drug Discovery and Development

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ABSTRACT

Artificial intelligence (AI) has emerged as a transformative force in drug discovery and development, reshaping the way pharmaceutical companies identify and develop new therapeutics. AI technologies, including machine learning, deep learning, and natural language processing, accelerate the entire drug development pipeline, from target identification to preclinical testing and clinical trials. By analyzing large datasets, AI can predict potential drug candidates, identify biomarkers, and uncover hidden relationships in complex biological systems, significantly reducing the time and cost traditionally required in drug discovery. AI models can analyze genetic, proteomic, and clinical data to predict which molecules are most likely to interact with specific disease pathways. In virtual screening, AI rapidly identifies promising compounds by simulating their interactions with biological targets, a process that would take years with conventional methods. Furthermore, AI-powered tools enhance the design of clinical trials by predicting patient responses, optimizing dosing regimens, and improving patient recruitment strategies. The integration of AI in drug development also facilitates the repurposing of existing drugs for new therapeutic indications, thus accelerating the development of treatments for unmet medical needs. Despite these advantages, challenges such as data quality, regulatory approval, and the need for specialized expertise remain. AI is reshaping the landscape of drug discovery and development by providing novel insights, improving efficiency, and reducing the risks associated with bringing new drugs to market. As AI technologies continue to evolve, they hold the potential to revolutionize the pharmaceutical industry, offering faster, safer, and more cost-effective drug development processes.

Keywords: Drug Discovery, Artificial Intelligence, Machine Learning, Drug Development.

Role of AI in Pharma

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ABSRACT

Artificial intelligence use in pharmaceutical technology has increased over the years, and the use of technology can save time and money while providing a better understanding of the relationships between different formulations and process parameters. Artificial intelligence is a branch of computer science that deals with problem-solving with the aid of symbolized programming. It has greatly evolved into a science of problem-solving with huge applications in business, health care, and engineering. The article describes drug discovery, tools of AI, manufacturing execution systems automated control processes systems, AI to predict new treatment, development of novel peptides from natural foods, treatment and management of rare diseases, drug adherence, and dosage, and challenges to adoption of AI in pharma.

Keywords: Drug Discovery, tools of AI, MES, ACPS, drug adherence, and dosage challenges to adoption of AI in pharma.

Innovative Nanocarriers in Arthritis Therapy: The Role of Herbal Cubosomes

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ABSTRACT

Rheumatoid arthritis (RA) and osteoarthritis (OA) are chronic inflammatory conditions affecting the joints. While conventional treatments like NSAIDs and DMARDs are effective, they often have adverse side effects. Traditional therapies often lead to adverse side effects, prompting a search for safer alternatives, particularly in herbal medicines. Herbal medicines have shown potential in managing arthritis symptoms, but their bioavailability and stability can be limited. Nanocarriers facilitate controlled drug release, improving retention time and penetration in the joint environment. The innovative use of herbal cubosomes as advanced nanocarriers for arthritis therapy can be used. Cubosomes, a type of self-assembled lipid nanoparticle, exhibit unique structural characteristics that enhance the delivery and bioavailability of encapsulated herbal compounds. Their ability to encapsulate both hydrophilic and hydrophobic drugs allows for improved therapeutic efficacy and targeted delivery to inflamed tissues and they having the various advantages over other nanocarriers. Key herbal components, such as *Withania somnifera* (Ashwagandha), *Boswellia serrata* (Frankincense), and *Curcuma longa* (Turmeric), are highlighted for their anti-inflammatory properties and potential benefits in arthritis management. This review explores the potential of herbal cubosomes as nanocarriers, highlighting their biocompatibility, biodegradability, and ability to target specific joint tissues. The integration of herbal components may also provide additional anti-inflammatory and regenerative benefits, enhancing the overall therapeutic effect. Overall, the integration of herbal cubosomes in arthritis therapy presents a promising approach that could lead to more effective and safer treatment options. The application of herbal cubosomes in arthritis therapy represents a novel approach to address the limitations of conventional treatments for OA and RA.

Keywords: Arthritis, Anti-inflammatory, Herbal Medicine, Nanocarriers, Cubosomes

Limitations And Future Challenges of Computer-Aided Drug Design Methods

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ABSTRACT

Over the past few decades, numerous advancements in computer-aided drug design (CADD) methods have been found. The molecules that are optimized and screened using various CADD techniques have shown good potential in in-vitro or in vivo studies in many cases. Computer-aided drug design includes a variety of theoretical and computational approaches that are part of modern drug discovery. Advances in machine learning methods and their applications speed up the drug discovery process. The exploration of nucleic acid-based therapeutics also plays an important role in healthcare. Despite these advancements and applications of these methods, realistic applications are minimal. There are many obstacles and challenges for various CADD methods, which are still not resolved. A lot of challenges have also been seen that complicate the therapeutic design. Extensive use of the computational program with high accuracy can reduce the limitations of CADD methods and can provide an efficient solution that may reduce the overall time and the cost of drug design. Therefore, investigation of challenges associated with therapeutic design is important, and the present chapter aims to cover various therapeutic design approaches and challenges associated with a future prospectus that may help to overcome the limitations of current computational methods.

Keywords: Computer-Aided Drug Design, High-Throughput Screening, Structure-Based Drug Design, Ligand-Based Drug Design, Machine Learning, AI

Role of Anti-inflammatory Medications in Neurodegenerative Diseases

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ABSTRACT

Neurodegenerative diseases, including Alzheimer's disease (AD), Parkinson's disease (PD), multiple sclerosis (MS), and amyotrophic lateral sclerosis (ALS), are characterized by a progressive loss of neurons and a decline in function. A substantial amount of research points to persistent neuroinflammation as a key role in the etiology of many conditions. This review study evaluates the therapeutic potential of anti-inflammatory medications in modifying the course and symptoms of neurodegenerative illnesses, as well as the role that neuroinflammation plays in these conditions. Reactive oxygen species (ROS), chemokines, and pro-inflammatory cytokines are generated when microglia and astrocytes become activated, leading to the death and destruction of neurons. We call this process neuroinflammation. The central nervous system's (CNS) inflammatory response has two sides: while it might be beneficial at first, persistent inflammation can also be harmful. Microglia are activated in AD due to the presence of tau tangles and amyloid-beta (Aβ) plaques, which releases inflammatory mediators. Similar to this, PD is characterized by the build-up of alpha-synuclein aggregates, which trigger an inflammatory response and worsen substantia nigra neuronal loss. In contrast to ALS, which also involves inflammation and motor neuron degeneration, MS is characterized by autoimmune-driven demyelination and neuroinflammation. In addition to neuroimaging results, biomarkers such as levels of inflammatory cytokines and chemokines in cerebrospinal fluid (CSF) can help with patient stratification and customized treatment plans. This review underscores the need for a multifaceted approach to combat neurodegenerative diseases, integrating anti-inflammatory strategies with other therapeutic modalities. Combination therapies targeting multiple pathogenic pathways may offer synergistic benefits. For instance, combining anti-inflammatory agents with neurotrophic factors, antioxidants, or small molecules promoting protein clearance could address the multifactorial nature of neurodegeneration.

Keywords: Neuroinflammation, Cytokines, Biomarkers, Inflammation.

Application of Quality by Design (QbD) in Pharmaceutical Product Development

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ABSTRACT

Quality by Design (QbD) is a systematic, science-driven approach to pharmaceutical product development that ensures consistent quality by integrating risk management and process understanding. Unlike traditional quality control methods, which rely on end-product testing, QbD focuses on designing robust formulations and manufacturing processes by understanding product and process variability. These components help create a structured framework that ensures minimal variability, improved reproducibility, and enhanced product performance. Advanced statistical tools such as Design of Experiments (DoE) and risk assessment methodologies like Failure Mode and Effects Analysis (FMEA) play a crucial role in optimizing formulations and manufacturing processes while minimizing variability and risks. The implementation of QbD offers numerous advantages, including improved efficiency, reduced product failures, enhanced regulatory compliance, and greater patient safety. It minimizes batch-to-batch variability, shortens development time, and lowers production costs, ultimately fostering a proactive approach to quality control. Furthermore, QbD streamlines regulatory approvals, as well-documented process understanding reduces the likelihood of unexpected deviations and ensures compliance with stringent guidelines. By improving drug quality, optimizing manufacturing, and enhancing regulatory acceptance, QbD has become an essential framework for achieving pharmaceutical excellence. Incorporating QbD into drug development not only ensures better therapeutic outcomes but also establishes a cost-effective, risk-based, and scientifically sound approach to pharmaceutical innovation.

Keywords: Quality by Design, QTPP, CQAs, DoE, Risk Management, ICH Guidelines, Process Optimization.

Nanotechnology and Invasomes: A New Era in Personalized Medicine

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ABSTRACT

Skin is one of the largest organs in the human body. It acts as an outer protective cover and comprises the epidermis, dermis, and hypodermis. Liposomes are formed by phospholipids and have a vesicular character that improves the encapsulation of lipophilic, hydrophilic, and amphiphilic drugs. The invasome structure is flexible as opposed to regular liposomes; this is due to the presence of ethanol and terpene that increases lipid fluidity in the vesicle structure. Terpenes, ethanol, or terpene mixes are potential carriers that invasomes' tiny liposomal vesicles used to improve skin penetration. Terpenes that are primarily derived from natural sources are the most efficient and secure kind of penetration enhancers (PEs). There are some methods for the preparation of invasomes, but mostly the techniques used for the preparation of invasomes are mechanical dispersion and film hydration methods. Although PEs are effective when applied topically, only a small number are clinically approved due to concerns about skin irritation and toxicity. Invasomes exhibit a higher rate of skin penetration than liposomes and ethosomes. This review examines the structure, components, preparation methods, and applications of invasomes in pharmaceutical formulations, focusing on their potential to treat skin disorders and improve therapeutic outcomes. The primary objective is to assess the future potential of invasome technologies in transdermal drug delivery, alongside an exploration of the regulatory challenges and pathways for their development and approval. Graphical abstract illustrating the composition, mechanism of action, and therapeutic applications of invasomes in transdermal drug delivery systems.

Current Approaches in Cancer Treatment

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ABSTRACT

Cancer is a major public health problem worldwide. Global demographic characteristics predict an increasing cancer incidence in the next decades, with greater than 20 million new cancer cases annually expected by 2025. In this review, we highlight the current concept and discuss some of the current challenges and future prospects in cancer therapy. We conducted a non-systematic PubMed search, selecting the most comprehensive and relevant research articles, clinical trials, translational papers, and review articles on precision oncology and immune-oncology. Papers were prioritized and selected based on their originality and potential clinical applicability. Despite major advances, the current approach to face cancer treatment is still reductionist. Targeting single molecular abnormalities or cancer pathways has achieved good clinical responses that have modesty affected survival in some cancers. However, targeting a single hallmark or pathway with a single drug (magic bullet) will not likely lead to cancer cure. We predict that drug combinations against several molecular alterations or cancer hallmarks, in a way that is similar to what we have done with HIV treatment, might be a promising therapeutic strategy to treat cancer in the near future.

Keywords: Cancer, Clinical trials, Oncology

Total quality management and its principle

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ABSTRACT

Total Quality Management (TQM) has emerged as a vital framework for enhancing organizational performance and competitiveness in both production and service sectors. This abstract explores the principles, benefits, and challenges of implementing TQM in various organizational settings. TQM is a comprehensive approach that aims to continuously improve processes, products, and services by involving all employees in quality enhancement initiatives. In production organizations, TQM principles such as process optimization, defect prevention, and customer focus lead to reduced waste, improved product quality, and increased customer satisfaction. In service organizations, TQM fosters efficiency, consistency, and responsiveness, resulting in enhanced customer experiences and loyalty. The adoption of TQM requires a cultural shift, emphasizing employee empowerment, teamwork, and a commitment to quality. Challenges such as resistance to change and the need for sustained leadership support may arise. However, the long-term benefits of TQM, including cost savings, increased market share, and improved reputation, outweigh the initial hurdles. TQM is a powerful management philosophy that can revolutionize production and service organizations, driving them towards excellence. Its principles align with the pursuit of quality, efficiency, and customer-centricity, making it a cornerstone of modern organizational success.

Keywords: Total Quality Management (TQM), production organization, service organization, competitiveness, organizational performance

Neuroinflammation as a Potential Therapeutic Target in Alzheimer's Disease

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ABSTRACT

Although amyloid-β (Aβ) peptide accumulation is considered as a key early event in the pathogenesis of Alzheimer's disease (AD), the precise pathophysiology of this deadly illness remains unclear and no effective remedies capable of inhibiting disease progression have been discovered. In addition to deposition of extracellular Aβ plaques and intracellular neurofibrillary tangles, neuroinflammation has been identified as the third core characteristic crucial in the pathogenesis of AD. More and more evidence from laboratory and clinical studies have suggested that anti-inflammatory treatments could defer or prevent the occurrence of AD. In this review, we will discuss multifaceted evidence of neuroinflammation presented in AD and the newly emerged anti-inflammatory targets both in pre-clinical and clinical AD.

Keywords: Alzheimer’s disease; anti-inflammatory treatment; disease-modifying therapy; neuroinflammation.

Diffuse Alveolar Haemorrhage from Human Metapneumovirus (HMPV): Exploring Herbal Therapies as Immune-Modulating Treatments

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ABSTRACT

Diffuse alveolar haemorrhage (DAH), or bleeding pneumonia, is a severe condition characterized by lung bleeding leading to respiratory failure. It requires rapid stabilization and evaluation due to its high morbidity and mortality rates. Human metapneumovirus (HMPV) is an emerging respiratory pathogen causing significant illness, particularly among children, the elderly, and immunocompromised patients, often leading to pneumonia. Its transmission occurs through droplets, direct contact, and contaminated surfaces, with healthcare settings being key spreaders. HMPV's clinical manifestations range from mild cold-like symptoms to severe pneumonia. Diagnosis typically involves PCR testing, antigen detection, serology, and viral culture. Medicinal plants offer an alternative treatment option due to their effectiveness, low side effects, and beneficial phytochemicals. Herbs such as elderberry (Sambucus nigra), yarrow (Achillea millefolium), and horsetail (Equisetum arvense) are used for boosting immunity, supporting lung health, and controlling bleeding. Despite this, no specific antiviral or vaccine is currently available for HMPV. Treatment strategies focus on blocking the virus's entry and replication and modulating the immune response through small molecule inhibitors, fusion proteins, and monoclonal antibodies. RNA-based therapeutics are also under development. Augmenting the immune response with immunomodulatory approaches is showing promise. Advances in understanding HMPV pathogenesis and identifying new therapeutic targets are essential for reducing the global health burden.

Keywords: Diffuse alveolar haemorrhage (DAH), Human metapneumovirus (HMPV), Medicinal plants, Respiratory pathogen.

Structure-Activity Relationships of Pyrimidine Derivatives and their Biological Activity - A Review

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ABSTRACT

Heterocycles play a major role in many fields of biochemical and physiological such as amino acids, DNA bases, vitamins, endogenous neurotransmitters, etc. Nitrogen containing heterocyclic compounds play a vital role in medicinal chemistry and exhibit notable biological and pharmacological activities. In the past two decades, scientists focused more on the diverse biological activities of pyrimidine derivatives. Pyrimidine is a six-membered heterocyclic compound, and it is present naturally in nucleic acid components (uracil, thymine, and cytosine) and vitamin B1; it is a promising lead molecule for synthesizing compounds with various substitutions to treat various diseases. We focused on the structure-activity relationship of pyrimidine derivatives and its various biological activities reported from 2010 to date. From this review, we concluded that the position of substituents in the pyrimidine nucleus greatly influences biological activities. Thus, the pyrimidine nucleus showed anti-microbial, anticancer, anti-inflammatory, anti-tubercular, anti-convulsant, antihypertensive, anthelmintic, antidepressant, analgesic, anti-hyperglycemic activities, etc. Conclusion: This study provides an overview of the pyrimidine nucleus and its derivatives from 2010 to date. There is a future scope for identifying a lead molecule for the target biological activity.

Keywords: Heterocycles; biological activities; drug discovery; lead molecule.; pyrimidine; substituents.

Advances in solvent based cocrystallization: Bridging the gap between theory and practice

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ABSTRACT

A common tactic in materials science and pharmaceuticals is cocrystallization, which synthesises multi-component crystalline materials with unique physicochemical characteristics. The solvent-based method is one of the most popular cocrystallization processes because of its effectiveness and adaptability in creating high-quality cocrystals. This review article covers the solvent-based cocrystallization technique in great detail, emphasizing its methods, applications, and guiding principles. The review methodically examines the important variables and how they affect the development of cocrystals.

The review also emphasizes the various practical uses of cocrystallization in the pharmaceutical industry, with a focus on improved medication solubility, stability, and bioavailability.

In conclusion, this study offers insightful information about the solvent-based cocrystallization process, including a thorough comprehension of its fundamental ideas, practical applications, and experimental methodologies. For scientists, engineers, and researchers working on the creation of cocrystals for a range of uses, this review is an invaluable resource as it summarizes the state of the art in this area.

Keywords: Cocrystallization, Solubility, Bioavailability, Stability.

Formulation and Evaluation of Fast Dissolving Tablet of Cetirizine and Curcumin Combination

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ABSTRACT

The objective of this study was to develop and optimize a combination anti-allergic tablet containing cetirizine and curcumin, with rosemary extract as an additive to enhance therapeutic efficacy in acute and chronic allergic conditions. The tablets were prepared using the wet granulation method, employing excipients such as hydroxypropyl methylcellulose (HPMC), lactose, starch, and polyethylene glycol (PEG) in varying concentrations to achieve an optimal formulation. Rosemary extract, containing bioactive compounds like ursolic acid and rosmarinic acid, was incorporated for its synergistic anti-inflammatory and anti-allergic properties alongside cetirizine and curcumin. Fourier-transform infrared spectroscopy (FTIR) analysis confirmed the absence of significant interactions between the active pharmaceutical ingredients (APIs) and excipients, ensuring formulation stability. Pre-compression evaluations showed favorable results, with bulk density (0.45–0.52 g/cm³), tapped density (0.55–0.60 g/cm³), Carr's index (10–14%), Hausner's ratio (1.10–1.14), and angle of repose (25°–28°) indicating excellent flow properties. Post-compression testing confirmed compliance with pharmacopeial standards, including uniform weight variations. The optimized combination tablet successfully integrates cetirizine, curcumin, and rosemary extract, exhibiting stable, high-quality characteristics with enhanced dissolution profiles. This formulation presents a promising therapeutic option for effective management of allergic conditions, combining rapid relief with potential long-term benefits.

Keywords: Curcumin, Cetirizine, Fast dissolving tablet, Solid dispersion techniques, Anti-allergic, HPMC.

Review on Application of 3D Printing in Pharmacy - Pixels to Pills

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ABSTRACT

In recent years, 3D printing has emerged as a transformative tool within the domain of pharmacy, presenting novel opportunities for drug delivery, personalized medicine, and dosage forms customization. Applications of 3D printing in pharmacy are: Firstly, its capability to produce complex structures layer-by-layer, enabling precise control over drug composition and distribution. Unlike traditional methods, which are often limited by batch processing and standardized formulations. Secondly it facilitates the creation of complex dosage forms with precise control over drug release kinetics, enhancing therapeutic outcomes and patient compliance. Additionally, the ability to tailor formulations to individual patient needs promotes personalized medicine, optimizing treatment efficacy while minimizing adverse effects. Furthermore, 3D printing enables rapid prototyping, expediting the drug development process and reducing time-to-market for novel pharmaceutical products. From fabricating patient-specific dosage forms to producing intricate drug delivery devices, its utility spans the entire pharmaceutical continuum. Moreover, 3D printing facilitates the production of paediatric and geriatric dosage forms with modified shapes and sizes, addressing unique challenges in vulnerable patient populations.

Keywords: Dosage customization, Patient-specific dosage form, Personalized medication.

Anticancer Activity of Natural and Synthetic Chalcones

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ABSTRACT

Cancer is a condition caused by many mechanisms (genetic, immune, oxidation, and inflammatory). Anticancer therapy aims to destroy or stop the growth of cancer cells. Resistance to treatment is the leading cause of the inefficiency of current standard therapies. Targeted therapies are the most effective due to the low number of side effects and low resistance. Among the small molecule natural compounds, flavonoids are of particular interest for the identification of new anticancer agents. Chalcones are precursors to all flavonoids and have many biological activities. The anticancer activity of chalcones is due to the ability of these compounds to act on many targets. Natural chalcones, such as licochalcones, xanthohumol (XN), panduretin (PA), and loncocarpine, have been extensively studied and modulated. Modification of the basic structure of chalcones in order to obtain compounds with superior cytotoxic properties has been performed by modulating the aromatic residues, replacing aromatic residues with heterocycles, and obtaining hybrid molecules. A huge number of chalcone derivatives with residues such as diaryl ether, sulfonamide, and amine have been obtained, their presence being favorable for anticancer activity. Modification of the amino group in the structure of aminochalconesis always favorable for antitumor activity. This is why hybrid molecules of chalcones with different nitrogen hetercycles in the molecule have been obtained. From these, azoles (imidazole, oxazoles, tetrazoles, thiazoles, 1,2,3-triazoles, and 1,2,4-triazoles) are of particular importance for the identification of new anticancer agents.

Keywords: chalcone; azole; cancer; cell line; bioactivity; ligand–receptor interaction

Formulation Challenges in Developing Nano-Structured Lipid Carriers for Brain Targeting

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ABSTRACT

Targeting the brain for therapeutic purposes presents significant challenges due to the highly selective blood-brain barrier (BBB), which restricts the entry of most drugs. Nano-structured lipid carriers (NLCs) have emerged as a promising strategy for overcoming these barriers, offering advantages such as improved drug solubility, enhanced bioavailability, and controlled release properties. However, developing NLCs for brain targeting involves addressing several formulation and design challenges to ensure efficacy, safety, and scalability. One of the key challenges lies in selecting the appropriate lipids and surfactants that ensure optimal encapsulation efficiency, stability, and biocompatibility. The physicochemical properties of NLCs, such as particle size, zeta potential, and surface morphology, play critical roles in determining their ability to cross the BBB. Additionally, the drug's lipophilicity and compatibility with the lipid matrix influence the loading efficiency and sustained release profile. Developing scalable and reproducible manufacturing techniques, such as high-pressure homogenization or solvent evaporation, further complicates the process. Regulatory considerations, including compliance with quality standards and long-term safety evaluations, must also be carefully addressed. Recent advancements in functionalization techniques, such as surface modification with targeting ligands, have demonstrated potential to enhance the specificity of NLCs for brain cells.

Keywords: Nano-Structured Lipid Carriers, Blood-Brain Barrier, Brain Targeting, Drug Delivery.

Nanoparticles: Drug delivery system in Cancer Treatment

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ABSTRACT

Nanoparticle-based drug delivery systems have a number of advantages compared to traditional drugs, including greater stability, improved biocompatibility and better targeting. Such systems make use of the enhanced permeability and retention (EPR) effect which enables the tumor site to be targeted effectively because of the relatively leaky blood vessels within tumors. The emergence of hybrid nanoparticles that integrate different types of nanoparticles has revolutionized drug delivery technology, enhancing the accuracy and effectiveness of treatment even further. In terms of cancer therapy, nanoparticle-based systems may be beneficial in the treatment of drug resistance, which is a common hurdle associated with chemotherapy. Factors that contribute to the cancer drug resistance mechanisms are the overproduction of drug efflux transporters, impairment of the apoptotic pathways and the tumor's microenvironment which is usually low in oxygen levels. As more drug resistance mechanisms have been elucidated, there is a convergence trend where peek nanoparticles are targeting these specific systems more accurately. Also, there is an increasing concern on nanoparticles use in immunotherapy which is becoming a significant cancer treatment modality.

Keywords: Cancer treatment, Targeted drug delivery, Nanoparticles, Controlled release.

Role of Artificial Intelligence (AI) in Quality management system (QMS)

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing Quality Management Systems (QMS) by enabling predictive analytics, automated inspections, and enhanced decision-making. AI-driven predictive quality analytics leverages real-time data to anticipate defects, reducing costs and improving efficiency. Automated visual inspections powered by machine learning (ML) ensure higher accuracy and consistency in defect detection compared to manual methods 412. AI also streamlines compliance with standards like ISO 9001:2015 through automated audit processes and anomaly detection 614. Integration with tools such as FMEA and SPC enhances process optimization. However, challenges like cost-benefit trade-offs in AI adoption and human-AI collaboration dynamics highlight the need for strategic implementation.

Keywords: Artificial Intelligence, Quality Management System, Predictive Maintenance, Defect Detection, Machine Learning.

Synthesis & Pharmacological Activity of Some New Hydrazone & Oxadiazole

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ABSTRACT

Trticum aestivum Linn. (Wheat) is a extensively farmed cereal crop known for its considerable nutritional and medicinal benefits. The health benefits of its various parts' pharmacognostical, phytochemical, and pharmacological properties have been increasingly acknowledged. T. aestivum displays a diverse array of morphological, microscopic, and organoleptic features from a pharmacognostic standpoint, facilitating accurate identification and quality standardization. Phytochemical analysis uncovers the presence of essential bioactive compounds such as alkaloids, flavonoids, phenols, saponins, and terpenoids, which are responsible for its antioxidant, anti-inflammatory, and antimicrobial properties. Moreover, the inclusion of essential fatty acids, vitamins, and minerals improves its nutritional quality, establishing it as a significant part of the diet. The extracts of T. aestivum have demonstrated promising pharmacological activities, including anti-diabetic, anti-hyperlipidemic, anti-cancer, and neuroprotective effects. Experimental models show its potential to influence various biochemical pathways, providing a basis for its therapeutic applications. Additionally, this review emphasizes the synergistic effects noted when used in conjunction with other medicinal plants. T. aestivum is generally acknowledged as safe; however, further investigation into its pharmacological and toxicological properties is essential for broader clinical application. More research is needed to investigate its complete potential in preventing and managing chronic diseases. Consequently, T. aestivum shows great potential as a beneficial herbal resource in contemporary medical applications. This abstract offers a brief overview of the assessment of Triticum aestivum from pharmacognostic, phytochemical, and pharmacological viewpoints. Tell me if you require any adjustments.

Keywords: Trticum aestivum Linn, Pharmacognostical, Antioxidant, Anti-inflammatory, Antimicrobial, Anti-hyperlipidemic, Neuroprotective.