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Contents

REVUMENIB (REVUFORJ): A FIRST-IN-CLASS MENIN INHIBITOR FOR ACUTE LEUKEMIA TREATMENT 3
Ms. Shalini Singh 3
INTERLINKING PATHOPHYSIOLOGY- CORRELATION BETWEEN DIABETES MELLITUS AND MICROBIAL INFECTIONS: A PERSPECTIVE STUDY 3
Mr. Vivek Kumar Tiwari, Ms. Binduja Ramavath, Ms. Hannah Yancey Gujjarlapudi, Ms. Sindhuja Gurijala 3
INNOVATIVE HERBAL FACE SERUM USING HYDROGEL TECHNOLOGY: A SUSTAINABLE SKINCARE SOLUTION 4
Ms. Shreya Shriram Dhuri, Ms. Reva Anand Pandit, Ms .Vaishnavi Vitthal Parab, Mr.Vinay Arjun Modak, Ms. Gauri Rama Dhuri. 4
METAL-ORGANIC FRAMEWORKS: NEXT-GENERATION PLATFORMS FOR SMART DRUG DELIVERY SYSTEMS 4
Mr. Gnanendra Sai Kumar Nareboina, Ms. Santi Priyanka Patam, Mr. Anil Kumar Vadaga 4
ROLE OF COSMECEUTICALS IN ACNE MANAGEMENT SYSTEM AND NEW DELIVERY METHODS 5
Ms. Mishika Verma, Mr. Tanmay Shukla 5
THREE-DIMENSIONAL PRINTING TECHNOLOGY: FUTURE DRUG DELIVERY SYSTEM 5
Ms. Asha Devi Priyanka Kompella, Mr. Anantha Narayani Kasireddy, Mr. Anil Kumar Vadaga 5
SMART NANOPARTICLES: AI-ENABLED SOLUTIONS FOR TARGETED DRUG DELIVERY 6
Mr. Sai Shashank Gudla, Ms. Likhitha Kurapati, Ms. Rajitha Yarram Palli, Mr. Anil Kumar Vadaga 6
UNLOCKING THE SECRETS OF HYDROGELS: REVOLUTIONIZING WOUND HEALING 6
Ms. Roohi Yusufi 6
INTEGRATION OF 3D PRINTING IN MICRONEEDLES FOR TRANSDERMAL DRUG DELIVERY 7
Mr. Yaga Maheswar Reddy, Dr. Haranath Chinthaginjala 7
HARNESSING QUANTUM INTELLIGENCE FOR NEXT-GENERATION PHARMACEUTICALS 7
Ms. Pathan S.M 7
GREEN CHEMISTRY IN PHARMACEUTICAL DEVELOPMENT 8
Mr. Vishal Thakur, Ms. Neha Gupta 8
ENVIRONMENTAL STEWARDSHIP IN PHARMA: HARNESSING GREEN CHEMISTRY PRINCIPLES 8
Ms. Pradeepthi Bokka 8
BIONIC PANCREAS WITH CONTINUOUS GLUCOSE MONITORING AND INSULIN SECRETION 9
Ms. Subha Gayathri Munta, Mr. Hussainvali Shaik, Ms. Sri Varshitha Peddinti, Mr. Anil Kumar Vadaga 9
DISCOVERY OF A 2-AMINOTHIAZOLE FRAMEWORK EMPLOYING A STATE-OF-ART MACHINE LEARNING QSAR MODEL ADDRESSING CHLOROQUINE-SENSITIVE *PLASMODIUM FALCIPARUM* 9
Dr. T. Prabha, Mr. A.S. Vishal Pranav, Mr. K. Ranjith 9
FROM MOSQUITO TO MAN: JOURNEY OF (PFEMP1) IN SEVERE MALARIA 10
Ms. Mousam 10
MULTICOMPONENT STRATEGIES FOR SYNTHESIZING PURINES AND PYRIMIDINES: BRIDGING EARLY LIFE CHEMISTRY WITH MODERN SUSTAINABLE DRUG DEVELOPMENT 10
Miss V Ranjani, Dr. W. Helen 10
NANOVACCINES: A NEW ERA IN THE FIGHT AGAINST INFECTIOUS DISEASES 11
Mr. Prathmesh Singh Bhati, Mr. Tanmay Shukla 11

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RECENT INNOVATIONS IN GASTRORETENTIVE FLOATING TABLETS....11

Mr. Gourab Saha, Mr. Niranjan Kumar Manna....11

A PROSPECTIVE STUDY ON COMORBIDITIES & TREATMENT PATHWAYS IN CHRONIC LIVER DISEASE AND CHOLELITHIASIS....12

Mr. Eswar Sai Kiran Kollu, Dr. M Phani Ramana Bhushan....12

PERSONALIZED CLINICAL TRIALS USING PATIENT SPECIFIC STEM CELLS FOR DISEASE MODELING....12

Ms. Reena Varshitha Saripalli, Mr. Abishek Babu Madada, Mr. Anil Kumar Vadaga....12

PRECISION DOSING AND PHARMACOGENOMICS: A SUSTAINABLE PARADIGM IN DRUG DEVELOPMENT....13

Ms. Pradeepthi Bokka....13

INNOVATIVE IDEAS FOR NOVEL EVALUATION METHODS IN PH- SENSITIVE DRUG DELIVERY PLATFORMS FOR SYSTEMIC CANCER TREATMENT....13

Ms. Ranitha Kadigitala, Ms. Suchitra Poritigadda, Ms. Sushmita Debnath, Mr. Anil Kumar Vadaga....13

PATIENT CENTRIC DRUG DISCOVERY: AI AT THE FOREFRONT OF SUSTAINABILITY....14

Mr. Prem Chand Songa....14

NATURAL MUCILAGE: NOVEL DRUG DELIVERY SYSTEM....14

Ms. Naga Harika Pragada, Ms. Naga Rani Chennu, Mr. Anil Kumar Vadaga....14

UNMASKING THE SILENT INVADER: EXTRANODAL DIFFUSE LARGE B-CELL LYMPHOMA (DLBCL) MIMICKING RHEUMATIC DISEASES....15

Mr. Eswar Sai Kiran Kollu, Dr. M. Phani Ramana Bhushan....15

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REVUMENIB (REVUFORJ): A FIRST-IN-CLASS MENIN INHIBITOR FOR ACUTE LEUKEMIA TREATMENT

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Abstract: Revumenib (Revuforj) is a versatile therapeutic innovation in the treatment of acute leukemia, specifically targeting KMT2A translocations, which are present in approximately 10% of cases. This first-in-class menin inhibitor received FDA approval in 2024 due to its ability to induce remission in patients with relapsed or treatment-resistant leukemia, as demonstrated in the AUGMENT-101 clinical trial. Acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) are aggressive blood cancers with limited treatment options for refractory cases. Genetic mutations, such as KMT2A rearrangements, worsen outcomes. Revumenib works by inhibiting the menin-KMT2A protein complex, which is responsible for disrupting normal gene regulation. By blocking this interaction, the drug restores healthy gene expression and promotes the destruction of leukemia cells. In the AUGMENT-101 trial, 104 patients aged 1 to 79 years with relapsed or refractory KMT2A-rearranged leukemia were treated. The therapy achieved a combined complete remission rate (CR+CRh) of 21.2%, with remission lasting a median of 6.4 months. Adverse effects included nausea (51%), differentiation syndrome (29%), and QT interval prolongation (29%), emphasizing the importance of careful patient monitoring. Revumenib represents a significant advance in precision medicine, offering a new targeted treatment option for patients with poor prognoses. While the results are promising, further studies are needed to expand its application, address safety concerns, and evaluate its potential in combination therapies to improve survival outcomes.

Keywords: Revumenib, Revuforj, Acute leukemia, Acute myeloid leukemia, Acute lymphoblastic leukemia.

INTERLINKING PATHOPHYSIOLOGY- CORRELATION BETWEEN DIABETES MELLITUS AND MICROBIAL INFECTIONS: A PERSPECTIVE STUDY

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Abstract: Diabetes mellitus presents a significant healthcare challenge, particularly due to increased susceptibility to infections resulting from hyperglycemia-induced immune dysfunction. The complex relationship between diabetes pathophysiology and microbial infections highlights the potential value of therapeutic agents that can address both conditions simultaneously. Several established medications demonstrate dual therapeutic potential. Metformin exhibits both antidiabetic and antimicrobial properties through multiple mechanisms, including reactive oxygen species reduction, immune function enhancement, and biofilm formation inhibition. Thiazolidinediones demonstrate glucose-lowering effects by modulating macrophage activation and reducing pro-inflammatory cytokines, while also exhibiting antimicrobial activity through bacterial cell wall disruption. Quercetin, a naturally occurring flavonoid, improves insulin sensitivity and β-cell function while providing antimicrobial effects through membrane disruption and microbial enzyme inhibition. Understanding these dual mechanisms provides a foundation for innovative therapeutic strategies that may reduce medication burden while improving patient outcomes in managing diabetes-associated infections.

Keywords: Diabetes Mellitus, Antimicrobial activity, Metformin, Thiazolidines, Quercetin, Immune modulation.

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INNOVATIVE HERBAL FACE SERUM USING HYDROGEL TECHNOLOGY: A SUSTAINABLE SKINCARE SOLUTION

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Abstract: A novel herbal face serum combines hydrogel technology with natural ingredients from Kokum seeds, Flax seeds, Lajari (Mimosa), Aloe Vera, and Sandalwood hydrosol. The formulation employs a sodium alginate-based hydrogel matrix to achieve controlled and sustained release of bioactive compounds, delivering extended hydration, enhanced skin elasticity, and UV protection. The development process incorporates advanced extraction, blending, and encapsulation techniques that optimize botanical benefits while maintaining environmental sustainability. Phytochemical analysis reveals significant concentrations of flavonoids, phenolics, and saponins, confirming the serum's antioxidant, anti-inflammatory, and skin-brightening efficacy. Performance evaluations demonstrate excellent stability, pH balance, spreadability, and homogeneity across diverse skin types. The lightweight, non-greasy formulation merges traditional Konkan botanical wisdom with modern hydrogel technology, creating an eco-friendly skincare solution that ensures deep penetration and sustained benefits.

Keywords: Hydrogel technology, Kokum seeds, Lajari, Flax seeds, Sandalwood, Sustainability, UV protection, Green cosmetic, Phytochemical testing.

METAL-ORGANIC FRAMEWORKS: NEXT-GENERATION PLATFORMS FOR SMART DRUG DELIVERY SYSTEMS

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Abstract: Metal-organic frameworks (MOFs) are crystalline materials composed of organic ligands and metal ions or clusters linked through coordination bonds, forming highly porous two-dimensional or three-dimensional networks. The molecular-level structural precision of MOFs makes them particularly advantageous for drug delivery system (DDS) applications. Recent advances in MOF synthesis and characterization have significantly expanded their potential in pharmaceutical applications. MOFs offer distinct advantages over conventional nanocarriers such as liposomes, polymers, and quantum dots, including well-defined porosity, superior drug loading capacity, and controlled release kinetics. Various synthetic approaches, including direct precipitation, vapor diffusion, solvothermal synthesis, and microwave-assisted synthesis, enable precise control over pore dimensions, surface properties, and functional groups for optimal therapeutic agent delivery. Despite their promise, several challenges must be addressed before clinical implementation. Primary concerns include comprehensive safety assessments for biological applications, control of physicochemical properties (particle size, morphology), drug incorporation efficiency, stability, and manufacturing consistency. The successful clinical translation of MOF-based delivery systems requires improvements in their biological stability, toxicological profiles, and scalable production methods.

Keywords: Metal Organic Framework (MOFs), Drug delivery, Stability, Porous, Biomedical.

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ROLE OF COSMECEUTICALS IN ACNE MANAGEMENT SYSTEM AND NEW DELIVERY METHODS

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Abstract: Cosmeceuticals represent a significant advancement in acne management, effectively bridging cosmetics and pharmaceuticals through bioactive ingredients that target multiple aspects of acne pathophysiology. These formulations address inflammation, bacterial growth, and excessive sebum production through active compounds including salicylic acid, niacinamide, and retinoids. Beyond acne lesion prevention, these products contribute to reduced skin irritation and enhanced barrier function. Modern delivery systems have substantially improved the efficacy of cosmeceutical products. Advanced technologies such as liposomes, nanoparticles, microsponges, transdermal patches, and iontophoresis enable deeper skin penetration and controlled release mechanisms. These innovations ensure targeted delivery while minimizing adverse effects commonly associated with conventional topical treatments. The integration of cosmeceuticals as adjunctive therapy in conventional acne treatment protocols has demonstrated significant benefits. Enhanced delivery methods have improved therapeutic outcomes, patient compliance, and overall treatment satisfaction. The combination of active ingredients with sophisticated delivery systems represents a comprehensive approach to acne management and skin health maintenance.

Keywords: Cosmeceuticals, Acne management, Active ingredients, Delivery methods, Skin health.

THREE-DIMENSIONAL PRINTING TECHNOLOGY: FUTURE DRUG DELIVERY SYSTEM

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Abstract: Three-dimensional (3D) printing has transformed multiple industries, including automotive, construction, aerospace, and healthcare sectors, with significant recent momentum in pharmaceutical applications. The technology offers distinct advantages over conventional manufacturing methods, enabling complex geometries, precise dosing control, combination products, and rapid prototyping capabilities. These features facilitate tailored drug release profiles, unprecedented personalization options, and accelerated development cycles, marking a significant advancement in pharmaceutical manufacturing paradigms. The unique characteristics of 3D printing technology necessitate specialized regulatory frameworks, with ongoing evolution in intellectual property protection, drug regulations, and related policies. Integration with digital health technologies is revolutionizing clinical pharmacy practice, establishing new pathways for adaptive, patient-centered treatment approaches. 3D printing enables agile, decentralized pharmaceutical production that can swiftly respond to dynamic patient needs and changing healthcare demands. The convergence of 3D printing with artificial intelligence (AI) presents promising opportunities, particularly in predicting printability parameters and ensuring product quality and safety. This technological synergy could propel pharmacy practice through digital prescription transmission to localized 3D printing facilities, enabling real-time personalized medicine production and dispensing.

Keywords: 3D Printing, Three-Dimensional Structures, Medicine Dispensing, Digital Pharmacy, Creativity.

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SMART NANOPARTICLES: AI-ENABLED SOLUTIONS FOR TARGETED DRUG DELIVERY

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Abstract: Smart nanoparticles (SPs) are one of the leading innovations in cancer therapy, as they allow for the targeted delivery of drugs activated by specific stimuli and tailored to target certain locations. Compared to conventional nanoparticles, smart NPs can progressively respond to different endogenous and exogenous stimuli, adjusting their size, shape, surface properties, targeting activities, and composition for optimal therapeutic outcomes. Artificial intelligence, along with further potential from smart nanoparticles, goes back to computational algorithms and models to create optimized properties of nanoparticles, navigating complex tumor microenvironments, and even delivering drugs with high precision. AI-powered nanoparticles are thus a means to accurate biomarker analysis using omics and nano sensor technologies for personalized clinically targeted treatment for cancer patients. In addition, AI-powered systems enable real-time therapeutic monitoring by incorporating sensors and imaging agents to enable adaptive therapy. Well beyond drug delivery, the combined potential of AI and nanotechnology promises to induce early diagnosis of cancer and sustain reductions in mortality through timely interventions. Now, comprehensive investigations and experiments are very important to overcome these challenges and establish the safety and efficacy of AI-enhanced nanoparticles in medical settings. The combination of AI with the intelligent nanoparticles especially offers significant transformative possibilities in the oncological treatment and offers new approaches for the precise drug administration and diagnostic procedures. This may well stay in its infancy but further research and collaboration are crucial to overcome today's challenges and to unlock the full scope of AI-promoted nanotechnology for achieving far superior patient care.

Keywords: Smart Nanoparticles, Artificial intelligence, Machine learning, Cancer, Diagnosis.

UNLOCKING THE SECRETS OF HYDROGELS: REVOLUTIONIZING WOUND HEALING

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Abstract: Hydrogels represent a revolutionary advancement in wound healing technologies, offering diverse formulations with unique therapeutic properties. Their distinctive physicochemical characteristics have established them as pivotal innovations in modern wound treatment approaches. Various specialized hydrogel formulations demonstrate significant efficacy in wound management. Key developments include hydrogel films incorporating gentamicin, L-arginine, and glycerol for optimal wound coverage; antimicrobial hydrogel dressings with superior rheological properties; and in-situ spray hydrogels combining naringenin and gentamicin for easy application and sustained drug delivery. Injectable hydrogels containing thiolate polyethylene glycol and silver nitrate provide both antibacterial and angiogenic benefits. Aloe vera-enriched hydrogels promote collagen synthesis and accelerate healing processes, while in-situ forming hydrogels incorporating collagen, poly-d-lysine, and chondroitin sulphate demonstrate enhanced wound repair capabilities. Recent scientific evidence supports the therapeutic efficacy of these various hydrogel formulations, highlighting their potential to revolutionize wound care practices and improve patient outcomes. The versatility and effectiveness of hydrogel technologies continue to expand, promising significant advancements in healthcare delivery and wound management strategies.

Keywords: Hydrogels, Wound dressing, Synergistic effect, Gentamicin Sulphate, Wound healing

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INTEGRATION OF 3D PRINTING IN MICRONEEDLES FOR TRANSDERMAL DRUG DELIVERY

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Abstract: Microneedles are minimally invasive, tiny needle devices that can be fabricated from a variety of materials, such as biomaterials, metals, polymers, ceramics, and composites which are designed to penetrate the skin's stratum corneum layer for various applications. Microneedles can be used to deliver drugs, proteins, and biomolecules for a variety of purposes, including cosmetics, immunology and diagnostics. 3D printing is a promising technique for making the microneedles for transdermal delivery. 3D printing can effectively create, update, and manufacture microneedles with appropriate size characteristics. The methods include Inkjet printing, Photopolymerization-based technologies, Fused deposition modelling/fused filament fabrication, Scanning electron and confocal laser scanning microscopy, stereolithography, digital light processing. The most preferred 3D printing technique is FDM, among the other methods. Based on the material and the application type, a particular 3D printing technology can be utilized. The first photopolymerization technique that was used in the fabrication of microneedles was the two-photon polymerization (2PP) process, which employs two-photon absorption in order to initiate polymerization. This stereolithography technique has the capability of printing microneedle arrays with a good printing quality, an excellent resolution, and a high accuracy. Biocompatible hollow microneedles were directly fabricated using two-photon polymerization. The resins used are polyacrylic acid (PAA), poly dimethylsiloxane (PDMS), and polyvinyl methylvinyl ether (PMVE). The application of microneedle includes vaccine delivery, transdermal gene delivery for genetic and other skin disorders like allergies, hyperpigmentation, psoriasis, and skin cancer.

Keywords: Microneedle, Transdermal drug delivery, Fused deposition modelling, photopolymerization, confocal laser scanning microscopy, Two-photon polymerisation

HARNESSING QUANTUM INTELLIGENCE FOR NEXT-GENERATION PHARMACEUTICALS

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Abstract: Quantum computing represents a transformative advancement in drug design, offering computational capabilities that surpass classical computing limitations. The technology enables precise molecular interaction simulations through artificial intelligence, providing detailed insights into drug-target interactions, particularly with proteins. Quantum systems can rapidly screen vast compound libraries, facilitating efficient identification and modeling of novel therapeutic molecules for specific diseases. Quantum machine learning (QML) enhances predictive capabilities regarding drug behavior, safety profiles, and efficacy. The synergistic integration of quantum and classical computing accelerates research processes while reducing developmental costs. Key applications include identifying promising drug candidates, predicting drug-target binding affinities, and advancing vaccine development through immunological response modeling. The implementation of quantum computing in pharmaceutical research promises to expedite drug discovery, reduce development costs, and improve predictive accuracy. These advantages position quantum computing as a crucial tool for addressing previously intractable diseases and developing more effective therapeutic solutions.

Keywords: Quantum Computing, Drug Discovery, Molecular Interactions, Quantum Machine Learning (QML), Drug Design, Pharmacokinetics.

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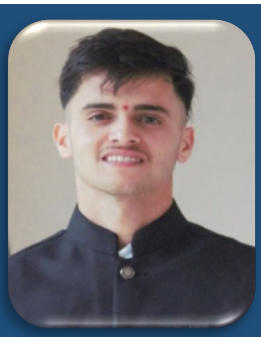
GREEN CHEMISTRY IN PHARMACEUTICAL DEVELOPMENT



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Abstract: The Pharmaceutical industry faces increased pressure to decrease down its environmental footprint during maintaining efficiency and innovation. The integration of Green Chemistry into the pharmaceutical development gives transformative shift towards sustainability. Green Chemistry offers sustainable framework during developing, manufacturing and disposing of pharmaceuticals by emphasizing waste reduction, energy efficiency and also use of renewable resources. This includes use of biocatalysis, renewable feedstocks and safer reaction solvents and also development of biodegradable and environmental benign pharmaceutical products. By this approach, green chemistry not only addresses regulatory and social demands but also fosters economic benefits and also increases the cost efficiency and corporate sustainability goals. One significant area of green chemistry in pharmaceutical development is the use of sustainable synthesis routes, which replace traditional methods that often involve hazardous chemicals and generate substantial waste. Techniques such as catalytic processes, microwave-assisted synthesis, and solvent-free reactions have emerged as greener alternatives that reduce waste and energy consumption. Additionally, green chemistry advocates for the reduction of hazardous reagents and the promotion of atom economy, where maximum utilization of starting materials is achieved. This approach focuses on minimizing environmental impact by adopting eco-friendly processes and addresses regulatory demands, promotes economic benefits and also establishes sustainability as a core principle in modern drug discovery and production.

Keywords: Green chemistry, Biocatalysis, Solvent-free reactions, Microwave-assisted synthesis

ENVIRONMENTAL STEWARDSHIP IN PHARMA: HARNESSING GREEN CHEMISTRY PRINCIPLES

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Abstract: Green chemistry in contrast to remediation method focuses on creating chemical products and processes that eliminate or significantly reduce the generation and use of hazardous substances. This approach spans the entire lifecycle of a chemical product including its design, production, application and eventual disposal. The adoption of green chemistry principles in contemporary drug discovery and development has become a revolutionary strategy to reduce environmental impact while promoting sustainable pharmaceutical production. Key advancements include using renewable raw materials (example: plant derived sugars, bio-based alcohols, lignocellulose biomass), biodegradable reagents such as enzymes, ionic liquids in drug synthesis. Additionally catalytic processes and continuous manufacturing technique are enabling resource efficient production pathways. The implementation of green chemistry in drug manufacturing, exemplified by the use of biocatalysts in active pharmaceutical ingredient (API) synthesis, highlights its transformative potential. Flow chemistry, enzymatic processes, and computational modeling, green chemistry promotes the development of sustainable pharmaceutical solutions. These methods help reduce waste, lower energy use, and incorporate environmentally friendly materials, aligning with sustainability goals and regulatory standards. Moreover, they enhance cost-efficiency and operational effectiveness. Utilizing these innovative practices enables the pharmaceutical industry to advance toward a more sustainable future, combining scientific progress with environmental stewardship and social responsibility.

Keywords: Green Chemistry, Drug Discovery, Sustainability, Ecofriendly, Pharmaceutical production.

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BIONIC PANCREAS WITH CONTINUOUS GLUCOSE MONITORING AND INSULIN SECRETION

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Abstract: In order to enhance the standard of living and convenience care of those having type 1 diabetes. The diabetes technology has continuously advanced over time. Regarding the management of Type 1 diabetes, frequent blood glucose (BG) tests and several daily insulin injections are now considered standard practices. Glycemic control trends can be observed and identified by patients using continuous glucose monitoring (CGM). The individual with diabetes is partially relieved of this ongoing duty by bionic pancreas or system with closed loop, it combines these devices with a control algorithm intended to keep the glucose level at the desired level. When insulin delivery is automated, better physiological and psychological outcomes are achieved, this reduces the amount of input that required from the wearers. A review was conducted on a variety of devices designed to replicate the natural organ's release of insulin. Using synthetic biocompatible semipermeable barriers, allogeneic or xenogeneic cells or cell clusters have been isolated from the host's immune system, avoiding the need for immune-suppressive treatments. The bionic pancreas, that delivers the insulin based on real time blood glucose readings and make up the artificial pancreas.

Keywords: Bionic Pancreas, Insulin Delivery System, Glucose Sensor, Homeostasis, Smart Insulin System.

DISCOVERY OF A 2-AMINOTHIAZOLE FRAMEWORK EMPLOYING A STATE-OF-ART MACHINE LEARNING QSAR MODEL ADDRESSING CHLOROQUINE-SENSITIVE *PLASMODIUM FALCIPARUM*

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Abstract: Highly susceptible to chloroquine, the most lethal type of malaria in humans is caused by *Plasmodium falciparum*. It is connected to numerous *P. falciparum* mutations. The protein known as chloroquine-resistant carrier functions as a transporter within the parasite's digestive vacuole envelope. In order to address P. falciparum strains (NF54) that are susceptible to chloroquine, this research applies QSAR modelling based on machine learning techniques to investigate potential structural modifications of 2-amino-thiazole analogues. The machine learning classifiers have been executed using the Python package on Google Collaboratory Notebook. The molecular descriptors used in the model were computed using the free PaDEL descriptor. The R2 values for RF, SVR, MLR, PLS, and OLS scores of the QSAR model constructed using a machine learning program remained at 0.7063, 0.6141, 0.9348, 0.7597, 0.7597, and 0.556, respectively, with a standard error value of 0.073. Results showed that the model's predictive ability was satisfactory, and it can be used for designing similar groups of antimalarial compounds. When we checked the predicted pIC50 values of the specific study molecules against those obtained from machine learning methods, we found a good fit between the model and the external database containing compounds. The result shows the advantages of applying such a cutting-edge approach to the discovery of new drug candidates, which could bridge a significant knowledge gap and create novel perspectives for medical research.

Keywords: *Plasmodium falciparum*, Antimalarial activity, Chloroquine-sensitive strain, 2-amino-thiazole derivatives, Machine learning, Python, QSAR

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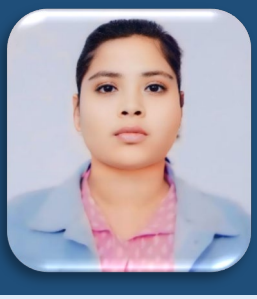
FROM MOSQUITO TO MAN: JOURNEY OF (PFEMP1) IN SEVERE MALARIA



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Abstract: Malaria, particularly caused by Plasmodium falciparum, remains one of history's deadliest diseases, causing over 500,000 deaths annually, predominantly affecting children under five. The disease severity is primarily mediated by PfEMP-1 (Plasmodium falciparum erythrocyte membrane protein-1), which modifies infected red blood cells (RBCs) and enables their adherence to blood vessel walls, a process known as sequestration. This sequestration process leads to three critical pathological events: impaired blood flow, vessel blockage, and inflammation. Certain PfEMP-1 variants specifically interact with the endothelial protein C receptor (EPCR) on blood vessel lining cells, resulting in vascular damage and severe complications. Recent research has identified human antibodies effective against different PfEMP-1 variants. These antibodies target the CIDR alpha 1 domain, which is responsible for EPCR interaction. Their mechanism of action involves recognition of three highly conserved amino acids within the CIDR alpha 1 region, effectively preventing parasite binding to vessel walls.

Keywords: Pathogenticity, Malignant, Deadly, Sequestration & Genus.

MULTICOMPONENT STRATEGIES FOR SYNTHESIZING PURINES AND PYRIMIDINES: BRIDGING EARLY LIFE CHEMISTRY WITH MODERN SUSTAINABLE DRUG DEVELOPMENT

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Abstract: As essential parts of nucleic acids, purines and pyrimidines are important for understanding the beginning of life as well as contemporary molecular biology. The creative application of multicomponent reactions (MCRs) for the effective synthesis of these heterocyclic molecules is explored in this abstract. These techniques offer insights into the evolutionary chemistry of life and open the door for sustainable approaches in medicinal applications by simulating the primordial conditions that may have assisted their early assembly. MCRs provide unmatched benefits in this regard, such as atom economy, ease of use, and the capacity to produce structurally varied libraries of bioactive molecules. This study examines how using these tactics not only emulates the resource-efficient processes found in nature but also tackles contemporary issues like quick drug development and green chemistry. It also looks at the history from primitive chemical landscapes to advanced synthetic techniques, emphasizing how these methods transform the creation of medicinal drugs that target the metabolism of nucleic acids and associated pathways. Purine and pyrimidine synthesis are important for both understanding the molecular origins of life and providing a basis for creative, sustainable medicinal chemistry solutions. This work emphasizes the significance of these processes.

Keywords: Origin of Life, MCRs, Purines, Pyrimidines, Green Chemistry, Sustainable Synthesis, Bioactive Molecules.

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NANOVACCINES: A NEW ERA IN THE FIGHT AGAINST INFECTIOUS DISEASES

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Abstract: Recent advances in nanotechnology have revolutionized vaccine development by enabling precise control over antigen presentation, enhanced immune responses, and improved stability. Nanovaccines utilize engineered particles ranging from 1-1000 nm to deliver antigens and immunostimulatory molecules to target cells efficiently. Various nanoplatforms, including lipid nanoparticles, polymeric nanoparticles, and inorganic nanocarriers, have demonstrated success in both prophylactic and therapeutic applications. The rational design of nanovaccines considers factors such as particle size, surface charge, morphology, and targeting ligands to optimize cellular uptake and immune system activation. Development strategies focus on selecting appropriate materials, incorporating antigens and adjuvants, and establishing reproducible synthesis methods. Manufacturing approaches have evolved to address challenges in scale-up production, quality control, and regulatory compliance. Current good manufacturing practice (cGMP) guidelines specifically adapted for nanovaccine production ensure consistent quality and safety. Advanced analytical techniques, including dynamic light scattering, electron microscopy, and chromatography, enable comprehensive characterization throughout the manufacturing process. Critical challenges include maintaining batch-to-batch consistency, ensuring sterility, and preserving stability during storage and transportation. Emerging technologies, such as microfluidic-based production and continuous manufacturing systems, offer promising solutions for large-scale nanovaccine production.

Keywords: Nanovaccines, Nanotechnology, Immunogenicity, Infectious diseases, SARS-CoV-2, Nanoparticles.

RECENT INNOVATIONS IN GASTRORETENTIVE FLOATING TABLETS

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Abstract: Gastroretentive floating tablets have emerged as a revolutionary approach in controlled drug delivery, offering enhanced therapeutic benefits for drugs with narrow absorption windows in the upper gastrointestinal tract. Recent innovations in floating tablet formulations have transformed drug delivery capabilities through advanced technological interventions and smart material integration. Natural polymers combined with synthetic matrices have shown exceptional floating capabilities exceeding 12 hours while maintaining controlled release profiles. The implementation of 3D printing technology has facilitated the creation of optimized internal structures, significantly improving tablet buoyancy and drug release patterns. Multi-unit floating systems have demonstrated superior performance in reducing dose dumping risks and achieving predictable gastric retention times. Quality-by-design principles have strengthened manufacturing processes, ensuring consistent product quality and performance. The incorporation of pH-responsive materials and dual-release mechanisms has substantially improved drug bioavailability and therapeutic efficacy. These advanced floating systems have shown particular success in treating *H. pylori* infections and conditions requiring sustained drug concentrations. Despite promising outcomes, challenges persist in large-scale manufacturing standardization and cost-effectiveness. The continuous evolution of materials science and fabrication technologies suggests increasing potential for gastroretentive floating tablets in enhancing therapeutic outcomes and patient compliance, particularly for drugs with absorption limitations in conventional dosage forms.

Keywords: Gastroretentive drug delivery, Controlled release, Gastointestinal tract, H.pylori, Buoyancy.

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A PROSPECTIVE STUDY ON COMORBIDITIES & TREATMENT PATHWAYS IN CHRONIC LIVER DISEASE AND CHOLELITHIASIS

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Abstract: Chronic liver disease and cholelithiasis frequently coexist due to altered bile metabolism and gallbladder dysfunction, leading to complex patient outcomes. A six-month prospective observational study conducted at a tertiary care hospital examined 200 cases (100 chronic liver disease, 100 cholelithiasis) to evaluate comorbidities, treatment approaches, and surgical interventions. Chronic liver disease complications included portal hypertension, ascites, splenomegaly, hepatopulmonary syndrome, hepatorenal syndrome, and hepatic encephalopathy. Cholelithiasis presented with complications such as gallbladder inflammation, choledocholithiasis, adenomyomatosis, adenomas, and gallbladder polyps. Common comorbidities in both conditions included diabetes mellitus, hypertension, coronary artery disease, chronic kidney disease, and jaundice. Primary pharmacological interventions for chronic liver disease included prednisolone, interferon alpha-2A, ursodeoxycholic acid, cholestyramine, naltrexone, and lactulose. Cholelithiasis treatment primarily utilized pantoprazole, ursodeoxycholic acid, morphine, hyoscyamine, and diclofenac sodium. Surgical management for chronic liver disease included transjugular intrahepatic portosystemic shunting and liver transplantation, while cholelithiasis treatment involved laparoscopic cholecystectomy and endoscopic retrograde cholangiopancreatography.

Keywords: Portal Hypertension, Splenomegaly, Gall Bladder Inflammation, Laparoscopic cholecystectomy, Adenomyomatosis.

PERSONALIZED CLINICAL TRIALS USING PATIENT SPECIFIC STEM CELLS FOR DISEASE MODELING

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Abstract: Stem cell research has revolutionized therapeutic approaches for previously untreatable conditions through various cell types, including human pluripotent stem cells (hPSCs), multipotent mesenchymal stem cells (MSCs), and induced pluripotent stem cells (iPSCs). These cells' self-renewal capabilities and differentiation potential make them invaluable tools in regenerative medicine. Clinical applications span multiple therapeutic areas, with iPSC technology demonstrating particular promise in modeling cardiovascular diseases, especially cardiomyopathy. Stem cell applications extend to cancer research, precision oncology, and neurodegenerative disorders such as Alzheimer's and Parkinson's disease, as well as diabetes. These treatments function through multiple mechanisms, including cellular differentiation, replacement therapy, and immunomodulation. Both embryonic stem cells (ESCs) and patient-specific iPSCs contribute significantly to disease modeling and drug discovery platforms. These approaches facilitate personalized medicine strategies and improve therapeutic outcomes across various pathological conditions.

Keywords: Immunomodulation, Protumor effect, Anti-tumor effect, Differentiation, Angiogenesis, Progenitor cells.

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PRECISION DOSING AND PHARMACOGENOMICS: A SUSTAINABLE PARADIGM IN DRUG DEVELOPMENT

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Abstract: Sustainable drug manufacturing is imperative in addressing critical environmental challenges and the increasing demands of global healthcare. Precision dosing, based on individual patient characteristics and genetic makeup, effectively minimizes drug wastage and prevents adverse effects, ensuring clinical outcomes support environmental sustainability. Pharmacogenomics identifies genetic markers associated with drug response, enabling precise drug development, streamlining production processes, and eliminating inefficient trial-and-error methods. These innovations enhance therapeutic efficacy while actively promoting eco-friendly practices by reducing resource consumption and minimizing chemical by-products in manufacturing. This paradigm shift directly tackles critical challenges in sustainable pharmaceutical development, including carbon footprint reduction and effective waste management. Pharmacogenomics, applied to biopharmaceutical optimization, showcases the clear potential of these technologies to enhance drug efficacy while driving environmental responsibility. Precision dosing empowers pharmaceutical companies to seamlessly align economic viability with ecological sustainability. Precision dosing and pharmacogenomics align patient-specific care with environmental stewardship, delivering a dual benefit of enhancing health outcomes and advancing a more sustainable pharmaceutical industry. Their integration addresses healthcare inequities and environmental challenges, redefining the pharmaceutical sector's role in achieving global sustainability objectives.

Keywords: Drug Development, Pharmacogenomics, Precision Dosing, Sustainable manufacturing, Innovation.

INNOVATIVE IDEAS FOR NOVEL EVALUATION METHODS IN PH- SENSITIVE DRUG DELIVERY PLATFORMS FOR SYSTEMIC CANCER TREATMENT

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Abstract: The concept of utilizing particulate formulations for drug delivery is a leading approach to address the shortcomings of conventional chemotherapy agents. The literature has extensively documented the shift towards more sophisticated multifunctional drug carriers. Currently, there is widespread acceptance of the potential of stimuli-responsive systems that can releases their payload in a controlled manner at the site of the lesion. While both internal and external stimuli are exerted for this purpose, the endogenic pH remains the more frequently used prompt. However, researchers face numerous obstacles in implementing this concept, including off-target accumulation of carriers, immune system reactions, difficulties in delivering drugs to intracellular targets, and challenges in producing carriers that meet all necessary criteria. Examines fundamental approaches to pH-responsive drug delivery, along with the constraints associated with the application of such carriers, and highlights the primary issues, shortcomings, and factors contributing to poor clinical outcomes. Additionally, we strove to define the attributes of an "ideal" carrier of a drug within various strategic frameworks, using metal-containing materials as an example and analyzing recent publications of these profiles through the lens. We anticipate this approach will aid in articulating the major challenges faced by experimenters and identifying the most favorable direction in the technological advancements.

Keywords: Cancer Treatment, Nanomedicine, Drug Delivery, Ph-Sensitivity, Intracellular Delivery, Nanoparticles, Metal-Frameworks.

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PATIENT CENTRIC DRUG DISCOVERY: AI AT THE FOREFRONT OF SUSTAINABILITY

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Abstract: Artificial intelligence (AI) is transforming drug development, establishing sustainable practices across the pharmaceutical value chain. It eliminates the inefficiencies of traditional drug discovery, which is resource-intensive, time-consuming, and environmentally taxing. AI enhances precision and efficiency at every stage, from target identification to clinical trials. With advanced technologies such as machine learning, deep learning, and natural language processing, AI rapidly analyses complex datasets, uncovers novel drug targets, and predicts molecular interactions with high accuracy. Virtual screening, powered by AI, minimizes reliance on physical experimentation, reducing chemical waste and conserving resources. Moreover, AI drives the design of environmentally friendly compounds, championing green chemistry and sustainable innovation. In manufacturing, AI-driven predictive models optimize processes with precision, increasing yields while significantly reducing energy consumption and waste. It streamlines clinical trials by accurately identifying suitable patient cohorts, leading to smaller trial sizes, shorter durations, and lower associated costs. Beyond development, AI enhances supply chain efficiency by effectively predicting demand and eliminating wastage from expired or unused drugs. With its ability to improve success rates and accelerate workflows, AI reduces the environmental footprint of drug development and aligns seamlessly with global sustainability goals. AI is reshaping the pharmaceutical industry into a sustainable, cost-effective, and patient-centered model by merging innovation with resource optimization.

Keywords: Artificial intelligence, Drug Discovery, Sustainability, Deep Learning, Technology, Manufacturing

NATURAL MUCILAGE: NOVEL DRUG DELIVERY SYSTEM

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Abstract: Natural mucilage and gums serve essential roles in drug delivery systems (DDS), particularly in modulating drug release kinetics under specific conditions. The evolution of DDS has been substantially enhanced by incorporating diverse excipients, including binders, thickeners, sweeteners, and glidants, which influence both the physicochemical characteristics of drug formulations and their pharmacological properties. These natural polymers are complex polysaccharides that decompose into simpler monosaccharides through hydrolysis. The hydrolysis products include pentosans (such as xylan) and hexoses (including starch and cellulose). Gums characteristically contain polyuronides - salts of potassium, calcium, and magnesium - while mucilage consists of polysaccharides esterified with sulfuric acid. Both substances share galactose and arabinose as fundamental sugar components, which can be identified through various chromatographic analyses. Natural gums present numerous advantages for pharmaceutical applications: they are economically viable, readily accessible, non-toxic, chemically modifiable, and generally biodegradable and biocompatible. These characteristics have positioned polysaccharide-based materials at the forefront of natural polymer research in drug delivery applications. Natural gums can be customized to create specialized drug delivery systems that compete effectively with existing synthetic excipients through chemical modification.

Keywords: Natural gums, Mucilage, Polysaccharides, Drug delivery, Medicinal, Biodegradable.

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UNMASKING THE SILENT INVADER: EXTRANODAL DIFFUSE LARGE B-CELL LYMPHOMA (DLBCL) MIMICKING RHEUMATIC DISEASES

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Abstract: Extranodal diffuse large B-cell lymphoma (DLBCL) is an uncommon variant of non-Hodgkin lymphoma originating outside lymph nodes, typically in the gastrointestinal tract, skin, or central nervous system. Its presentation often mimics autoimmune or inflammatory conditions, potentially leading to delayed diagnosis. An 18-year-old male presented with progressive diffuse joint pain over seven months, with acute worsening in the right shoulder and elbow during the previous five days. Associated symptoms included night sweats and loss of appetite for three days. Radiological examination revealed fractures of the surgical neck of the right humerus and left intercondylar region. Fine-needle aspiration cytology from the right distal humeral lytic lesion showed clusters of highly atypical cells with increased nucleus-to-cytoplasm ratio, nuclear pleomorphism, bi-nucleation, and fine granular chromatin, suggesting a "small round blue cell" tumor. Histopathological examination revealed sheets and cords of small round blue cells with extensive crush artifacts surrounded by desmoplastic stroma. Immunohistochemistry demonstrated positive staining for leucocyte cell antigen and CD-20, while CD-3 and pan-CK were negative, confirming a B-cell lymphoproliferative disorder. The final diagnosis was disseminated malignant DLBCL with primary bone involvement.

Keywords: B-cell Lymphoma, Nuclear pleomorphism, Gastointestinal tract, Autoimmune disease, Rheumatoid arthritis.