National Conference

BCRCPNATCON-2025

25th - 26th April 2025

SOUVENIR AND SCIENTIFIC ABSTRACTS

Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions

Organized by
IQAC, Dr. B. C. Roy College of Pharmacy & AHS
Durgapur (West Bengal)

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Subject: Well-Wishes for BCRCP-NATCON 2025 from NDLI and NDLI Club

To,
Dr. B.C. Roy College of Pharmacy & AHS,
Bidhannagar, Durgapur–713206

On behalf of the National Digital Library of India (NDLI) and the ever-growing NDLI Club community, I extend my warmest congratulations and best wishes as you prepare to host the National Conference **"BCRCP-NATCON 2025"** on April 25th–26th, 2025, centred on the theme **"Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions."**

This theme embodies a bold, forward-looking vision that resonates deeply with our shared mission to advance knowledge, drive innovation, and empower the next generation of researchers and learners. Your unwavering dedication to exploring uncharted frontiers in therapeutic research is both inspiring and impactful.

The NDLI and NDLI Club are honoured to be associated with an institution of your distinction—one that consistently upholds the highest standards of academic excellence and fosters a culture rooted in research and inquiry. The sustained enthusiasm and active engagement of the NDLI Club on your campus are a reflection of the dynamic learning environment you have cultivated—one that champions curiosity, collaboration, and creativity.

As BCRCP-NATCON 2025 brings together exceptional minds and ground-breaking ideas, we are confident that it will facilitate meaningful dialogue, foster innovative discoveries, and cultivate enduring collaborations that transcend traditional academic boundaries. This conference is not only a celebration of scientific advancement but also a significant stride toward shaping a healthier and more innovative future.

We wish the organising committee, speakers, participants, and attendees a truly enriching and successful conference. May BCRCP-NATCON 2025 be a beacon of insight, innovation, and inspiration for all.

With warm regards and best wishes,

Dr. B. Sutradhar

Joint Principal Investigator
National Digital Library of India (NDLI)
IIT Kharagpur.

National Conference

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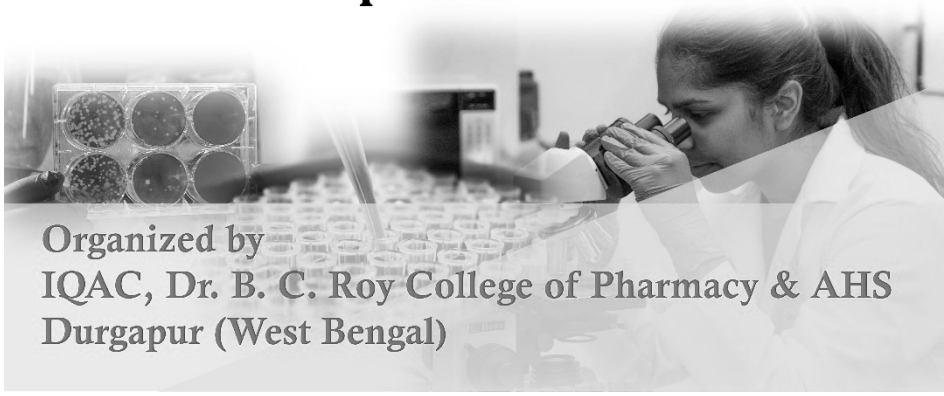

Organized by
IQAC, Dr. B. C. Roy College of Pharmacy & AHS
Durgapur (West Bengal)

About Us

Dr. B. C. Roy College of Pharmacy and Allied Health Sciences (BCRCP), established in 2005 in Durgapur, West Bengal, India is a premier institution dedicated to nurturing industry-ready pharmaceutical technologists. Ranked 94th in the Pharmacy category by the NIRF in 2024, BCRCP offers programs including D. Pharm, B. Pharm, and M. Pharm, with the B. Pharm program reaccredited by the NBA for 2023-2026 and a B++ grade accreditation from NAAC for 2022-2027.

About the Conference

"Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions" represents a bold vision for the future of healthcare, where innovation and collaboration redefine the landscape of treatment and care. As medical science advances, the need for cutting-edge solutions that transcend traditional boundaries has never been more urgent. From harnessing the power of artificial intelligence and precision medicine to exploring new frontiers in gene therapy and regenerative medicine, the next wave of therapeutic solutions promises to unlock unprecedented potential. By pushing the limits of current knowledge and technology, researchers and clinicians are opening doors to more personalized, effective, and accessible treatments. These breakthroughs offer the hope of not only improving quality of life but also providing long-term cures to previously untreatable conditions, ultimately transforming the way we approach health and healing

প্রদীপ কুমার মজুমদার
ভারপ্রাপ্ত মন্ত্রী
পঞ্চায়েত ও গ্রামোন্নয়ন দপ্তর এবং
সমবায় দপ্তর
পশ্চিমবঙ্গ সরকার

सत्यमेव जयते

Pradip K Mazumdar
MINISTER-IN-CHARGE
Department of Panchayats & Rural Development and Department of Co-operation
Govt. of West Bengal

8th April, 2025

MESSAGE

I am pleased to acknowledge your invitation to inaugurate the National Seminar titled "Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions", organized by Dr. B. C. Roy College of Pharmacy and Allied Health Sciences.

It is with great honour that I convey my consent to attend the National Seminar at the newly established M. L. Schroff Auditorium and enrich myself.

I look forward to being a part of this prestigious event and interacting with the distinguished participants. I commend your institution's commitment to advancing pharmaceutical education and innovation.

I wish the National Seminar on "Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions", organized by Dr. B. C. Roy Society, Durgapur, a grand success.

Pradip K Mazumdar

Shri Tarun Bhattacharya
General Secretary,
Dr. B. C. Roy Society
Durgapur, West Bengal

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Message from the Chief Patron

It is my distinct pleasure to welcome you to our conference , themed “Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions.” I am thrilled to expect so many passionate individuals gathered here, united by our commitment to advancing the field of pharmacy and enhancing patient care.

In recent years, we have witnessed remarkable innovations that challenge traditional paradigms in therapeutics. From groundbreaking biologics to the integration of artificial intelligence in drug discovery, the landscape of healthcare is evolving at an unprecedented pace. This CME aims to explore these advancements, highlighting how we can transcend conventional boundaries to develop more effective and personalized therapeutic solutions.

Across sessions, we will engage with leading experts who will share their insights on emerging therapies, novel drug delivery systems, and the role of pharmacists in interdisciplinary healthcare teams. Our discussions will not only broaden our understanding but also inspire us to think creatively about our roles in shaping the future of pharmacy practice.

I encourage each of you to actively participate, ask questions, and share your perspectives. Together, we can foster an environment of collaboration and innovation that will benefit our profession and the patients we ultimately serve.

Thank you for being here and for your dedication to lifelong learning. Let’s embark on this journey beyond boundaries, as we pioneer the next wave of therapeutic solutions.

Warm regards,

Dr. Satyajit Bose,
Chairman, The Mission Hospital, Durgapur
& President, Dr. B.C. Roy Society, Durgapur

Message from the General Secretary

Dear Esteemed Guests, Participants, and Experts,

It is with great pleasure and anticipation that I welcome you to the national conference, "Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions," hosted by Dr. B. C. Roy College of Pharmacy and Allied Health Sciences. As the General Secretary of Dr. B C Roy Society, I am honored to extend my heartfelt greetings to each of you.

This conference represents a unique opportunity for us to come together, share knowledge, and explore innovative solutions that transcend traditional boundaries in the field of therapeutics. Our vision at BCRCP is to transform into a global center of learning, fostering an environment where creativity and excellence thrive. This event is a testament to our commitment to advancing pharmaceutical science and improving healthcare outcomes.

We are privileged to have distinguished experts, researchers, and industry leaders join us for this conference. Your presence and contributions are invaluable, and we look forward to the insightful discussions and collaborations that will emerge from this gathering. It is our hope that this conference will not only inspire new ideas but also forge lasting partnerships that will drive the next wave of therapeutic advancements.

On behalf of the entire BCRCP community, I extend a warm welcome to all participants. May this conference be a fruitful and enriching experience for everyone involved. Together, let us push the boundaries of pharmaceutical science and pave the way for a healthier future.

Warm regards,

Tarun Bhattacharya
General Secretary
Dr. B C Roy Society
Managing
Dr. B. C. Roy College of Pharmacy and Allied Health Sciences

Message from the Chief Advisor

DR. B.C. ROY SOCIETY

25 YEARS OF EXCELLENCE

Prof. (Dr) Saikat Maitra
Chief Advisor
Dr. B.C. Roy Society
(Former Vice Chancellor, MAKAUT, WB)

It gives me immense pleasure to extend my heartfelt congratulations to Dr. B.C. Roy College of Pharmacy and Allied Health Sciences, Durgapur, for organizing the National Conference – ***BCRCP NATCON 2025*** on the 25th and 26th of April, 2025.

This prestigious event stands as a testament to the institution's unwavering commitment to academic excellence, research advancement, and professional development in the field of pharmaceutical and allied health sciences. By bringing together academicians, researchers, industry experts, and students on a common platform, the conference paves the way for insightful discussions, knowledge sharing, and innovative collaborations that are essential for addressing contemporary healthcare challenges.

I extend my best wishes for the grand success of **BCRCP NATCON 2025** and hope that it inspires new ideas, ignites intellectual curiosity, and strengthens the academic and professional community.

Prof. (Dr) Saikat Maitra
Chief Advisor
Dr. B.C. Roy Society

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Message from the Chairman

Esteemed Guests, Speakers, and Attendees,

Welcome to the conference, "Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions." This event brings together leading experts, innovators, and thought leaders in healthcare and therapy to explore and share groundbreaking advancements that transcend traditional boundaries. Over the course of this conference, we will delve into cutting-edge therapies, new methodologies, and revolutionary technologies poised to transform the healthcare landscape. Engage in meaningful discussions, challenge existing paradigms, and foster collaborations that will pave the way for a new era in therapeutic solutions. We are excited to have you here and look forward to thought-provoking conversations, inspiring presentations, and invaluable connections. Together, we can push the limits of innovation and shape the future of patient care.

Principal
Dr. B. C. Roy College of Pharmacy & AHS, Durgapur (BCRCP),
West Bengal

Message from the Convener

It gives me immense pleasure to welcome you all to *"Beyond Boundaries: Pioneering the Next Wave of Therapeutic Solutions"* organized by **Dr. B. C. Roy College of Pharmacy & Allied Health Sciences, Durgapur**. This event marks a significant step in our ongoing mission to foster innovation, collaboration, and critical thinking in the pharmaceutical and allied health sciences.

In today's dynamic healthcare landscape, the need for groundbreaking therapeutic solutions is greater than ever. Emerging diseases, drug resistance, and global health challenges demand novel approaches, interdisciplinary insights, and a spirit of relentless inquiry. Through this platform, we aim to bring together brilliant minds from academia, industry, and research to share ideas, explore trends, and envision the future of patient care.

This seminar is not only a celebration of knowledge but also a call to action—for students, scholars, and professionals to think beyond conventional boundaries. It is through such collaborative engagements that we can truly redefine the possibilities of therapy, drug development, and clinical innovation. We are proud to host discussions that span across modern drug design, biotechnology, regulatory challenges, and integrative approaches that reflect the evolving nature of global healthcare.

I extend my sincere gratitude to all our distinguished speakers, contributors, faculty members, and student volunteers whose dedication has made this event possible. Your participation reaffirms our shared commitment to academic excellence and societal well-being.

Let this gathering be a spark for new ideas, partnerships, and pathways. Together, let us pioneer a future where healthcare is more effective, accessible, and sustainable.

Warm regards,
Dr. Souvik Basak,
Professor
&
In-Charge, Division of Pharmaceutical Chemistry
Dr. B. C. Roy College of Pharmacy & Allied Health Sciences, Durgapur

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Content

Plenary Lecture 1

Prof. Bhaswat S. Chakraborty
President, Foresee Consultants, Ahmedabad and Toronto
Former Professor, Emeritus, Ganpat University & Nirma University
Former senior VP & Chair, R&D Core Committee, Cadila Pharma

Topic: Productive and Innovative Pharmaceutical Research in India: Opportunity Areas for Upcoming Pharmaceutical Scientists

Abstract:

The world scenario of pharmaceutical innovations and research & development in general is somewhat enigmatic right now. On one hand, developed nations are facing gaps like increasing R&D expenses, reduced efficiency, and burden of their specific diseases. On the other hand, countries like India are mainly focusing on generic drugs and low-cost innovations. This presentation will first review the history and enormous contributions of Indian R&D and industry in pharmaceuticals, including Biotechnology derived drugs, despite somewhat restricted scope of innovative projects. While Government of India initiatives like PRIP (Promotion of Research and Innovation in Pharma Medtech Sector) are beginning to show positive results, private sector comprising of a good number of Pharma companies are actively engaged in innovative research and development. Pharmacy and Biotech graduates, young scientists thereof, have tremendous opportunities in all major areas of Pharmaceutical and Biotech R&D, production, sales and administration to say the least. The context of this presentation warrants that we discuss some decisive aspects of relevant research like the True and False Positives of research outcomes and briefly review the principles of the marketing approvals given by the leading FDAs worldwide.

We shall discuss some case studies and examples of low budget and yet innovative approaches to drug development worldwide. Some of these approaches are readily suitable for India and provide career opportunities for our aspiring scientists. Examples include, but not limited to, Simulation Research, Generic Drug Development, Complex Generics, Real-World Evidence, Publicly Funded Research, Vaccines and Orphan Drugs. We will go through each example for clarity. We will also take a look at the potential employers and recognition of young scientists in India.

Plenary Lecture 2

Dr. Aniruddha Roy
Associate Professor | Department of Pharmacy
Birla Institute of Technology & Science, Pilani | Rajasthan

Topic: Tumor-Responsive Nanomedicine: A Synergistic Strategy Targeting Cancer and Its Microenvironment

Abstract:

Traditional cancer therapies have primarily focused on eradicating tumor cells, but this single-target approach has often proven insufficient due to the complex nature of cancer. Tumors are not isolated entities; they thrive within a dynamic tumor microenvironment (TME) composed of cancer cells and various supporting components that promote growth, immune evasion, and drug resistance. As a result, advanced treatment strategies now aim to target both the cancer cells and the supportive TME components. Emerging evidence suggests that multidimensional therapies, which employ rational drug combinations to disrupt multiple aspects of the tumor ecosystem, hold great promise in enhancing treatment efficacy. However, achieving precise tumor-targeted delivery of such therapies remains a significant challenge.

Nanomedicine offers a powerful solution by enabling the targeted delivery of synergistic drug combinations directly to the tumor site. In this work, we developed novel TME-responsive nanoparticles capable of delivering multi-drug formulations with high specificity. These nanoparticles are designed to release their therapeutic cargo in response to the tumor's microenvironmental cues, allowing for simultaneous targeting of both the tumor cells and key components within the TME. By addressing both cellular and environmental drivers of tumor progression, these multidimensional nanoparticles have the potential to improve therapeutic outcomes and reduce systemic side effects.

Plenary Lecture 3

Prof. Subramanian Natesan
Professor (and Registrar)
NIPER Kolkata

Topic: Yeast Microcapsule for efficient delivery of drugs for the treatment of ulcerative colitis.

Abstract:

The use of bioinspired or biomimetic systems such as yeast microcapsules are the most encouraging and multimodal system for delivering therapeutic molecules via the oral route and gained more attention due to their characteristics such as biocompatibility, biodegradability, stabilization of the loaded drug, control release, conjugation, and immune cell targeting ability. However, premature drug release has hindered its applicability in oral drug delivery. Chitosan have been frequently used for stabilization of premature release of the drug from a carrier system through surface coating. The present talk will address the study on the evaluation of *in-vivo* efficacy of cefadroxil in ulcerative colitis treatment and to formulate and characterized cefadroxil loaded YM coated with chitosan. In vivo efficacy study in mouse model shows good therapeutic activity by improving disease pathology, strong anti-oxidant activity, reducing the expression of inflammatory biomarkers and cell infiltration. YM showed irregular, porous structure with size 2.833 ± 0.72 µm. The % entrapment was 92.54% and drug loading was 79.14%. The 0.5, 1, and 1.5% of chitosan coated YM showed a regular spheroidal shape with a size of 2.781 ± 0.06 µm, 3.034± 0.16 µm, and 3.336 ± 0.15 µm respectively. Moreover, drug-excipient interaction studies show no sign of interaction with a release of 60% in intestinal pH in 24h. In the in vivo mouse model, the formulation shows good therapeutic activity and also achieved colon targeting.

In another study, a Janus kinase inhibitor tofacitinib citrate which is approved for treating ulcerative colitis was encapsulated within yeast microcapsules employing two different biopolymer system and chitosan/sodium alginate. Tofacitinib citrate-loaded yeast microcapsule, tofacitinib citrate loaded chitosan\sodium alginate-yeast microcapsule was characterized for its size, morphology, entrapment, loading and release study. The raw yeast microcapsule have showed irregular, porous structure with size 2.4 um. However, chitosan and sodium alginate yeast microcapsule with a size of 2-5 um and 2-3 um respectively. The encapsulation efficiency was found to be 40-60 % and a drug loading was found to be 3-6%. In addition, for all formulation drug-excipient interaction studies with the help of FT-IR, DSC, and Powder XRD shows no sign of interaction. The in vitro drug release results showed a delayed release behaviour. With this positive results it can be concluded that yeast microcapsule can be a potential carrier for targeting the later part of the colon.

Plenary Lecture 4

Dr. Krishnangshu Ray
Medical Director, Peerless Hospital and B.K. Roy Research Centre.
Former Director, School of Tropical Medicine, Calcutta Medical College

Topic: Good Clinical Practice: Overview and Guidelines in Clinical Trial

Abstract:

Good Clinical practice (GCP) is considered as the statutory norms applicable to all procedures while conducting Clinical Trial of new molecules and devices suggesting scientific and ethical human experimentation throughout the globe. It has conceptualized after IInd World War when drug development explosion has emerged. new regulatory measures like Helsinki Declaration (1964) and Nuremberg Trial (1946) were formulated in consideration to respect, safety, autonomy and justice pertaining to the human volunteers. These guidelines were further strengthened by European concepts termed as International Council of Harmonization (ICH). ICH-GCP guideline has formulated several Standard Operating Procedures (SOP) which binds all stakeholders related to Clinical Trials. Those include Investigator, Sponsor, Monitor, Institutional Ethics Committee (IEC) and Regulatory Agencies (licensing Authority). Contents of Informed Consents, constitution of IEC and Compensation procedures in Trial related Injuries and other aspects. Lastly, generation of good data and its analysis with interpretation is the chief objective of GCP. GCP is always amendable since it has got some constraints. Role of a Biostatistician is also important for unbiased designing, randomization, and data management. In one word, GCP is the combination of Good Data + Ethics. The aim of GCP is to discover effective, safe and affordable medicines in the society. Scientific Protocol and GCP guided human experiments could bring out pro-people, Essential and Rational medicines for the community at large.

Plenary Lecture 5

Prof. Animesh Ghosh
Professor
Department of Pharmaceutical Sciences and Technology
BIT Mesra

Topic: Pharmaceutical Cocrystal: Design, Characterization, and Bioavailability Assessment in Healthy Human Volunteers

Abstract:

This research employed crystal engineering to enhance the physicochemical properties of Pirfenidone (PFD) and Acetazolamide (ACZ). For PFD, cocrystals with FA and TA were developed to reduce solubility and sustain drug release, resulting in a tablet formulation that extended release to 12 hours (vs. 45 min for PIRFENEX®) while maintaining bioequivalence in human studies. For ACZ, a 1:1 cocrystal with PABA significantly improved solubility, permeability, flowability, and tablet ability, enabling a direct compression tablet with twice the bioavailability of DIAMOX®. The study demonstrates Cocrystallization as a powerful tool to optimize drug performance and simplify tablet manufacturing for challenging APIs.

Plenary Lecture 6

Dr. Amita Barik
Faculty
Department of Biotechnology, NIT Durgapur

Topic: Intrinsically Disordered Proteins in Therapeutics and Drug Discovery

Abstract:

Intrinsically Disordered Proteins (IDPs) and regions (IDRs) challenge the traditional structure-function paradigm by functioning without a stable three-dimensional structure. Unlike the structured proteins, they have dynamic flexibility, which enables them to participate in a wide range of molecular interactions, including cellular signaling, regulation, and stress response pathways. A significant number of disease-associated proteins, particularly in cancer, neurodegenerative and cardiovascular disorders are enriched with IDRs.

Despite the challenges posed by their structural heterogeneity, IDPs present exciting new opportunities in therapeutics and drug discovery. They carry the ability to engage in multiple interactions, undergo structural transitions, and modulate key signaling pathways, thereby making them useful as the drug targets. Recently, IDPs have gained increasing attention for therapeutic purposes, marking a shift in drug discovery strategies toward targeting these dynamic and flexible biomolecules. Strategies like stabilizing disorder-to-order transitions with small molecules, modulating the interactions, and employing targeted protein degradation, are now being explored to therapeutically use the IDPs.

BCR/NATCON/25/O-001

STUDIES ON THE ROLE OF DRIED ETHANOLIC EXTRACT OF AGARICUS BISPORUS IN THE TREATMENT OF DEPRESSION IN MICE

Sushruta Chakraborty[1], Samir Kumar Samanta[1], Souvik Basak[1]

[1] Dr. B. C. Roy College of Pharmacy and Allied Health Sciences, Durgapur, West Bengal, India.

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Depression, a pervasive mental illness affecting over 322 million individuals globally, is a leading cause of medical and physical disability. Standard treatments often result in adverse effects, including addiction and physical dependence, necessitating exploration of alternative natural remedies. This study aimed to evaluate the anti-depressant potential of dried ethanolic extract of *Agaricus bisporus* (EEAB) in Swiss albino mice through various models. The extract was standardized, and its dose-dependent efficacy was assessed. Chronic anti-depressant effects were determined using the optimal dose, supported by brain bioamine estimation.

Statistical analysis of observed results demonstrated significant anti-depressant activity of EEAB at 200 mg/kg and 400 mg/kg doses in a dose-dependent manner. High-performance liquid chromatography revealed the presence of stigma sterol within the EEAB extract. Notably, treatment with EEAB at 400 mg/kg resulted in the up regulation of serotonin, a critical neurotransmitter involved in anti-depressant activity. These findings suggest that EEAB exhibits substantial anti-depressant effects, potentially mediated through serotonin modulation, highlighting its therapeutic potential as a natural alternative for managing depression. Detailed studies (methodology and result) will be discussed during presentation.

Keywords: Depression, high-performance liquid chromatography, serotonin, dopamine, stigmasterol, white button mushroom.

BCR/NATCON/25/O-002

QUERCETIN LOADED NANOLIPOSOME FOR THE TREATMENT OF ALZHEIMER'S DISEASE

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Quercetin is incorporated in nanoliposomes to make use of its neuroprotective properties in combating Alzheimer's disease. Herbal component quercetin derived from edible sources, plays crucial role in memory and cognitive enhancements, but these benefits of quercetin are limited by its poor aqueous solubility and excessive first pass metabolism. The objective of this study is to incorporate quercetin in nanoliposome to make use of its neuroprotective properties in combating Alzheimer's disease. Piperine is also incorporated in the liposome, as a bioenhancer. Dual loading of quercetin and piperine into liposomes is anticipated to prevent rapid metabolism, improve bioavailability, and ultimately provide superior neuroprotective effects. Nanoliposomes were prepared by thin film hydration technique. In vitro characterization included drug release study, drug entrapment efficiency, FTIR, and zeta potential analysis. In vivo behavioral studies, including the Morris Water Maze, Elevated Plus Maze, and Novel Object Recognition tests, were employed in a

scopolamine-induced amnesia mouse model. The neuroprotective potential of the nanoliposomes was evaluated by measuring brain acetylcholinesterase activity and assessing their efficacy in attenuating amyloid-β plaque formation. Nanoparticles size was measured to be around 100nm. FTIR spectra confirm no drug polymer interation. Liposomes shows significant improvement in the learning and memory. The liposomes inhibited whole brain acetylcholinesterase activity thus it could increase the availability of acetylcholine in brain cholinergic synapse and reduced amyloid β plaque formation in vitro. The aforementioned studies indicate that quercetin and piperine loaded liposomes exhibit a significantly greater neuroprotective effect than quercetin alone in scopolamine induced amnesia in Swiss albino mice.

Keywords: Quercetin, piperine, nanoliposome, amnesia, Alzheimer's disease

BCR/NATCON/25/O-003

EXPLORING THE THERAPEUTIC POTENTIAL OF AQUEOUS EXTRACT OF *BUTEA MONOSPERMA* STEM BARK IN ULCERATIVE COLITIS

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Ulcerative colitis is a chronic, relapsing and destructive inflammatory disorder of the gastrointestinal tract which mainly affects the colonic mucosa and submucosa. In ayurveda, stem barks of *Butea monosperma* are widely used for the treatment of diarrhea and gastrointestinal diseases. This study aimed to explore the therapeutic potential of *B. monosperma* stem bark in ameliorating ulcerative colitis by utilizing in-silico (network pharmacology), in-vitro and in-vivo studies. Firstly, the common targets between the phytoconstituents which were obtained from LC-MS/MS analysis of aqueous extract of *B. monosperma* stem bark (BME) and disease related targets were retrieved from different databases and then they were introduced for protein-protein interaction, GO and KEGG pathway analysis. Then molecular docking and dynamics were done between the phytoconstituents and the key regulated proteins. After that different in-vitro studies were done to evaluate the anti-inflammatory and anti-oxidant effect BME. Then, the rats were pretreated with different doses BME from day 0 to 14. Ulcerative colitis was induced by intrarectal administration of TNBS on day 7. During this period different colitis parameters were evaluated. On day 15 the animals were sacrificed and colon weight/length, colon mucosal damage index and biochemical parameters were estimated. Results of network pharmacology and molecular docking predicted the pathways and proteins that are modulated by *Butea monosperma* in ulcerative colitis. Results indicates the anticolitic effects of stem bark of *Butea monosperma* and thus validates its traditional claims. Further, molecular studies need to be carried out to explore its mechanism of action.

Keywords: *Butea monosperma*, GO, KEGG, molecular docking and ulcerative colitis

BCR/NATCON/25/O-004

HIGH THROUGHPUT IN-VITRO HUMAN LIVER MICROSOMAL INHIBITION POTENTIAL STUDY OF QUINIDINE WITH SPECIAL EMPHASIS TO CYP INHIBITION

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In an aging society, polypharmacy has become a significant public health and economic concern. The overuse of medications, especially among patients with cardiovascular diseases, presents major

health risks. One common consequence of polypharmacy is the increased incidence of adverse drug events, primarily due to drug-drug interactions. The majority of currently available drugs are metabolized by cytochrome P450 (CYP450) enzymes, and interactions arising from shared CYP450-mediated metabolic pathways among two or more drugs are common. High-throughput drug-drug interaction screening using liquid chromatography-mass spectrometry (LC-MS) is a powerful method for identifying potential drug interactions. The present investigation aimed to evaluate the effect of Quinidine, an antiarrhythmic agent, on different CYP isoforms. Specifically, the impact of Quinidine on the metabolism of several standard cardiovascular agents (Propranolol, Diltiazem, Ezetimibe, Nicardipine, Pindolol, Amiodarone, and Verapamil) was studied using human liver microsomal (HLM) stability assays in the presence or absence of Quinidine. A cytochrome P450 inhibition assay was performed using CYP-specific substrates—Tacrine (CYP1A2), Diclofenac (CYP2C9), Dextromethorphan (CYP2D6), Midazolam (CYP3A4), Amodiaquine (CYP2C8), Bupropion (CYP2B6), and S-Mephenytoin (CYP2C19)—at their respective Km values. A probe substrate-based LC-MS/MS method was developed for all CYP isoforms. Metabolite formation was analysed following the incubation of probe substrates with HLM in the presence or absence of Quinidine. The inhibitory effect of Quinidine was characterized using kinetic parameters, including IC50 values. The results revealed that Quinidine reduced the clearance value of Propranolol by twofold when Propranolol was incubated with human liver microsomes in the presence of Quinidine. However, the clearance values of Diltiazem, Ezetimibe, Nicardipine, Pindolol, Amiodarone, and Verapamil remained unchanged. The probe substrate-based CYP inhibition study indicated that Quinidine selectively inhibits CYP2D6, with an IC50 value of 0.048 µM. As Propranolol is a substrate of CYP2D6, its clearance was reduced upon incubation with Quinidine. The findings of this study demonstrate that Quinidine inhibits CYP2D6, significantly impacting the metabolism and clearance of Propranolol. These results underscore the importance of understanding CYP-mediated drug interactions, particularly in patients undergoing polypharmacy for cardiovascular conditions.

Keywords: LC-MS/MS, high-throughput screening, drug metabolism, microsomal stability, cyp450 inhibition, bioanalytical method, pharmacokinetic profiling.

BCR/NATCON/25/O-005

STUDIES ON THE INFLUENCE OF *MARSILEA MINUTA* EXTRACT ON EXPRESSION AND DEVELOPMENT OF ETHANOL-INDUCED LOCOMOTOR SENSITIZATION IN MICE

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Altering the serotonin system has been shown to play a role in influencing the development of sensitivity to ethanol. *Marsilea minuta Linn* was reported for anti-fertility activity , in vitro antibacterial activity , anxiolytic activity , sedative and anticonvulsant activity , anti-inflammatory and analgesic activity , antidepressant activity, adaptogenic and antistress activity and hypo cholesterolemic activities. However, no reports are currently available regarding its role in ethanol-induced behavioral sensitization. Hence, this study aims to investigate this aspect using a previously established animal model of ethanol-induced locomotor sensitization. The

results showed that *Marsilea minuta* (100, 200, 400 mg/kg, orally), administered prior to the ethanol challenge dose (2.4 g/kg, intraperitoneally), significantly and dose-dependently reduced the expression of sensitization. Furthermore, when *Marsilea minuta* (100, 200, 400 mg/kg, orally) was given before ethanol administration on days 1, 4, 7, and 10, it significantly inhibited both the development (on days 1, 4, 7, and 10) and the expression (on day 15) of sensitization to ethanol's locomotor-stimulating effects. *Marsilea minuta* alone did not influence locomotor activity and had no effect on blood ethanol concentrations. These findings suggest that *Marsilea minuta* may inhibit the development and expression of ethanol-induced locomotor sensitization, potentially through interaction with 5-HT3 receptors.

Keywords: 5-HT3 receptor, behavioural sensitization, ethanol, locomotor activity, Marsilea minuta, serotonin

BCR/NATCON/25/O-006

STUDIES ON THE EFFECTS OF DRIED ETHANOLIC EXTRACT OF *MARSELIA M8INUTA* ON ETHANOL WITHDRAWAL-INDUCED ANXIETY IN MICE

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Alcoholism is closely linked to disruptions in mood, impulse control, and reward systems, largely influenced by serotonin. Serotonin affects dopamine release, reinforcing alcohol use. Chronic alcohol use disrupts serotonin function, worsening mood, impulsivity, and stress, which promotes continued drinking. Treatments targeting the serotonin system, like SSRIs and receptor modulators, show promise, but further research is needed to improve their effectiveness The study sought to examine the impact of a dried ethanolic extract of *Marsilea minuta* on anxiety and anhedonia in mice undergoing alcohol withdrawal. A total of 55 male/female mice were assigned to 11 different groups, each consisting of 5 animals. In the present study, *Marsilea minuta* Linn has been shown to possess a range of pharmacological activities including anti-fertility, in vitro antibacterial, anxiolytic, sedative, anticonvulsant, anti-inflammatory, analgesic, antidepressant, adaptogenic, antistress, and hypocholesterolaemia activities. However, there is currently no available evidence regarding its potential role in managing ethanol-induced withdrawal symptoms. Ethanol dependence was established in mice by administering a liquid ethanol diet for 10 days. On the 11th day, withdrawal led to peak anxiety observed at the 6th hour. Both acute and chronic treatments with *Marsilea minuta* Linn (200, 400 mg/kg orally) significantly reduced anxiety levels. Acute treatment was given 10 minutes before peak anxiety, while chronic treatment was administered throughout the 10-day period. On the 11th day, anxiety levels were evaluated using the Elevated Plus Maze (EPM) test.

Keywords: $5HT_3$ receptor, behavioural study, ethanol, Marsilea minuta, serotonin, withdrawal symptoms.

BCR/NATCON/25/O-007

AN INVESTIGATION ON THE THERAPEUTIC POTENTIAL OF STEM BARK DECOCTION OF *HOLARRHENA ANTIDYSENTRICA* THROUGH IN-VITRO METHODS AND AN EXPERIMENTAL RAT MODEL OF HEMORRHOIDS

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The stem bark decoction of *Holarrhena antidysenterica* are used traditionally by various tribes and in the Ayurvedic system of medicine for the treatment of hemorrhoids or piles. Despite the Ayurvedic use of stem bark decoction of *Holarrhena Antidysenterica* in hemorrhoids (piles), no studies have been scientifically evaluated for its pharmacological efficacy of stem bark decoction of *Holarrhena Antidysenterica* in rectal inflammation in experimental animals. Hence, the present study assessed the effect of on croton oil-induced hemorrhoids in rats. The stem-bark was standardized, before evaluating its toxicity and pharmacological activity studies. it can be interpreted that the stem bark of *Holarrhena Antidysenterica* are of requisite quality as per the standards laid down in Ayurvedic Pharmacopoeia of India. In in-vitro study antioxidant (DPPH, and H_2O_2 scavenging assay) and inti-inflammatory (Protein denaturation inhibition study) models are done. In acute oral toxicity studies, the cage side observation showed that stem bark decoction of *Holarrhena antidysenterica* did not cause any signs of alterations in the parameters. In in-vitro studies, the decoction was found to have antioxidant and anti-inflammatory properties. Further, results of in vivo studies revealed that application of croton oil preparation with exposure for 10 sec caused induction of hemorrhoids as indicated by the significant increase in Evans blue concentration and anorectal tissue index as compared to normal animals. Treatment with stem bark decoction for 7 days significantly ameliorated hemorrhoidal parameters suggesting its curative effects. The study further validates the traditional use of stem bark decoction of *Holarrhena Antidysenterica* in hemorrhoids.

Keywords: *Holarrhena Antidysenterica,* hemorrhoids, inflammation, traditional medicine, antioxidant

BCR/NATCON/25/O-008

EFFECTS OF HYDROALCOHOLIC EXTRACT OF *NEOLAMARCKIA CADAMBA* LEAVES IN REGULATING CARBOHYDRATE METABOLISM ENZYMES

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Diabetes mellitus, especially Type 2 Diabetes (T2D) escalating worldwide and becoming menace to the society due to economic burden associated with lifelong usage of synthetic drugs for its management. Therefore, globally it has shown interest, mainly in scientific and healthcare community to exploring medicinal plants as potential alternative for safer, more affordable diabetes management. *Neolamarckia cadamba* (Kadamba) is a medicinal plant traditionally utilized for its diverse therapeutic properties. The present study was designed to perform the pharmacognostic study and the effects of the hydroalcoholic extract of *Neolamarckia cadamba* leaves on key enzymes involved in carbohydrate metabolism, namely α-amylase and α-glucosidase, alongside its antioxidant potential and safety profile. The pharmacognostic study established the standard profile for the accurate identification of *Neolamarckia cadamba.* Toxicity study was conducted successfully and the extract proved to be safe. Potential antioxidant activity was observed, with ability of the Hydroalcoholic extract to show extended inhibition of carbohydrate metabolism enzymes, to emerge as a promising candidate for future treatment of Diabetic state.

Keywords: Enzyme inhibition, hydroalcoholic extract, *Neolamarckia cadamba*, safety profile, type 2 diabetes

BCR/NATCON/25/O-009

PHARMACOGNOSTIC PROFILE, A-GLUCOSIDASE, AND A-AMYLASE INHIBITION POTENTIAL AND TOXICITY EVALUATION OF HYDROALCOHOLIC EXTRACT OF *ZIZIPHUS MAURITIANA* BARK (HEZMB)

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Ziziphus mauritiana is a valuable medicinal plant whose all parts have a wide range of therapeutic uses. Among them bark is the one whose exploration for medicinal effects is insufficient. In our study thus we have incorporated the bark to evaluate the crude medication's quality and purity by using physicochemical analysis, which comprised total ash, acid-insoluble ash, extractive values, and moisture content. The existence of important bioactive components was validated by phytochemical analysis. For safety use, toxicity was conduced as per OECD guidelines -425 & 408.Further therapeutic establishment of the Hydroalcoholic extract of bark was evaluated by determining its in vitro antioxidant and α-amylase and α-glucosidase inhibitory potential to combat the hyperglycemia. The obtained results indicate the bark as the rich source of antioxidant and its promising inhibitory potential in regulation of the enzymes of post prandial glucose level. These findings affirm the therapeutic promise and safety of *Ziziphus mauritiana* hydroalcoholic bark extract, supporting its traditional use and providing a foundation for future pharmacological and clinical investigations.

Keywords: Antioxidant activity, α-amylase and α- glucosidase inhibition, toxicity study, *Ziziphus mauritiana.*

BCR/NATCON/25/O-010

INVESTIGATIONS ON THE EFFECT OF MARSILEA MINUTA ON ETHANOL-INDUCED INTESTINAL PERMEABILITY DISRUPTION IN RODENTS

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A study conducted in India identified alcohol as the most commonly used psychoactive agent. Data suggest that 14.6% of the population aged 10– 75 consuming it. Of this group, 5.2% exhibited problematic use, while 2.7% were dependent. Interestingly men had notably higher usage rates (27.3%) compared to women (1.6%) and children aged 10–17 (1.3%). These statistics highlight the alarming health consequences associated with alcohol consumption and alcohol use disorders (AUD). The most severe and costly medical complications linked to AUD include intestinal and liver diseases. A high percentage of chronic heavy alcohol users develop various digestive disorders. It is widely accepted that alcohol's negative effects are mediated by components of the normal gut flora, which act as pathogens when they invade non-gut tissues. These pathogens travel from the intestine through the venous portal system to the liver, where they exert direct effects or induce hepatic inflammation. The mechanisms by which alcohol compromises the intestinal barrier and increases gut permeability, thereby enabling the translocation of pathogens ("alcohol induced gut leakage"), are well-documented. *Marsilea minuta* Linn, a pteridophyte of the family Marsileaceae, is an aquatic and amphibious plant with roots embedded in soil, mud, or shallow pools. The sporophytic plant, commonly known as four-leaf clover, water clover, pepperwort, or water shamrock, is referred to as Sushni in parts of India. The present study investigates the potential of *Marsilea minuta* in mitigating alcohol-induced intestinal barrier disruption and reducing gut permeability by reducing oxidative stress generated on metabolism by CYP2E1.

Keywords: *Marsilea minuta*, intestinal permeability, ethanol-induced gut damage, oxidative stress, rodent model

BCR/NATCON/25/O-011

HERBAL TONIC OF KALANCHOE PINNATA FOR PROTECTING LUNGS.

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This study investigates the effects of Kalanchoe pinnata (Kp) and its flavonoids, quercetin (QE) and quercitrin (QI), on mast cell activation and allergic airway inflammation. In vitro results revealed that Kp and QE significantly suppressed degranulation and cytokine release in bone marrow-derived mast cells triggered by IgE/FcΛRI (Immunoglobulin E

(IgE) binds to Fc epsilon receptor I) crosslinking, while QI showed no such activity. In vivo, Kp and QE reduced airway hyperresponsiveness, inflammation, goblet cell metaplasia, and levels of IL-5: Interleukin 5 IL-13: Interleukin 13 and TNF (Tumor Necrosis Factor alpha) highlighting their potential in modulating allergic responses. Kalanchoe pinnata, native to Madagascar, is rich in bioactive compounds such as flavonoids, terpenes, phenolic acids, and saponins, known for their anti-allergenic, anti-inflammatory, and antioxidant effects. The plant was also studied for its protective role against bifenthrin-induced lung injury in Wistar rats. Results showed dose-dependent lung protection, with greater efficacy at lower doses. Its constituents influence key biological processes like oxidative stress, apoptosis, cell proliferation, and epigenetic regulation, suggesting therapeutic potential in cancer and toxin-induced damage. With a broad spectrum of pharmacological benefits—including anti-diabetic, antimicrobial, and anticancer activities—Kalanchoe pinnata is widely used in traditional medicine, reflecting the global reliance on plant-based treatments for managing oxidative stress-related conditions. Herbal tonic, made from natural extracts like tulsi, ginger, turmeric, and orange peel, offer antioxidant and antibacterial benefits. Used to treat coughs and colds, they're cost-effective, safe, and easy to make at home. Quality is assessed by pH, density, specific gravity, and taste or appearance.

Keywords: Kalanchoe pinnata, allergic airway inflammation, lung injury

BCR/NATCON/25/O-012

EXPLORING THIAZOLIDINEDIONE-LINKED INDOLE AND FURAN HYBRIDS: MICROWAVE-ASSISTED SYNTHESIS, *IN SILICO* & *IN VITRO* EVALUATION FOR ANTIBACTERIAL ACTIVITY

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Our entire world is a vast sea of microorganisms, some of which are beneficial to our health, while others are detrimental to it. A massive number of marketed anti-bacterial medications are available, but they all come with some disadvantages. Some have toxicity problems, some come with target specificity problems, and others arise with adverse effects. So, intending to overcome these problems, we have introduced thiazolidinedione-linked indole and thiazolidinedione-linked furan moieties, two novel series of compounds by implementing a microwave synthesizer. We confirmed their structure by IR spectrophotometry and NMR. A molecular docking study was performed using Maestro 12.5 and found all of the compounds had a good binding affinity with Glucosamine 6-phosphate (PDB ID: 2VF5) Protein. Compound RBS 7 appeared with the highest docking score of -10.6 Kcal/mol. An in-vitro study was performed on *Staphylococcus aureus* and *Escherichia coli* bacterial species by calculating the zone of inhibition. Most of the compounds show very good activity. The zone of inhibition of compound RBS 7 is the nearest to the standard drug ciprofloxacin.

Keywords: Thiazolidinedione, microwave-assisted synthesis, anti-microbial, molecular docking, spectral analysis.

BCR/NATCON/25/O-013

UNVELLING STRUCTURAL REQUIREMENT OF NOVEL INDOLE & PYRROLE, BASED ON ATR INHIBITORS BY VALIDATED AND PREDICTIVE 2D-QSAR ANALYSIS

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Ataxia telangiectasia-mutated and Rad3-related protein (ATR) is crucial in the DNA damage response in cancer cell. It senses replication stress, enabling DNA repair by activating checkpoints, arresting the cell cycle, and aiding fork recovery. ATR inhibition makes the cancer cells more vulnerable to PARP inhibitors, chemotherapy and radiotherapy rendering ATR inhibitors as promising leads for anticancer therapy. In the current investigation, we performed 2D-Quantitative Structure Activity Relationship (2D-QSAR) analyses with thirty-five indole and pyrrole[2,3-dpyrimidin] based ATR inhibitors to understand crucial structural features responsible for higher inhibitory potentials against ATR. The structures were subjected to descriptor calculation with Dragon software and two different categories of models were constructed with all descriptors and with limited number of interpretable descriptors. Stochastic and non-stochastic feature selection methodologies were employed to generate multiple linear regression (MLR) models. Overall, significant improvement in statistical quality was observed when all descriptors were recruited indicating that less interpretable graph-based topological descriptors are crucial to develop predictive models for the dataset. The most predictive model based on all descriptors (Model 1) showed Q^2_{LOO} and R^2_{Pred} of 0.834 and 0.793, respectively. On the other hand, the most predictive interpretable model (Model 2) was found to have R^2_{Pred} of 0.729 and 0.800, respectively. Edge adjacency descriptor Eig11_EA (ri) appeared as the most significant negatively contributing descriptor of the most predictive model. Both models showed importance of pyrrole ring for higher inhibitory potential. Additionally, the interpretable model predicted that the presence of sulphonyl group also helps in improving activity of the compounds.

Keywords: ATR, 2D-QSAR, MLR, Q^2_{Loo}, R^2_{Pred}

BCR/NATCON/25/O-014

STUDY OF BINDING INTERACTIONS OF PYRAZOLE AND OXAZOLE SCAFFOLDS AS BACE-1 PROTEIN INHIBITORS

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Protein fibrillation is a biological process wherein proteins undergo misfolding,

resulting in the formation of large, insoluble aggregates. These misfolded proteins initially aggregate into soluble oligomers, which are considered highly toxic intermediates, in case of CNS related disorders or Alzheimer's disease (AD). Mostly, AD is caused due to formation of insoluble protein aggregates by abnormal cleavage of β-secretase (β-site Amyloid Precursor Protein Cleaving Enzyme-1 or BACE-1) enzyme.Researchers observed pyrazole & oxazole derivatives have demonstrated the potential to inhibit protein fibrillation.Thus, BACE-1 is selected as target protein and ligands were designed on the basis of newer research areas in AD. Natural product, Curcumin derivatives were selected as scaffold and pyrazole and isoxazole heterocycle were introduced in the 1, 3-diketone region. The designed compounds from the library was docked against β-secretase (BACE-1) and validated by exploring its drug likeliness and *in silico* toxicity. The docking score of the ligand and ligand-protein interactions result indicated that the ligand could reach the active site of BACE-1. This research investigates the comparative study of the curcumin derivatives effectiveness against protein fibrillation. *In silico* study exhibits strong binding interactions with the active site of BACE-1 (Asp 28, Asp 228, Gly 34, Ser 35, Tyr 71, Thr 72, Thr 232, & Gly 11). Pyrazole & oxazole derivatives genuinely bind with the maximum active site of the protein. This research aims to contribute to the development new derivatives & novel strategies for preventing and treating protein misfolding diseases.

Keywords: Fibrillation, aggregates, β-secretase, pyrazole, isoxazole

BCR/NATCON/25/O-015

DESIGN, SYNTHESIS, AND ANTI-MICROBIAL EVALUATION OF CERTAIN BACTERIAL DNA GYRASE INHIBITORS

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The demand for new antimicrobial medicines with distinct modes of action has increas ed due to the widespread rise of bacterial strains that are resistant to antibiotics. An established and appealing target for the development of antibacterial drugs is DNA gyrase, a type II topoisomerase that is necessary for bacterial DNA replication. In this work, a new class of DNA gyrase inhibitors is designed, synthesized, molecularly docked, and biologically evaluated.

To find molecular scaffolds with a high affinity for the DNA gyrase B subunit's ATP-binding region, a structure-based drug design methodology was used. AutoDock and PyRx were used in molecular docking investigations, which showed a good binding relationship. Promising candidates were chosen for synthesis based on docking scores and binding energy profiles.

IR, NMR, and mass spectrometry were used to characterize the chosen compounds, which were created by multi-step synthesis procedures. Using enzymatic tests, the compounds' in vitro inhibitory activity against bacterial DNA gyrase was assessed.

Several compounds had strong inhibitory effects, with IC_{50} values in the low micromolar range. The target-specific mode of action was supported by the docking results' strong correlation with IC_{50} data.

According to the study, these substances show promise as lead candidates for the creation of novel antibacterial drugs that target the bacterial DNA gyrase.

Keywords: DNA gyrase inhibitors, Molecular docking, AutoDock, PyRx, IC_{50} values, Topoisomerase II, ATP-binding site

BCR/NATCON/25/O-016

EXPLORING CINNAMIC ACID DERIVATIVES AS α-GLUCOSIDASE INHIBITORS USING 2D-QSAR ANALYSIS

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α-Glucosidase inhibitors are compounds that block the activity of the enzymes α-glucosidase that are responsible for carbohydrate digestion. These inhibitors are widely studied and used in the treatment of type 2 diabetes mellitus and other metabolic disorders to control postprandial hyper glycemia. Various literature reports insinuated that different cinnamic acid derivatives may be effective in inhibiting α-Glucosidase enzyme and may act as potential anti-diabetic agents. In this work, we gathered 77 newly developed cinnamic acid derivatives, the biological activity of which were determined by the same protocol against α-Glucosidase. The dataset was used for the development of 2D-QSAR models using AlvaDesc descriptors. The structures of the compounds were prepared from their SMILES notations and standardised by CDK software. Subsequently, AlvaDesc descriptors were calculated after Rdkit based geometrical optimization. Two feature selection strategies namely SFS (sequential forward selection) and GA (genetic algorithm) were employed to select five descriptors for MLR (multiple linear regression) based model generation after splitting the dataset into a training set (80%) and a test set (20%). In SFS-MLR, we used four different scoring functions and two cross-validation strategies. Finally, the most predictive model appeared with reliable statistical internal and external predictivity ($Q^2LOO > 0.6$ and $R^2Pred > 0.5$). The most predictive model helped understanding which structural features may be responsible for higher binding affinity of compounds towards α-Glucosidase. The QSAR model was developed following OECD guidelines applicable for 2D-QSAR modelling and may be considered in future development of pharmaceutical for the treatment of diabetes mellitus.

Keywords: QSAR, 2D QSAR, Enzyme inhibition, α-Glucosidase inhibitors, AlvaDesc descriptors, diabetes mellitus, genetic algorithm

BCR/NATCON/25/O-017

DEVELOPMENT OF A SYNERGISTIC ANTIMICROBIAL STRATEGY USING SILVER NANOPARTICLES, GUAVA LEAF OIL, AND ENDURACIDIDINE ANALOGUE TO COMBAT TOPICAL DRUG- RESISTANT INFECTIONS

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Antimicrobial resistance (AMR) has emerged as a critical challenge in treating hospital-acquired infections, particularly those affecting post-surgical wounds, where conventional topical treatments often fail. In response, this study focuses on developing a novel, multi-component antimicrobial strategy by combining silver nanoparticles (AgNPs), guava leaf essential oil, and a synthetic enduracididine analogue. AgNPs were synthesized and characterized through UV-Vis spectroscopy, dynamic light scattering (DLS), and energy-dispersive X-ray (EDX) analysis, confirming a surface plasmon resonance peak at 385 nm and a hydrodynamic diameter of 78 nm. Guava oil, extracted via hydro-distillation, underwent GC-MS analysis, revealing 37 phytochemicals, 17 of which were cross-referenced with the IMPPAT database for biological relevance. The enduracididine analogue, confirmed by IR, NMR, and mass spectrometry, exhibited significant antimicrobial activity, with 84.76% inhibition of *Staphylococcus aureus* at a concentration of 80 µg/mL. Biocompatibility of AgNPs was validated through hemolytic assays, ensuring their safe application in topical formulations. The antimicrobial potential of each agent was assessed individually and in combination against multidrug-resistant (MDR) bacterial strains, demonstrating enhanced efficacy through synergism. Current efforts are directed toward the isolation of milk-derived antimicrobial peptides using enzymatic hydrolysis and RP-HPLC, which will be integrated with the above components into a hydrogel for controlled drug release. This approach aims to provide a next-generation topical antimicrobial therapy, reducing AMR complications and healthcare costs while improving patient outcomes through a targeted, biocompatible formulation.

Keywords: Silver nanoparticles, guava leaf oil, enduracididine analogue, antimicrobial resistance, milk peptides.

BCR/NATCON/25/O-018

DEVELOPMENT AND ANALYTICAL CHARACTERIZATION OF AN ANTI-INFLAMMATORY HYDROGEL INCORPORATING COPPER NANOPARTICLES AND ENDURACIDIDINE ANALOGUE FOR TOPICAL WOUND TREATMENT

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Inflammation is a key pathological process in various chronic and acute diseases,

necessitating the development of effective therapeutic agents. This study focuses on the formulation and evaluation of an anti-inflammatory hydrogel incorporating copper nanoparticles (CuNPs) and an enduracididine analogue. Copper nanoparticles are known for their potent anti- inflammatory, antimicrobial, and wound-healing properties, while enduracididine, a rare non- proteinogenic amino acid, plays a crucial role in modulating immune responses. The hydrogel matrix was optimized for controlled drug release and enhanced bioavailability. CuNPs were synthesized using a green chemistry approach to ensure biocompatibility and stability. The enduracididine analogue was chemically synthesized and characterized to assess its purity and functional efficacy. The hydrogel was prepared using a biocompatible polymer system, incorporating CuNPs and the analogue through a sustained-release formulation. The physicochemical properties of the hydrogel, including viscosity, swelling behavior, and mechanical strength, were evaluated to ensure suitability for topical application. The anti- inflammatory potential of the hydrogel was assessed through in vitro assays, including nitric oxide inhibition and cytokine suppression studies on macrophage cell lines. In vivo evaluation using an animal model of inflammation demonstrated significant reduction in pro- inflammatory markers, confirming the synergistic effect of CuNPs and the enduracididine analogue. Additionally, biocompatibility studies indicated minimal cytotoxicity and good skin penetration, making the hydrogel a promising candidate for therapeutic use. This novel hydrogel formulation offers a dual-functional approach by combining the metal-based anti- inflammatory properties of CuNPs with the bioactive potential of enduracididine derivatives. The results highlight its potential in managing inflammatory disorders and wound healing applications. Further studies on clinical translation and stability enhancement will be pursued to establish its pharmaceutical viability.

Keywords: Anti-inflammatory hydrogel, copper nanoparticles, enduracididine analogue, cytokine suppression, nanomedicine.

BCR/NATCON/25/O-019

EXPLORING THE ANTI-INFLAMMATORY AND ANTIMICROBIAL POTENTIAL OF COPPER NANOPARTICLES LOADED ELLAGIC ACID FOR OCULAR INFLAMMATION

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Ellagic acid is a natural polyphenolic compound known for its anti-inflammatory, antioxidant, and antimicrobial properties. Despite its therapeutic promise, its poor aqueous solubility, limited stability, and low ocular bioavailability restrict its clinical application

in ocular drug delivery. To address these limitations, copper nanoparticles (CuNPs) were developed as a potential nanocarrier system for ellagic acid. Copper itself possesses inherent antimicrobial and tissue-regenerative properties, making it a synergistic carrier for treating ocular conditions. In this study, ellagic acid-loaded CuNPs were synthesized using a chemical reduction method and optimized by varying parameters such as metal salt concentration, reducing agent volume, and reaction time. The developed nanoparticles exhibited an average particle size of around 100-150nm and zeta potential values suggested stable dispersions. Scanning Electron Microscopy (SEM) was carried out for morphology studies; drug encapsulation efficiency of around 80-85% was exhibited by all formulations with high drug loading efficiency. FTIR and XRD analyses were performed to study drug-polymer interactions and crystallinity which confirmed compatibility of drug with excipients. The in vitro release studies showed a drug release profile of around 60% over 8hours. Biological assessments including DPPH assay (antioxidant), agar diffusion method (antimicrobial), carrageenan-induced paw edema model (anti-inflammatory), transcorneal permeation studies, and HET-CAM test (ocular irritancy) confirmed ocular uptake and anti-inflammatory activity. MTT assay suggested no toxicity to viable cells. The results demonstrated that ellagic acid-loaded CuNPs significantly enhanced bioavailability, exhibited by strong antimicrobial action, and effectively reduced inflammation, indicating their potential as a promising nanotherapeutic strategy for ocular inflammation.

Keywords: Ellagic acid, copper nanoparticles, ocular inflammation, nanocarriers, anti-inflammatory activity, antimicrobial potential

BCR/NATCON/25/O-020

FORMULATION, CHARACTERISATION, AND *IN VITRO* ANTI-MICROBIAL STUDY OF HERBAL BIGEL

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In the 21st century the topical phytopharmaceuticals become a promising alternative to synthetic pharmaceuticals worldwide, considering their wide accessibility with limited side effects. The present study deals with the fabrication, and characterization of olive oil-based *Lantana camara* essential oil (2%V/V) loaded Span 80-Tween 80-HPMCK15M bigel. The preparation method of bigels followed the combined principles of fluid fiber mechanism and hot gelation technique and subjected to physico-chemical parameters, drug release profile, rheological, thermal, X-ray diffraction, stability studies and *in vitro* anti-microbial activity via the Kirby-Bauer method (against *Propionibacterium acnes*, MTCC 1951). FT-IR study revealed compatibility among the components of yellowish-

white coloured bigels. All the formulations exhibited pseudoplastic flow behaviour confirmed by Ostwald-de Waele modified power model and were satisfactorily stable till five freeze-thaw cycles. The endothermic peak (ΔH_m: 569.1J/g) at 108.5°C (T_m) demonstrated the enhanced amorphousity of the essential oil loaded bigel in comparison to the drug alone. The amorphous nature (78.2%) of the best bigel formulation was observed, indicating remarkable essential oil release profile (89.3%±2.5 at 8h) via non-Fickian diffusion and followed Higuchi kinetics with desirable t_{50} value (3±1.2h). The average zone of inhibition (9mm) with the requirement of minimum inhibitory concentration (62.5 µg of Lantana essential oil loaded bigel) suggested the herbal bigel as a potent topical gel matrix for the treatment of acne.

Keywords: Higuchi kinetics, Kirby-Bauer method, Non-Fickian diffusion, pseudoplastic flow, *Propionibacterium acnes*

BCR/NATCON/25/O-021

DESIGN AND OPTIMIZATION OF BCS CLASS II DRUG LOADED NANOFRMULATION

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Self nano emulsifying drug delivery system (SNEDDS), an isotropic mixture having nano sized globules, is comprised of oils, surfactants and co-surfactants. The objective of present work is to fabricate and optimize SNEDDS of anti-hypertensive BCS class II drug (Nicardipine hydrochloride) via Box Behnken design for improving dissolution profile of the drug. Pseudo ternary phase diagram was developed for selecting the concentration ranges of oleic acid (oil), Tween 20 (surfactant), PEG 200 (co-surfactant), and water required for the fabrication of experimental design. The Nicardipine hydrochloride loaded liquid self nanoemulsifying formulations was optimized via polynomial quadratic model on each dependent factor (droplet size, self emulsification time and cumulative percentage drug release at 1h) and characterised on the basis of physic-chemical parameters, thermal and stability study. Further to enhance the stability and patient compliance, the powdered form of optimized formulation was compressed in tablet and again evaluated. The optimized drug loaded SNEEDS, comprising of oleic acid (15.001%V/V), Tween 20 (29.948%V/V), PEG 200 (20.926%V/V), demonstrated nano ranged droplet size (70nm±1.3), minimum self emulsification time (36s±0.9), and 89.2±1.2% of drug release

(at 1h) following Higuchi kinetics. The percentage bias lies within the range of -2.77 to +0.63% and the formulation was found to be stable. Moreover, the *in vitro* drug release of both liquid and solid form of self nanoemulsifying drug delivery system were found to be 4.32-4.4 fold increased than pure drug suspension suggesting the formulations as potential candidate for further *in vivo* study.

Keywords: Box Behnken design, Higuchi kinetics, PEG 200, self nano emulsifying drug delivery system, Tween 20

BCR/NATCON/25/O-022

INVESTIGATION OF SOLVENT EFFECTS ON THE DESIGN AND CHARACTERIZATION OF TELMISARTAN-MALEIC ACID COCRYSTALS FOR ENHANCEMENT OF SOLUBILITY AND DISSOLUTION

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Cocrystallization has gained attention as an effective strategy to enhance the solubility of drugs with low water solubility, without compromising their chemical stability. This research explores the application of cocrystal formation to improve the solubility and dissolution profile of telmisartan, a poorly soluble antihypertensive drug. The study specifically examines how different solvent systems influence the development of telmisartan-based cocrystals. Cocrystals were produced through the solvent evaporation method using varying molar ratios of telmisartan and maleic acid across different solvents. Initial assessments of the resulting cocrystals included melting point analysis, visual examination under a trinocular microscope, solubility study, determination of drug content, and *in-vitro* dissolution study. Further structural and morphological features were studied through FESEM, while compatibility between the drug and coformer was confirmed using FTIR. The findings revealed that the telmisartan-maleic acid cocrystals demonstrated a marked improvement in both solubility and dissolution rate compared to pure telmisartan. These enhancements suggest that cocrystallization is a viable crystal engineering method for improving the bioavailability of telmisartan. In conclusion, the formation of these multicomponent systems not only modified the drug's physicochemical behavior but also established the potential of cocrystals as a practical tool in pharmaceutical formulation, especially for drugs with limited aqueous solubility.

Keywords: Cocrystals, solubility, dissolution, stability, solvent evaporation method, crystal engineering method

BCR/NATCON/25/O-023

IN-SITU NANOEMULGEL: DEVELOPMENT AND OPTIMIZATION OF A NOVEL OPHTHALMIC CARRIER SYSTEM FOR CURCUMIN

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The development of effective ocular drug delivery systems poses significant challenges due to the eye's protective barriers and rapid elimination mechanisms. This study focuses on the formulation and optimization of an *in-situ* nanoemulgel-based ophthalmic drug delivery system for curcumin, a natural polyphenolic compound known for its potent anti-inflammatory, antioxidant, and anti-microbial properties. Despite its therapeutic potential, curcumin's clinical application in ocular treatments is limited by its poor aqueous solubility and low bioavailability. To overcome these challenges, a nanoemulsion system was first developed using a high-energy emulsification technique, with carefully selected surfactants and co-surfactants to boost both solubility and formulation stability. The formulated nanoemulsion was subsequently embedded within a thermosensitive gelling matrix, ensuring ease of administration and prolonged precorneal retention. The final nanoemulgel formulation was characterized by gelation time, spreadibility, viscosity, gelling capacity, drug content study, etc. The findings suggest that this *in-situ* forming nanoemulgel could serve as an effective system to enhance curcumin delivery and therapeutic impact in managing anterior eye disorders.

Keywords: Curcumin, thermosensitive gelling matrix, bioavailability, ocular drug delivery, *in-situ* nanoemulgel.

BCR/NATCON/25/O-024

EXPLORING COUMARIC ACID/PULLULAN-BASED PRODRUG NANOPARTICLES WITH A-AMYLASE INHIBITORY AND ANTIOXIDANT POTENTIALS

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Over last few years, prodrug nanoparticles have received overwhelming attentions of the researchers. The current research strives aimed to develop grafted coumaric acid (CA)/pullulan (Pull) based conjugates (CA-*g*-Pull) and their nanoparticles to estimate their α-amylase inhibition and antioxidant capabilities. In this milieu, Steglish esterification was exploited to graft flexible amounts of CA onto Pull skeleton. The subsequent conjugates were subjected to structural characterization with ^{1}H NMR, DSC, TGA, XRD, FTIR and SEM analyses. These conjugates exhibited spontaneous self-aggregation in an aqueous media to yield nanoparticles (F-1 – F-3), with acceptable particle sizes (277-295 nm), PDI values (0.311-0.461) and zeta potentials (-11 to -21 mV). TEM analyses exposed spherical structures of the prodrug nanoparticles. Among several formulations, F-3 with maximum CA contents conferred an improved free radical (DPPH, ABTS) stabilizing and α-amylase inhibitory abilities. These nanoparticles also displayed extremely lower hemolytic activity, ascribed to their better cytocompatibility. Therefore, the developed

formulation could be deployed as potential biomaterials with significant α-amylase inhibitory activities and antioxidant potentials.

Keywords: Biomaterials, cytocompatibility, prodrug nanoparticles, steglish esterification

BCR/NATCON/25/O-025

Development of tailor-made biopolymer based hybrid films as packaging materials for foods

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The aim of this research work was to achieve pectin/tamarind gum (TG) grafted caffeic acid (CA) based biodegradable hybrid films as packaging materials for foods. The CA was primarily linked with TG through carbodiimide-mediated esterification reaction and the resulting conjugates (TG-*g*-CA) were consequently combined with pectin to afford hybrid films (F-3). The structural, thermal, crystallinity, morphological properties and surface charges of TG/CA conjugates and hybrid films (F-3) were characterized. Further, various physicochemical properties, biological activities and food storage capabilities of F-3 were evaluated and compared with the reference films (F-1, Pectin and F-2, Pectin/TG). Among several films, F-3 showed a higher porosity (30 %), water vapor transmission rate (WVTR, 2050.35 g.day-1.cm^{-2}), mechanical strength and soil burial biodegradation pattern. The films also exhibited acceptable antioxidant and antibacterial properties and delayed the decomposition of the sliced apples. Thus, the newly developed pectin/TG-*g*-CA based hybrid films could be exploited as packaging materials for foods to enhance their self-life.

Keywords: Esterification reaction, food products, phytoconstituents, polysaccharides.

BCR/NATCON/25/O-026

BIOACTIVE INSITU GEL POWDERS OF FERULIC ACID-MODIFIED NATURAL POLYMERS FOR NEXT GENERATION WOUND DRESSINGS

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The current research focused on the development of Guar gum/ ferulic acid-grafted tamarind gum (FA-g-TG/GG) powder-based wound dressings designed to undergo in-situ gelation upon interaction with wound exudated. In situ gels for wound exudates are smart biomaterials that transition from powder to gel upon application, promoting controlled drug release, moisture retention, and enhanced wound healing by adapting to the wound microenvironment. FA was grafted onto TG using the Steglich esterification method, and the synthesized conjugates were then integrated with GG before undergoing lyophilization to yeild dry powders (F-1 to F-3). These powders had an average particle size of 5.10–

5.54 µm and an angle of repose of approximately 30°. Structural characterization was conducted and morphological differences were observed among pure TG, FA-g-TG, and FA-g-TG/GG powders (F-2), along with exhibiting a spectrum of negative surface charge (zeta potential) (-11.06 mV to -25.50 mV). Among the formulations, F-2 exhibited an optimal powder-to-gel transition time (~20 min), a favourable water vapor transmission rate (WVTR, 2564.94 ± 32.47 g/m²/day), and excellent swelling (4559.00 ± 41.57%) and water retention capacities in wound fluid. Moreover the powders did not demonstrate any cytotoxic effects, revealed promising antioxidant properties, and encouraged fibroblast activity including motility and binding to the surfaces, indicating their wound-healing potential. Overall, these in situ self gelling powders hold promise as next generation wound dressing aimed at enhancing wound management.

Keywords: Wound, in-situ gels, steglich esterification, lyophilization, cytotoxic

BCR/NATCON/25/O-027

DESIGN AND DEVELOPMENT OF TELMISARTAN-BENZOIC ACID COCRYSTALS: AN APPROACH FOR ENHANCEMENT OF SOLUBILITY AND DISSOLUTION

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This study focuses on improving the solubility & dissolution of Telmisartan, a BCS class II drug, using a cocrystallization approach. Cocrystallization has proven to be a promising method for improving the solubility of less soluble drugs without altering their therapeutic efficacy. In this study, telmisartan cocrystals were developed using benzoic acid as a coformer with the aim of modifying its physicochemical properties. Various concentrations of the coformer were employed during formulation, and investigate the influence of coformer concentrations and the effects of solvent systems on melting point, solubility and *in-vitro* dissolution of the prepared cocrystals and select the optimized formulation. Characterize the optimized telmisartan-benzoic acid cocrystals of each solvent system by FESEM, FT-IR, etc. FESEM imaging confirmed the formation of new crystal structures, indicating successful interaction between telmisartan and benzoic acid. FT-IR analysis further supported the compatibility between the drug and coformer. The results demonstrated a significant improvement in both solubility & dissolution of telmisartan when processed into cocrystals with benzoic acid. These findings indicate that selecting an appropriate coformer and optimizing the formulation process can effectively improve the drug's biopharmaceutical performance. In conclusion, the study highlights cocrystallization as a valuable strategy for enhancing the solubility of telmisartan, potentially leading to better oral bioavailability and therapeutic effectiveness.

Keywords: Bioavailability, cocrystallization, coformer, *in-vitro* dissolution, solubility

BCR/NATCON/25/O-028

PREPARATION AND EVALUATION OF RIBOCICLIB LOADED SOLID LIPID NANOPARTICLES FOR THE TREATMENT OF BREAST CANCER

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The present study focuses on the targeted design and assessment of solid lipid nanoparticles administered orally. aiming to address the intrinsic limitations of chemotherapeutic agents. Ribociclib was employed as a model drug for breast cancer treatment to mitigate its bioavailability challenges. Oral dose of drug is 600mg'day and oral formulation necessitates use of comparatively high dose in order to achieve desired concentration in target tumour cells. Compritol 888 ATO based solid lipid nanoparticles were prepared. by solvent diffusion method. The prepared particles exhibited mean particle size of 78 1 nm with polydispersity index value 0.55 quite high zeta potential value of 56.SmV influence higher stability. Entrapment efficiency of the formulation varies from 48.59+1.88 to 5|+0.53% depending on the formulation variables. Higher concentration of Compritol ATO 88S provides denser matrix which results in more sustained release of day over time.

Keywords: Solid lipid nanoparticles, breast cancer, ribociclib, Compritol 888 ATO, chemotherapy

BCR/NATCON/25/P-001

ROLE OF GSK-3B NEUROINFLAMMATORY MEDIATOR IN PARKINSON'S DISEASE

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Glycogen synthase kinase-3β (GSK-3β), is a multifunctional serine/threonine kinase playing a role in the pathogenesis of PD via its role in neuroinflammation. Recent evidence indicates that activation of GSK-3β has the potential to worsen dopaminergic neurodegeneration in part via modulation of inflammatory pathways of microglia and astrocytes that increase proinflammatory cytokine (i.e., TNF-α, IL-6, IL-1β) production. Here, current knowledge of how GSK-3β contributes to the neuroinflammation in PD is synthesized by summarizing the ways in which GSK-3β interacts with the major signaling cascades such as NFκB, NLRP3 inflammasome, and the Wnt/β-catenin. Oxidative stress, mitochondrial dysfunction and α synuclein aggregation are dysregulated in neurotoxic GSK-3β beyond the murine model to further amplify these processes. Additionally, GSK-3 enhibitors are protective in preclinical models decreasing neuroinflammation and protection of dopaminergic neurons. Nevertheless, selective GSK-3β modulators are still challenging to develop because GSK-3β has broad physiological functions. Aside from discussing crosstalk between GSK-3β and other disease related PD pathways (autophagy,

synaptic dysfunction), this review also provides an overview of its contribution to PD progression. This paper also highlights the importance to understand the role of GSK-3β in neuronal survival and inflammatory responses, revealing the mechanistic importance of dual role of GSK-3β in neuronal survival and inflammatory responses and under emphasizes the need for further research of the target interventions, these may be able to mitigate neuroinflammation, without disrupting essential cellular functions. This may lead to new ways for treatment of PD based on blockage of the GSK-3β's involvement in PD.

Keywords: GSK-3β, neuroinflammation, Parkinson's disease, microglia, cytokines, neurodegeneration, therapeutic target

BCR/NATCON/25/P-002

DRUG-COATED BALLOON IN PERIPHERAL ARTERIAL DISEASE

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Drug-Coated Balloon in Peripheral Arterial Disease mainly helps in healthcare system and plays a crucial role in minimising the risk of re narrowing of the artery wall. Peripheral arterial disease (PAD) is highly common atherosclerotic disease which is caused due to the accumulation of fats, cholesterol and other substances in the artery wall that supply the blood to the limbs usually legs, become narrowed or blocked known as critical limb ischemia. This reduces blood flow to the leg, causing symptoms such as leg pain, cramping. The major risk factors of this disease are smoking, hypertension, hyperlipidaemia, obesity. The advanced PAD therapy drug-coated balloons (DCBs) delivers minimally invasive rehabilitation of the peripheral arteries by providing restenosis prevention with antiproliferative drug coatings. Therapeutic substance is applied to balloons before angioplasty which allows direct coating on the artery wall for stopping both neointimal hyperplasia development and vessel restenosis. This review investigates the working principle and performance together with the safety features of DCBs in PAD treatment of femoropopliteal and below-the-knee arterial segments. DCB technology shows better clinical results than drug-eluting stents because it avoids complications such as failure while eliminating in-stent restenosis and making them suitable for treatment of extensive hardened vessel lesions. Drug-coated balloon innovation now comprises new coating structures that enhance medicine delivery speed and biocompatible agents which enhance their overall effectiveness. The endovascular treatment utilizes DCBs as a promising therapy which provides PAD patients with efficient therapy along with minimized risks for extended complications.

Keywords: Drug coated balloons (DCB), peripheral arterial disease (PAD), critical limb ischemia, endovascular therapy, angioplasty

BCR/NATCON/25/P-003

A DUAL PERSPECTIVE ON DEMENTIA MANAGEMENT IN ALZHEIMER'S: NATURAL VS SYNTHETIC APPROACHES

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Alzheimer's disease (AD), a progressive neurodegenerative disorder, is characterized by dementia and gradual decline of cognitive abilities and functions, ultimately leading to severe disability and mortality. AD specifically involves the irreversible degradation of cholinergic neurons and synapses associated with the buildup of abnormal proteins, resulting in a significant decrease in cortical and hippocampal acetylcholine levels. Dementia, a broader neurological syndrome encompassing cognitive impairment and memory loss, poses a significant global health challenge, with AD being the most extensively studied variant. Over time, dementia management strategies have evolved into two distinct yet complementary paradigms: synthetic drug interventions and natural therapeutic approaches. This study provides a comparative analysis focusing on their mechanism, efficacy, and safety profiles. Natural approaches, including brain booster plants and plant-derived alkaloids, flavonoids and phenolic acids, demonstrate significant potential in targeting neurodegenerative pathways due to their neuroprotective, antioxidant, and anti-inflammatory properties. Conversely, synthetic cholinesterase inhibitors improve memory and learning by enhancing acetylcholine levels in standardized treatment regimens. Lifestyle modifications, a healthy diet, regular physical activities, and social interaction further support cognitive resilience. The study also highlights the synergistic potential of integrating natural compounds with synthetic therapies to address limitations and improve patient outcomes. It expands the utility of research into plant-based remedies and combining them with modern treatment strategies for long-term well-being of patients suffering from Alzheimer's dementia.

Keywords: Alzheimer's disease, dementia, neurodegeneration, cognitive enhancers, cholinesterase inhibitors, natural neuroprotective

BCR/NATCON/25/P-004

PLAZOMICIN IN MULTI DRUG RESISTANCE FOR URINARY TRACT INFECTION (UTI)

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Plazomicin, next generation semisynthetic aminoglycoside antibiotic, are used in treating infections caused due to multidrug resistance bacteria in case of Urinary Tract Infection (UTI). It is effective against many bacteria-producing carbapenems or other specific hydrolases. UTI is a more specific symptom on the urinary tract, affecting kidney, urinary bladder, and urethra. According to the findings, plazomicin has been approved by FDA in treating Urinary Tract Infection (UTI). Plazomicin eliminates multidrug resistant bacteria including E. coli, K. pneumoniae, P. aeruginosa, S. aureus and A. baumannii to treat the UTIs. Plazomicin mainly affects MDR Enterobacteriaceae, combined with other

antibiotics showing bactericidal effects against infections caused by above pathogens. Plazomicin has higher potency in demonstrating a minimum bactericidal concentration (MBC). Plazomicin serves as an effective therapeutic option in the treatment of infections caused by multidrug resistant (MDR) K. pneumoniae. Plazomicin shows greater efficacy as an alternative treatment method for most severe Gram-negative pathogens responsible for causing Urinary tract infections. Since this molecule incorporates chemical amendments at three important positions: 3', 4', and 6', it stays resistant to the predominant aminoglycoside-modifying enzymes (AMEs), mainly the AACs, APHs, and ANTs. According to present findings, plazomicin appeared to be less effective against pathogens containing aminoglycoside-resistant 16S rRNA methyltransferases; this finding suggests that modification of plazomicin could be useful solely in such cases.

Keywords: Plazomicin, multidrug resistant, urinary tract Infection, bactericidal, Enterobacteriaceae

BCR/NATCON/25/P-005

EXPLORING THE BLOOD PRESSURE-LOWERING POTENTIAL OF PHYTOCONSTITUENTS IN ALOE BARBADENSIS MILLER

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Hypertension remains a major risk factor for cardiovascular diseases and continues to drive interest in complementary and plant-based therapeutic options. Aloe barbadensis Miller (commonly known as Aloe vera) is a succulent plant widely recognized for its medicinal value, particularly in traditional and integrative medicine. Recent research focuses on its bioactive constituents—such as acemannan, aloein, aloe-emodin, and various polyphenols—for their potential antihypertensive effects. These compounds exhibit vasodilatory, antioxidant, and anti-inflammatory properties, which contribute to blood pressure regulation. Their mechanisms include improving endothelial function, inhibiting angiotensin-converting enzyme (ACE), increasing nitric oxide bioavailability, and reducing oxidative stress in vascular tissues. Preclinical animal studies consistently show a reduction in both systolic and diastolic blood pressure following administration of Aloe-vera extracts. In addition to its blood pressure-lowering properties, Aloe-vera supports cardiovascular health by enhancing glucose metabolism and improving lipid profiles. Despite promising findings, clinical evidence in human populations remains limited and variable due to differences in dosage, extract preparation, and study design. Further investigation is essential to establish optimal formulations, effective dosages, and long-term safety. Overall, Aloe vera demonstrates strong potential as a natural, accessible, and cost-effective adjunct for hypertension management—especially in populations seeking holistic or integrative treatment strategies. This study emphasizes its strong pharmacological potential and highlights of the need for more rigorous clinical validation.

Keywords: Acemannan, Plant based therapy, bio-active components, vasodilatory effect, cardiovascular health.

BCR/NATCON/25/P-006

PHYTOESTROGENS AS POTENTIAL ALTERNATIVES TO HORMONE REPLACEMENT THERAPY: RECENT DEVELOPMENTS AND CONSTRAINTS

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Concerns over the detrimental effects of traditional hormone replacement treatment (HRT)—such as heightened risks of breast cancer, thromboembolism, and cardiovascular issues—have stimulated interest in phytoestrogens as natural alternatives. Phytoestrogens are plant-derived polyphenolic chemicals that structurally resemble 17β-estradiol, allowing them to bind to estrogen receptors (ERα and ERβ) and produce selective estrogen receptor modulator (SERM)-like actions. Isoflavones, lignans, and coumestans, prevalent in soy, flaxseed, and legumes, are among the most extensively researched phytoestrogens. These substances have demonstrated efficacy in mitigating menopausal symptoms, enhancing bone mineral density, and providing cardiovascular and neuroprotective advantages, as evidenced by recent clinical and preclinical studies. The therapeutic efficacy and bioavailability of phytoestrogens are affected by various factors, including gut microbiota makeup, individual genetic differences, and enzymatic activity, particularly β-glucosidase, which is implicated in their metabolism. Notwithstanding their potential, variable clinical outcomes, the absence of defined dose methods, and insufficient long-term safety evidence continue to pose substantial obstacles to their wider implementation in endocrine therapy. This talk elucidates recent advancements in phytoestrogen research and examines critical difficulties that must be surmounted prior to the widespread acceptance of these chemicals as viable alternatives to hormone replacement therapy (HRT).

Keywords: Phytoestrogens, HRT, SERMs, menopause

BCR/NATCON/25/P-007

TARGETING BRAIN DISORDERS WITH GOLD NANOPARTICLES: ADVANCES IN COGNITIVE NEURO-NANOMEDICINE

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Gold nanoparticles (AuNPs) are gaining significant attention as innovative tools in the diagnosis and treatment of various neurological disorders. Their unique properties—such as high biocompatibility, chemical stability, and tunable optical behavior—make them suitable for multiple neuro-therapeutic applications. AuNPs demonstrate neuroprotective and anti-inflammatory effects in conditions like Alzheimer's disease, Parkinson's disease, and Stroke by interacting with several molecular pathways. One of the major challenges in neurological applications of AuNPs is the restricted permeability of the blood-brain

barrier (BBB). Recent advancement reveal, novel strategies to enhance nanoparticle transport across the BBB, including intra-cisterna magna injections combined with systemic hypertonic saline, significantly improving CNS uptake. Glucose-functionalized AuNPs has shown rapid brain penetration post intra-carotid administration, with preferential localization around neurons and glial cells. AuNPs are also being explored for targeted drug delivery, molecular imaging, and theranostic approaches in neurological field. They can be engineered with specific ligands, contrast agents, or therapeutic payloads to enable precision medicine. In the field of glioblastoma cancer therapy, AuNPs offers promising technique in therapy when conjugated with radiopharmaceuticals, enhancing PET/SPECT imaging techniques and enabling targeted radionuclide therapy. As research evolves, gold nanoparticles are expected to revolutionize diagnostic treatment platforms in branch of neurology, offering novel, minimally invasive, and highly specific solutions for complex brain disorders.

Keywords: Alzheimer's disease, blood brain barrier, gold nanoparticles, biocompatibility, Parkinson's disease, SPECT/PET

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STEM CELLS IN NEURODEGENERATIVE DISEASE TREATMENT

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Stem cells represent a remarkable resource for advancing our understanding of the mortal body and hold significant pledge in the field of regenerative drug. The most compelling areas of interest is the use of stem cells as an autologous remedy, particularly in the treatment of neurodegenerative conditions. These conditions, including Alzheimer's complaint, Parkinson's complaint, amyotrophic side sclerosis (ALS), and multiple sclerosis, are characterized by the progressive degeneration of neuronal structures, frequently leading to severe cognitive and physical impairments. Current treatments concentrate on symptom operation rather than complaint revision, pressing the critical need for further effective remedial approaches. Stem cells, with their unique capability to separate into colorful cell types and tone- renew, offer the eventuality to repair or replace damaged neural towel. In an autologous environment where the case's own cells are used — the threat of vulnerable rejection is greatly minimized, making the remedy safer and further personalized. Recent advances in stem cell exploration have shown encouraging preclinical and early clinical results, suggesting bettered functional issues and braked complaint progression in some cases. Despite their pledge, the restatement of stem cell curatives into routine clinical practice requires careful consideration. Challenges similar as icing the safety, efficacity, and long- term integration of scattered cells must be addressed. Likewise, ethical and nonsupervisory fabrics must keep pace with scientific developments. Nonetheless, as exploration continues to progress, the clinical operation of stem cells in neurodegenerative conditions is poised to expand significantly in the times to come, offering stopgap to cases and clinicians likewise.

Keyword: Autologous, early clinical, neurodegenerative, preclinical, regenerative, transplanted

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MARINE NATURAL PRODUCTS: A SOURCE OF NOVEL ANTICANCER DRUGS

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Cancer remains one of the deadliest diseases globally, and the need for new and innovative treatments has become increasingly urgent. As a result, substantial research has been devoted to discovering novel anticancer drugs, particularly from natural sources. Marine organisms, such as plants, algae, bacteria, fungi, sponges, actinomycetes, and soft corals, have emerged as a rich source of bioactive compounds with unique chemical structures. These organisms are viewed as valuable reservoirs for novel metabolites that could lead to the development of new anticancer therapies. This review delves into the significant contributions of marine organisms in cancer research, with a focus on their anti-cancer effects observed in both in vitro and in vivo studies. It discusses the role of marine-derived compounds in preventing tumor formation and inducing Apoptosis and cytotoxicity in cancer cells. Furthermore, the review explores the potential molecular mechanisms under lying these biological activities, providing a deeper understanding of how these natural compounds interact with cancerous cells at the molecular level. The diversity of marine organisms and the novel chemical structures they produce are key aspects of their therapeutic potential. These compounds possess unique chemical properties that differ from traditional synthetic drugs, making them promising candidates for cancer treatment. The review also addresses current therapeutic strategies involving marinederived components, along with the challenges and limitations faced in their development. Finally, the future directions of marine-based anticancer research are discussed, emphasizing the need for continued exploration of marine biodiversity to uncover effective cancer therapies.

Keywords: Apoptosis, cancer, emphasizing, novel metabolites, tumor

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UNRAVELLING THE GENETIC AND BIOCHEMICAL ROOTS OF MICROBIAL DRUG RESISTANCE

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The emergence of drug resistance presents a critical challenge in modern medicine, as an increasing number of microorganisms acquire resistance to widely used antimicrobial

agents. This phenomenon significantly compromises the efficacy of existing therapies, rendering many once-effective treatments obsolete. Prior to the discovery of antibiotics, numerous infectious diseases were associated with high mortality rates and severe clinical complications. The advent of antibiotics revolutionized healthcare, markedly reducing disease burden and improving patient outcomes. However, the escalating prevalence of drug-resistant pathogens now threatens these achievements. Infections previously deemed manageable are becoming increasingly difficult to treat, contributing to prolonged hospitalizations, elevated healthcare costs, and rising mortality. This pressing issue underscores the urgent necessity for the development of novel antibiotics and alternative therapeutic strategies.A comprehensive understanding of resistance mechanisms, including efflux pumps, enzymatic degradation, and genetic mutations, is fundamental to addressing this global health threat. Consequently, extensive efforts by pharmaceutical industries and research institutions are focused on the innovation of next-generation antimicrobial therapies. Combating antimicrobial resistance is vital to maintaining the efficacy of medical interventions and securing the future of global public health.

Keywords: Drug resistance, antimicrobial agents, antibiotics, resistant pathogens, infectious diseases, efflux pumps, enzymatic degradation, genetic mutations, antimicrobial resistance (AMR)

BCR/NATCON/25/P-011

MOLECULAR MODELLING TO ALGORITHMIC APPLICATIONS: FABRICATION OF AI-ENHANCED 3D PRINTING OF PRECISION NANOMEDICINE PLATFORMS

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The global spread of COVID-19 has elevated the relevance of pharmaceutical drug delivery, designing and screening as intractable and dynamic research. 1-100 nanometer sized particles (liposomes, PLGA, PCL, alginate nanoparticles) hold tremendous potential as an effective drug delivery system as the pharmacotherapy of cancer, HIV, AIDS, tuberculosis, cardiovascular and neurodegenerative disease due to their tiny size, customized surface, high physiochemical stability, aqueous solubility, specificity, cellular internalization, drug carrying capacity and controlled drug release by minimizing non-specific uptake, toxic side effects and dosing frequency. AI methods (reinforcement learning, GANs, SVM, molecular informatics) are revolutionizing pharmacogenomics with improve drug selection, dosage response, therapeutic efficiency and drug designs. Techniques such as “de-novo” design leverage AI to predict binding affinity, molecular property by recognizing, optimizing, predicting effective drug design with unprecedented speed and accuracy by operating AI algorithms which integrate multi-omics data sets (genomics and proteomics), decipher molecular connections, therapeutic targets, biological data. 3D printings (SLS, LAB, FDM) are redefining drug screening and pharmaceutical manufacturing (in geometry, morphology, dimensionality, internal microarchitecture) offer unparalleled flexibility in the design and fabrication of patient-

specific therapeutics, facilitating on-demand production with tunable release kinetics, enhanced bioavailability, and improved patient compliance (e.g., ease of deglutition). The ability of rapidly and precisely 3D objects fabrication enables sophisticated and complex dosage forms that recapitulate cellular interactions and tissue microenvironments. Though the approach shows promise, but their implementation is constrained by several technical, regulatory and translational limitations.

Keywords: Drug delivery, Drug designning, Drug screening, Nanoparticles, De-novo design, 3D printings.

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NEWLY APPROVED ORPHAN DRUGS IN 2024 BY FDA AND ITS CLINICAL APPLICATIONS

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In 2024, the Food and Drug Administrations (FDA) has approved some orphan drugs based on their mechanism of action and their clinical properties. An estimated affected rate of alzheimer's disease in 2024 is 6.9 million worldwide. Donanemab-azbt (Kisunla) and Lecanemab (Leqembi) are the wo drugs approved for treating alzheimer's disease. In these drugs immunoglobulins targets the amyloid beta peptide responsible for alzheimer's disease. In recent studies, it has been observed that in 2024 about 1% people worldwide suffering with schizophrenia. By taking care into this Cobenfy (marketed as Xanomeline and Trospium Chloride) is introduced. Cobenfy is dual-acting medication that combines with Xanomeline and Trospium Chloride that helps to mitigate the side effects of Xanomeline while showing its therapeutic benefits. The medication has demonstrated improvement in Positive and Negative Syndrome Scale (PANSS) scores of treating Schizophrenia. Some drugs are also approved for treating the rare diseases such as Cystic Fibrosis, WHIM Syndrome, Niemann- Pick Disease, etc. Alyftrek (for treating Cystic Fibrosis), Mavorixafor (for the traetement of WHIM Syndrome), Imetelstat (for treating Myelodyplastic Syndrome), Elafibranor (for the treatment of Primary Biliary Cholangitis), Miplyffa (approved for the treatement of Nieman-Pick Disease type-C) are the drugs that are approved by FDA focusing on the rare diseases.

Keywords: Orphan drugs, FDA, diseases, clinical applications

BCR/NATCON/25/P-013

GUT MICROBIOME MODULATION IN NEUROPHARMACOLOGY: A THERAPEUTIC PERSPECTIVE

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Gut microbiota is found in the hole Gastrointestinal tract, like bacteria, fungal, virus etc. Different proportion and constitution of bacteria are present in GIT tract specially small and large intestine. Gut microbiota may influence gut and brain function, there have many beneficial function of gut microbes. Gut microbiota also regulates the stress and Hypothalamic-pituitary- adrenal (HPA) axis activity. It is important that the intricate relationship between the gut microbiota and the pharmaceutical products, microbiota can interact with some drug like Warfarin, Metformin etc. and can produce microbiota drug interaction and some can impactions fir drug metabolism, safety and efficacy. Gut microbiota helps in regulate of the neuro inflammatory response, and play a crucial role in psychiatric disorder like Alzheimer's disease, Perkinson's disease, Schizophrenia etc.

Keywords: Gut microbiota, microbiota-drug reaction, drug metabolism, psychiatric disorders, therapy

BCR/NATCON/25/P-014

A REVIEW ON NANOBIOTECHNOLOGY-DRIVEN DRUG DELIVERY

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Nanobiotechnology has transformed the field of biomedicine by enabling precise manipulation of materials at the nanoscale, allowing the development of biocompatible, functional nanodevices with targeted delivery capabilities. Nanomaterials engineered as drug delivery systems (DDS) bring numerous benefits, primarily due to their nanosized structure, which allows them to traverse biological barriers and deliver therapeutic agents directly to specific tissues, tumors, or even individual cells. These nanocarriers possess tunable surface properties that make it possible to encapsulate drugs or conjugate them to the nanoparticle surface, thereby improving solubility, stability, and resistance to early degradation. Their high surface-area-to-volume ratio allows for the attachment of targeting molecules such as peptides or antibodies, which enhances delivery specificity to the intended site. By directing drugs precisely to their target, nanocarrier-based delivery systems can significantly enhance therapeutic outcomes while minimizing off-target effects and reducing systemic toxicity—ultimately leading to better patient adherence and outcomes. This study focuses on nanoparticle-mediated drug delivery, emphasizing size-specific, precise, and efficient nanomedicine-based therapies to enhance targeted treatment effectiveness and minimize systemic side effects.

Keywords: Nanobiotechnology, drug delivery systems (DDS), nanoparticles (NPs), targeted drug delivery, enhanced permeability and retention (EPR) effect

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EDIBLE VACCINES: AN INNOVATIVE STRATEGY FOR ORAL IMMUNIZATION

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The immune system is a dynamic and intricate network of cells, tissues, and organs that defends the body against pathogens such as viruses, bacteria, fungi, and toxins. Its ability to detect and neutralize foreign bodies is facilitated by the production of antibodies and the recognition of antigens, particularly proteins and carbohydrates. However, certain microorganisms evolve rapidly, altering their structures to evade immune responses, which can compromise immune Défense. Vaccination has long been a critical tool for preventing infectious and non-infectious diseases, traditionally involving inactivated microbes, live-attenuated organisms, or subunit vaccines. Despite their success, these conventional approaches face limitations in terms of cost, stability, and storage. In response, the concept of "edible vaccines," introduced by Charles Arntzen in 1990, has emerged as a promising alternative. Edible vaccines utilize genetically modified plants or probiotics to express pathogen-specific antigens, offering a safe, cost-effective, and needle-free immunization strategy. These vaccines are orally administered, and the plant cell walls protect antigens from degradation in the acidic gastric environment, releasing them in the gut through microbial enzyme activity. Probiotic strains like Lactobacillus further enhance stability under acidic conditions. Additionally, freeze-dried plant cells preserve protein drugs at ambient temperatures. With FDA approval of plant-based biopharmaceutical production under cGMP guidelines, edible vaccines represent a novel and scalable platform with potential to revolutionize global immunization strategies.

Keywords: Immune system, edible vaccines, antigens, vaccination, genetically modified plants

BCR/NATCON/25/P-016

PRECISION PHARMACOTHERAPY: INTEGRATION OF GENOMICS AND PHARMACOGENOMICS IN DRUG RESPONSE PREDICTION

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PGx or pharmacogenomics studies inherited drug response differences. From ineffective treatment to catastrophic adverse drug response, there are many possibilities. Genomic guidance in medication and selection and dose makes pharmacotherapy safer and more effective. pharmacogenomic testing can help patients at risk of any pharmaceutical adverse effect from minor to severe determine the best course of action, including dosage modification or alternative treatments. In pharmacogenomics, gene differences alter a drug's pharmacokinetics and pharmacodynamics, which changes it metabolism, excretion, and bodily effective. This interconnectivity highlights the need of genetically tailored treatment, which can change a drug's efficacy or toxicity. Oncology pharmacogenomics involves identifying person who will benefits from specific cancer drug and other who can experience senior adverse effect. NGS, WES, LRS, and CRISPR based genome editing can helps integrate genomics and pharmacogenomic in medication response predication.

We faced challenges such identifying relevant genes and vibrations, inadequate clinical evidences and education, non- coding vibration, and uncommon variants. Future drug response predication well includes omics information, machine learning, dynamic biomarkers, and individualized treatment strategies. This technology will enable early medication interaction detection, targeted therapy and individualized treatment strategies in clinical settings

Keywords: Precision pharmacotherapy, pharmacogenomics, genetics approach, adverse drug reaction, clinical pharmacy

BCR/NATCON/25/P-017

MELITTIN: THE BEE VENOM MOLECULE THAT STINGS CANCER

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Cancer is still one of the leading threats in the contemporary world, which is why new methods of treatment are needed to treat effectively, with conventional therapies. Researcher found a natural therapy to fight cancer. Current data suggest that Melittin a main vital component of Honey bee Venom which has been shown to have potent anticancer properties. Melittin enter the surface or plasma membrane of the cell and forms holes or pores in the cell and can induce apoptosis, necrosis and inhibition of proliferation in variety of cancer types of cancer cells, including breast, lungs, liver, prostate & bladder without harming normal healthy cell. Additionally, melittin also disrupt the main messaging or signalling pathway that allow cancer cells to communicate with each other in order to replicate & grow. Melittin when combine with chemotherapy drug found to be more effective in killing tumour. The holes that were created by melittin on surface of cancer cell allow chemotherapy drug to enter the target cell. Researcher managed to reproduce melittin synthetically in lab & found to have many therapeutic uses including anti-cancer, anti-inflammatory, anti-viral agent and melittin are able to kill cancer cell in just 60 min. The development of melittin based therapies by further research provide new treatment options for cancer patients. Nature's Tiniest Warriors might just be our biggest hope in the fight against cancer.

Keywords: Bee venom, melittin, anticancer effects, cancer management, apoptosis.

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ADVANCEMENTS IN NANOTECHNOLOGY FOR ENHANCED TREATMENT OF VIRAL INFECTIONS: ADDRESSING DRUG RESISTANCE CHALLENGES

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Infections, particularly, have significant impacts on healthcare and societal progress, and their occurrence has been rising globally. In addition to the harmful consequences of long-term use, the rapid development of drug resistance to existing therapies poses a major public health issue. Therefore, new forms of treatment must be developed. The exchange of nanostructures and microorganisms is currently reshaping biomedicine due to their intrinsic restorative and individual functionalities. The unique physical properties of nanoparticles provide a promising approach to drug delivery. Key factors influencing circulation time and bioavailability include large drug payloads, a variable surface charge that facilitates encapsulation, and a considerable surface area-to-volume ratio that enhances solubility compared to larger particles, which are in turn affected by the particle's size. Research into acquiring and/or enhancing therapeutic effects can greatly benefit from nanoparticulate drug delivery systems due to their distinctive features that differentiate them from bulk materials of the same composition. For anyone interested in learning more about how nanomaterials can assist in curing common viral infections, this article serves as a good starting point.

Keywords: Nanotechnology, viral infection, drug delivery, drug resistance, drug payloads

BCR/NATCON/25/P-019

RECENT TRENDS IN THERMORESPONSIVE HYDROGEL FOR WOUND HEALING

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In recent years, thermos-responsive hydrogels have distinguished themselves as potentially useful materials for improved wound healing applications. These intelligent polymers undergo temperature-dependent phase transitions, which grant them the ability to transform from a liquid state to a gel-like structure upon exposure to physiological temperatures. The unique characteristic in question makes it easier to apply and adhere to wound surfaces, so creating an ideal moist environment that is helpful to the healing process. By incorporating bioactive compounds, growth factors, and antimicrobial agents into thermoresponsive hydrogels, it is possible to build these hydrogels in such a way that they improve tissue regeneration and provide regulated drug administration. It is also possible to remove them without causing any damage to newly developed tissue thanks to their ability to react to variations in temperature. In light of this, these cutting-edge biomaterials have the potential to significantly improve the results of wound healing and the quality of care provided to patients in a variety of clinical settings.

Keywords: Thermoresponsive, hydrogels, wound healing, drug delivery, tissue regeneration

BCR/NATCON/25/P-020

COMBATING OSTEOPOROSIS AND OSTEOARTHRITIS BY CISSUS QUADRANGULARIS: IN SILICO PREDICTION

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Osteoporosis and osteoarthritis are widespread not only among elderly people but also affect middle-aged ones all over the world. To find remedies from mother nature for these two ailments, Cissus quadrangularis, also known as ‘harjod’, appears to be used in a lot of traditional medicines. To find its molecular mechanisms, we performed this in silico study using its constituent phytochemicals collecting from IMPPAT, LOTUS and KNApSAcK databases. We primarily screened the phytochemicals showing drug-likeness properties evaluated by Swiss ADME, based on zero violation of Lipinski's rule of five, Veber's rule, the Ghose filter, Muegge's rule, and Egan's rule. Following the exclusion of phytocompounds with potential toxicity, screened through ProTox-3.0, we got 9 ones to be safe. Searching for target proteins from the therapeutic target database (TTD), it was found that osteoporosis and osteoarthritis, though distinct, share some common molecular pathways and protein targets, making them partially overlapping in therapeutic strategies. 17β-HSD, cathepsin K, COX-2, FXR, IL-1β, RANK, RANKL, osteopontin, and osteoprotegerin, were found to be common for both. Calcitonin receptor, parathyroid hormone 1 receptor (PTH1R), and sclerostin are primarily associated with osteoporosis, while TRPV1is more specific to osteoarthritis. Interestingly, the phytocompounds showed good binding scores with every protein mentioned. Though specifically cissuside, was the only compound which interacted strongly with maximum number of targets. This finding highlights the interconnected nature of bone and joint pathologies and opens the door to developing multiple-target therapies that could manage both conditions by modulating inflammation, bone resorption, and cartilage degradation.

Keywords: Osteoporosis, osteoarthritis, drug-likeness, molecular docking, RANK, PTH1R

BCR/NATCON/25/P-021

HONEY AND WOUND HEALING: AN UPDATE

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Honey has long been valued for its wound healing potential due to its natural antibacterial, anti-inflammatory, and tissue-regenerative properties. With increasing resistance to

antibiotics, interest in honey-based therapies has surged. This presentation highlights the mechanism of action of honey in wound healing, its clinical applications in burns, ulcers, surgical wounds, and infected or malignant wounds. Honey promotes a moist healing environment, removes necrotic tissue, reduces odor and exudate, and stimulates immune responses. Despite proven benefits, large-scale randomized clinical trials are still needed to establish standardized clinical outcomes. Future prospects include advanced honey-based dressings, bioengineered gels, and potential roles in diabetic and cancer wound care.

Keywords: Honey, Wound Healing, Antibacterial, Burns, Natural Therapy

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SIGNALLING PATHWAYS ASSOCIATED WITH PATHOGENESIS OF PSORIASIS

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Psoriasis is a chronic autoimmune disease, characterized by hyper proliferation of keratinocyte, thereby increasing the thickness of the skin. Plaque, pustular, guttate, inverse and erythrodermic are the common types of psoriasis. Understanding the pathophysiology of any disease can give a broad view of the situation as well as help to identify the probable drug target areas. Due to this disease's autoimmune nature, immunological pathogenesis of this complication is widely explored. Some major epigenetic factors like DNA methylation, histone modifications and non coding RNAs maintain the pathological state of psoriasis. Moreover, hyper proliferation being a direct effect of inflammation, signals the release of cytokines, which is considered as another crucial factor for disease pathogenesis. From various extensive literature survey it has been inferred that cytokines like Tumor Necrosis Factor-α (TNF-α), Interleukin- 17 (IL-17), IL-23 and Interferon-γ (IFN- γ) being the highlighted signalling pathways contributing to the disease progression. Some other pathways are also triggered during the pathogenesis of this disease like Janus Kinase-signal transducer and activator (JAK-STAT), Tyrosine Kinase-2 (TYK-2) and Mitogen Activated Protein Kinase (MAPK). Some metabolites formed due to some biochemical pathways in body also act as contributing factors for the disease progression. In this poster, a summarized version of several signalling pathways for psoriasis pathogenesis has been depicted, which will provide a clear approach for identifying the steps involved in disease progression and intervention by drugs.

Keywords: Psoriasis, signalling pathways, epigenetic factors, tumor necrosis factor-α, interleukin, metabolites

BCR/NATCON/25/P-023

PHYTOCHEMICALS ALLEVIATING PSORIASIS AND ASSOCIATED COMPLICATIONS WITH THEIR RESPECTIVE MECHANISMS INVOLVED.

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Psoriasis is a chronic autoimmune disease, characterized by hyper proliferation of keratinocyte, thereby increasing the thickness of the skin. Plaque, pustular, guttate, inverse and erythrodermic are the common types of psoriasis. Despite several current interventions by topical formulations and synthetic systemic biologics, complete cure of this ailment is not possible. Moreover, significant immunosuppression with increased carcinogenic cases leads to cessation of those products usage during chronic complications. Phytochemicals have been proven immensely beneficial for curing of several skin related ailments like eczema, atopic dermatitis, scabies and even psoriasis, without having adverse effects, unlike that of synthetic regimens. The cases of relapse after the treatment are also very minimal. From thorough literature survey, it has been found that several classes of phytochemicals are responsible for reducing psoriasis like inflammation and associated complications. Some mentionable potent bioactive phytoconstituents possessing anti inflammatory effect in psoriasis are alkaloids, polyphenols, terpenoids and omega-3-fatty acids. These phytochemical classes are readily available amongst several medicinal plants and herbs. While, in some of the cases, the probable mechanism involved in their claimed pharmacological effect is known and depicted well, but many other phytochemicals are completely untouched regarding their mechanism involved in the said activity. Clinical trials activity of these molecules are also not evaluated, which keeps the door open for future researches. This poster is a summarized review of various phytochemicals possessing anti-psoriatic effect with their respective mechanism of action.

Keywords: Psoriasis, hyper proliferation, phytochemicals, alkaloids, polyphenols, terpenoids

BCR/NATCON/25/P-024

ROLE OF MIRNAS IN COPD

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Chronic obstructive pulmonary disease or COPD is a gradually worsening respiratory condition marked by escalating difficulty in breathing, persistent cough, and the production of sputum. This disease significantly contributes to illness and death on a global scale, commonly linked to smoking or prolonged exposure to harmful

environmental agents. MicroRNAs (miRNAs) are key regulators in the progression of chronic obstructive pulmonary disease (COPD), influencing various cellular pathways and serving as potential diagnostic and therapeutic targets. MiR-144, along with exosomal miRNAs like miR-100, miR-21, and miR-181a, show promise as biomarkers for COPD diagnosis and prognosis. Moreover, miRNAs such as miR-1343 and miR-145 are implicated in COPD pathophysiology, with roles in regulating fibrotic factors and cytokine expression. Furthermore, miRNAs regulate gene expression in COPD, with several implicated in its pathophysiology. For instance, miR-1343 reduces the expression of fibrotic factors such as transforming growth factor (TGF)-β receptors I and II, SMAD2, and SMAD3, while miR-145 may promote fibrosis by inducing the differentiation of lung myofibroblasts and negatively regulating cytokine expression in airway smooth muscle cells (ASMCs). Overall, miRNAs play pivotal roles in COPD development, offering new avenues for treatment and patient management through modulation of their activity.

Keywords: Respiratory disorders, gene expression, therapeutic targets, inflammation, remodeling and lung damage.

BCR/NATCON/25/P-025

POSSIBLE PARTICIPATION OF NITRERGIC SYSTEM IN THE ANTI-DEPRESSION-LIKE EFFECT OF STATINS IN MICE

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Statins are classified as antihyperlipidemic that lowers cholesterol levels by inhibiting the enzyme HMG-COA reductase, plays a central role in the production of cholesterol in the liver. Intriguingly, literature indicates dual effects of statins on mood disorders. The present study investigated the effect of statins on animal models of depression. Adult Swiss mice (n=6) weighing 20-25 gms were treated acutely or chronically with simvastatin or rosovastatin or arginine and methylene blue. Results showed that statins dose-dependent decreased the immobility time. Chronically, both simvastatin and rosuvastatin (10, 20, or 40 mg/kg, p.o.) also showed significant decrease in immobility in comparison with control (10 ml/kg, p.o.; saline) and flouxetine (20 mg/kg). Co-joint administration of methylene blue (0.5mg/kg) and stains (simvastatin and rosuvastatin, 10 mg/kg) also showed significant effect on immobility time as compared to the per se effects. Similarly, pretreatment of methylene blue (0.5,1,2 mg/kg, i.p.) also potentiated the effects of statins, indicating that nitrergic system might be involved in the antidepressant effects of statins. However, the exact mechanism of nitrergic system involved in the effects of statins still needs further investigations.

Keywords: Statins, HMG-COA reductase, depression, simvastatin, rosuvastatin

BCR/NATCON/25/P-026

MOLECULAR GLUES VERSUS CLASSICAL THERAPIES: A NEW PARADIGM IN ALZHEIMER'S TREATMENT

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, amyloid-β plaque deposition, tau protein tangles, and neuronal loss. Despite significant research efforts, current treatments mainly provide relief from symptoms or only slightly slow the disease's progression. However, molecular glues are emerging as a promising new therapeutic strategy. These compounds could offer advantages over traditional treatments by specifically targeting protein-protein interactions to enhance protein degradation, stabilize functional protein complexes, or alter disease-related pathways. Molecular glues facilitate selective protein degradation by recruiting target proteins to the ubiquitin-proteasome system, thereby reducing toxic aggregates such as amyloid-β and hyper- phosphorylated tau. Unlike classical small-molecule inhibitors, which often face challenges of specificity and resistance, molecular glues leverage endogenous degradation pathways, providing a more targeted and sustained therapeutic effect. Recent advances in molecular glue technology have shown promise in neurodegenerative disease models, demonstrating their ability to modulate key pathological proteins implicated in AD progression. This study shows the differences in how classical therapies and molecular glues work, emphasizing the potential of molecular glues to transform AD treatment. By moving away from simply inhibiting disease processes and instead focusing on targeted protein degradation, molecular glues offer a promising route for creating advanced treatments that can modify the course of AD. This innovative strategy could lead to a new generation of effective therapies.

Keywords: Alzheimer's Disease, amyloid beta protein, tau protein, molecular glue, targeted protein degradation.

BCR/NATCON/25/P-027

REACTIVE OXYGEN SPECIES: A DUAL ROLE IN GLIOBLASTOMA- FROM TUMOR GROWTH TO THERAPEUTIC TARGET

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Glioblastomas are the most common and deadly primary brain tumors, with about 250,000 new cases diagnosed and 200,000 deaths reported worldwide annually. This aggressive form of cancer is characterized by fast cell growth, high invasiveness, and a significant resistance to standard treatments. Current studies have shown that reactive oxygen species (ROS) play dual role in Glioblastoma pathogenesis. At low level of ROS stimulate carcinogenic property by promoting cell growth, angiogenesis, and survival through activation of pathways such as PI3K/Akt/mTOR and NF-κB. They also influence

transcription factors like HIF-1α, NRF2, p53, and FOXO3, thereby regulating genes involved in autophagy, metabolism, and cell fate. In contrast, excessive ROS levels result in oxidative stress, causing DNA damage, mitochondrial dysfunction, autophagy, ferroptosis, and apoptosis, which highlights their potential as therapeutic targets. Therapeutic approaches to manipulate ROS include using pro-oxidants to selectively induce cancer cell death and antioxidants to protect normal tissue during treatment. This study delves into the molecular mechanisms underlying the dual role of ROS in Glioblastoma —supporting tumor growth while also serving as a vulnerability—and discusses emerging redox-based strategies that could enhance treatment outcomes for Glioblastoma patients

Keywords: Glioblastoma, brain tumor, ROS, oxidative stress, tumor microenvironment

BCR/NATCON/25/P-028

ROLE OF THE GALLBLADDER IN OUR METABOLISM AND IMMUNE SYSTEM

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Investigations were carried out by the researchers to identify gallbladder's significant impact on metabolism and the immune system. However, it was demonstrated that bile acids play a crucial role in overall metabolic processes. Bile acids are produced in the liver and stored in the gallbladder, which regulates the outward flow of bile acids. Recent researches highlight that bile acids improve the absorption of fat-soluble vitamins and lipids in the digestive system. The removal of the gallbladder can lead to various health issues, including elevated liver enzymes, insulin resistance, dyslipidaemia, hypertension, and cirrhosis. Beyond lipid absorption, bile acids are vital for controlling systemic hormonal functions and glucose metabolism. By activating the FXR receptor, bile acids trigger the production of fibroblast growth factor 15/19, which controls liver glucose output and glycogen storage. Meanwhile, the activation of TGR5 enhances the secretion of glucagon-like peptide-1, which in turn promotes insulin release and level up glucose utilization. On the other hand, their detergent-like properties affect cell membranes, triggering the release of cytokines and chemokines, which are central to immune regulation and inflammation control. Additionally, bile acids have antimicrobial effects. The gallbladder also secretes proteins that maintain gut balance by managing the gut microbiota. Overall, gall bladder plays pivotal roles in bile acid secretion, in immunity and metabolism, and also some metabolic disorders arise due to dysfunction of gall bladder.

Keywords: Dyslipidaemia, hormonal functions, vitamins, bile acids, hypertension.

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THE GUT-BRAIN CONNECTION: METABOLITE INTERVENTIONS FOR ALZHEIMER'S DISEASE

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Alzheimer's disease (AD) is a progressive neurological disease which is marked by the aggregation of mainly two types of protein, amyloid-β and tau in the brain, leading to a gradual reduction in cognitive functions. By the year 2050, AD is expected to affect more than 150 million people globally, intensifying the need for effective and innovative treatment strategies. Although there is no cure for AD, existing treatments can help slow its progression. New research emphasizes the significant role of metabolites produced by gut microbial flora in influencing the development and progression of AD via the gut-brain connection. Short-chain fatty acids (SCFAs) are important microbial metabolites that provide neuroprotective benefits by decreasing neuroinflammation, improving the integrity of the gut membrane, and preventing the accumulation of amyloid-beta plaques. These metabolites reduce overall inflammation by controlling immune responses and suppressing pro-inflammatory cytokines, which are associated with neuronal damage and cognitive decline. Additionally, SCFAs promote synaptic plasticity and neurogenesis by crossing the blood-brain barrier and influencing histone acetylation, thereby enhancing memory-related pathways. Other microbial metabolites like secondary bile acids and tryptophan derivatives also help regulate oxidative stress and neurotransmission. Disruptions in gut microbiota in AD patients worsen disease progression, but interventions such as probiotics, dietary fibers, and fecal transplants may restore balance and offer therapeutic benefits. These insights highlight the promise of targeting gut-derived metabolites in AD prevention and treatment.

Keywords: Amyloid beta, tau protein, gut brain axis, gut metabolites, neurodegenerative disease.

BCR/NATCON/25/P-030

REPURPOSING METFORMIN: A POTENTIAL THERAPEUTIC APPROACH FOR PARKINSON'S DISEASE

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Parkinson's disease (PD) is a chronic neurodegenerative state which is distinguished by the gradual degeneration of dopaminergic nerve in the substantia nigra cause motor and non-motor impairments. Despite current therapeutic options, disease-modifying treatments remain elusive. Metformin, a broadly used hypoglycemic drug, has gained interest for its

neuroprotective properties beyond glycemic control. Emerging data indicate that metformin may mitigate PD pathology through mechanisms involving AMPK activation, mitochondrial protection, autophagy enhancement, inhibition of α-synuclein aggregation, and reduction of oxidative stress and neuroinflammation. This review explores the possibility of metformin as a repurposed treatment for PD, reviewing both preclinical and clinical evidence that supports its effectiveness. We highlight key molecular pathways influenced by metformin that may contribute to neuronal survival and improved motor function. Given its established safety profile and low cost, metformin represents a promising drug for repositioning in PD management, warranting further investigation through controlled clinical trials.

Keywords: Parkinson's disease, alpha-synuclein, neuroinflammation, metformin, neurological disease

BCR/NATCON/25/P-031

PHYTOCHEMICAL AND PHARMACOLOGICAL ASPECTS OF MURRAYA KOENIGII(CURRY LEAVES)-A REVIEW

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Murraya koenigii, commonly known as curry leaves, is a widely used medicinal plant in traditional Indian medicine, particularly Ayurveda and Siddha systems. This review highlights the phytochemical composition and pharmacological properties of Murraya koenigii, emphasizing its potential as a natural remedy for various health conditions. The leaves contain diverse bioactive compounds including alkaloids, flavonoids, terpenoids, tannins, steroids, and essential oils, which contribute to its antioxidant, antidiabetic, anti-inflammatory, antimicrobial, hepatoprotective, and neuroprotective effects. Traditionally used to treat digestive issues, diabetes, skin diseases, and more, Murraya koenigii has also shown promising results in modern pharmacological research. Despite its rich therapeutic potential, further studies and clinical evaluations are required to explore its full efficacy and safety profile in healthcare and medicine.

Keywords: Murraya koenigii, alkaloids, flavonoids, terpenoids, tannins

BCR/NATCON/25/P-032

THE SIDDHA MEDICINE SYSTEM

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The Siddha Medicine System is an ancient Indian system of traditional medicine that originated in South India, mainly in Tamil Nadu and also it is believed to have evolved from the Dravidian Civilization. It's based on a holistic approach to health, combining spiritual, physical and mental well-being. Tridosha theory, similar to a Ayurveda, siddha medicine recognizes three fundamental humors (vata, pitta and kapha) that govern the human body. The system emphasizes the interconnectedness of the five elements (earth, water, fire, air and ether) with human health. Siddha medicine relies heavily on plant-based remedies and natural substances. It also incorporates the use of minerals and metals in treatments. Siddha medicine is deeply rooted in tamil culture and spirituality, often invoking divine intervention for healing. Siddha medicine system employs eight primary diagnostic method referred to as "Envagal Thervukal." The system emphasizes preventive measures, lifestyle modification and natural therapies.

Keywords: History, herbalism, therapies, treatment, diagnosis, benefits.

BCR/NATCON/25/033

IMPORTANCE OF ADR REPORTING FOR PATIENT SAFETY

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Adverse Drug Reaction (ADR) reporting is essential for ensuring patient safety and enhancing the drug safety profile through continuous monitoring. Despite being a critical element of pharmacovigilance, ADR reporting faces numerous challenges such as underreporting by healthcare professionals due to lack of time, awareness, and fear of legal consequences. Additionally, issues like incomplete data, difficulty distinguishing ADRs from comorbidities, privacy concerns, and absence of standardised global systems further hinder effective reporting. However, the future of ADR reporting is promising, driven by advancements in artificial intelligence, big data analytics, and mobile-based patient reporting tools. These innovations, along with global collaboration and increased patient involvement, are set to revolutionise ADR detection and risk mitigation. Overcoming existing barriers will not only improve patient outcomes but also ensure the safer use of medications in real-world settings.

Keywords: Adverse drug reaction, pharmacovigilance, patient safety, drug monitoring, AI in healthcare, public health

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NUTRACEUTICAL OR PHARMACOLOGICAL POTENTIAL OF MORINGA OLEIFERA LAM

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Moringa oleifera Lam., belonging to the Moringaceae family, is a multifunctional herbal plant known for its rich nutritional and medicinal properties. Widely regarded as the most nutrient-dense plant, Moringa is a potent source of proteins, essential amino acids, vitamins, minerals, antioxidants, and bioactive phytochemicals such as flavonoids and isothiocyanates. Various parts of the plant have demonstrated anti-inflammatory, antioxidant, hepatoprotective, neuroprotective, hypolipidemic, and antidiabetic activities. Its pharmacological applications also include antimicrobial, antifungal, and anticancer properties. The plant's therapeutic potential varies based on phytochemical composition and preparation. This review highlights Moringa's value as a promising nutraceutical with significant relevance in both traditional and modern medicine.

Keywords: Phytomedicine, herbal, antioxidants, flavonoids, Moringa oleifera.

BCR/NATCON/25/P-035

THE ROLE OF AI IN DRUG DISCOVERY: CHALLENGES, OPPORTUNITIES, AND STRATEGIES

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Artificial Intelligence (AI) is revolutionizing drug discovery by enhancing efficiency, accuracy, and speed across key stages such as target identification, drug formulation, clinical trial design, and personalized medicine. This poster explores the diverse applications of AI in pharmacy—from predictive modeling and data analysis to streamlining patient selection in clinical trials. It also discusses major benefits such as cost-effective R&D, improved accuracy, and faster development. However, challenges like data quality, ethical concerns, regulatory hurdles, and implementation costs limit AI's full potential. The presentation highlights future strategies, including improved data

standardization, explainable AI, and global collaboration, which can enable safer, faster, and more effective drug development and healthcare delivery.

Keywords: Artificial intelligence, drug discovery, clinical trials, personalized medicine, data standardization.

BCR/NATCON/25/P-036

MENTAL HEALTH AND MEDICATION: ADDRESSING THE PHARMACIST'S ROLE

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Mental health disorders such as depression, anxiety, schizophrenia, and mood disorders significantly impact individuals worldwide. Pharmacists, as easily reachable healthcare professionals, are increasingly vital in supporting mental health management. This poster highlights the pharmacist's role in patient education, medication counselling, monitoring for adverse drug reactions, and promoting treatment adherence. It also discusses current pharmacological treatments, adverse effects, and innovations like digital therapeutics and personalized medicine. Graphical data and case studies from the COVID-19 pandemic underscore the rise in mental health issues and the need for pharmacist-led support. As mental health technologies and therapies evolve, pharmacists are well-positioned to lead efforts in improving mental health outcomes through accessible care, awareness, and interdisciplinary collaboration.

Keywords: Mental health, pharmacists, medication, patient counselling, personalized medicine, awareness.

BCR/NATCON/25/P-037

RECENT STUDIES ON THE CHRONOTHERAPY APPROACHES FOR THE TREATMENT OF HYPERTENSION

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Chronotherapy is the strategic timing of treatment to align with the body's natural circadian rhythms for improved therapeutic outcomes. Chronotherapy used to improve

treatment efficacy and reduce side effects by coordinating drug administration with the body's natural circadian cycles has drawn a lot of attention in the field of managing hypertension. The 24-hour cycle of blood pressure is characterised by a morning increase and a nocturnal fall. The peripheral circadian clocks in the vascular and renal tissues, as well as the central circadian clock in the suprachiasmatic nucleus, control these variations. According to recent research, the non-dipping blood pressure pattern that is seen in a significant portion of patients and is linked to higher cardiovascular morbidity and mortality may not be sufficiently addressed by the conventional morning dosage of antihypertensive medications. New research trends centre on the administration of antihypertensive drugs in the evening or before bed, specifically angiotensin-converting enzyme inhibitors, angiotensin receptor blockers (ARBs), and calcium channel blockers. Clinical studies like the Hygia Chronotherapy and MAPEC (Monitorización Ambulatoria para Predicción de Eventos Cardiovasculares) trials have produced strong evidence that bedtime dose is preferable in lowering cardiovascular events and enhancing long-term prognosis. Real-time data-driven therapy timing modifications are made possible by the combination of wearable monitoring devices and machine learning algorithms to analyse circadian blood pressure variations. Future studies should concentrate on large-scale, multiethnic cohort studies, investigating the role of genetics in circadian blood pressure regulation, and incorporating chronotherapeutic principles into clinical standards as chronotherapy develops.

Keywords: Chronotherapy, hypertension, circadian rhythms, MAPEC, hygia

BCR/NATCON/25/P-038

MICROBIOME & DRUG PHARMACOKINETICS: THE IMPACT OF GUT BACTERIA ON DRUG METABOLISM AND PERSONALIZED TREATMENT

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The human gut microbiome plays a critical and increasingly recognized role in drug pharmacokinetics, influencing how medications are absorbed, metabolized, and ultimately affect the body. This poster highlights the intersection between microbiology and pharmacology, focusing on how gut bacteria can significantly alter drug efficacy and toxicity. Traditionally, the liver has been seen as the primary site for drug metabolism, especially through the action of cytochrome P450 enzymes. However, emerging evidence shows that gut microbes can activate, inactivate, or even toxify drugs before hepatic metabolism occurs. Key microbial actions—such as reduction, hydrolysis, deconjugation, and decarboxylation can impact a drug's therapeutic outcome. Real-world examples like digoxin, levodopa, irinotecan, and sulfasalazine demonstrate how bacterial activity can either enhance or hinder drug performance. These interactions underscore the importance of considering the microbiome in personalized medicine. By profiling a patient's gut microbial composition, clinicians may better predict drug responses and minimize adverse

effects. Furthermore, the poster explores the future of microbiome-informed therapy, including microbiota-targeted drug design, the use of probiotics to modulate outcomes, and AI-powered prediction tools based on metagenomics. Visual aids—like split diagrams, infographics, and tables—make these complex processes easier to understand, offering an accessible yet detailed overview for researchers, students, and clinicians. With growing research in this area, the gut microbiome stands poised to revolutionize how we develop and prescribe medication.

BCR/NATCON/25/P-039

TECHNOLOGY AND BEYOND THE FUTURE OF ANTIBODY-BASED THERAPIES

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Thanks to hybridoma technology, which was created in 1975, monoclonal antibodies (mAbs) have completely changed diagnosis and therapy. Scientists generated hybridomas, immortal cells that produce homogenous, highly specific antibodies, by combining B lymphocytes with myeloma cells. Since their initial development from mice, mAbs have improved in safety and decreased immunological rejection because to innovations like humanization and totally human constructions. mAbs are now essential in the therapy of infections, autoimmune conditions, and cancer. Advanced techniques including recombinant DNA, phage display, and transgenic animals are improving their accuracy, despite ongoing production costs and immunological difficulties. With their ability to provide more intelligent, focused, and minimally intrusive treatments, mAbs are set to spearhead the future of customized medicine.

Keywords: B lymphocytes, myeloma cells, immortal cells, specific antibodies, mouse-derived antibodies, humanization

BCR/NATCON/25/P-040

THE EFFECTS OF TYPE II DIABETES ON COGNITIVE IMPAIRMENT: A FOCUS ON DEMENTIA, HEART DISEASE, AND INFLAMMATION

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Type II diabetes & dementia represent significant health problems in our aging society, affecting millions globally. Diabetes is known to double the risk of developing dementia, yet its impact on the earlier stages of cognitive decline remains unclear. While some studies indicate a connection between diabetes and cognitive issues, others do not support this link. There is also increasing concern regarding prediabetes and its potential effects on brain health, although research in this area is still limited. Moreover, diabetics and heart disease there have a relation is frequently overlooked in brain health studies, despite heart disease being a leading cause of mortality in diabetes. Inflammation plays a role in linking diabetes and heart disease to cognitive decline, but our understanding of this connection is still incomplete. This study aims to investigate (1) how diabetes influences cognitive impairment and its progression to dementia, with a focus on blood sugar control, and (2) how the presence of heart disease and increased inflammation may contribute to cognitive decline in individuals with diabetes. Future studies should examine the impact of diabetes severity on early cognitive decline prior to the full onset of dementia, including poor blood sugar management and other illnesses like heart disease. Understanding the part inflammation plays in this process should be a primary priority.

Keywords: Cognitive impairment, type II diabetes, prediabetes, inflammation, dementia.

BCR/NATCON/25/P-041

ASSESSMENT OF METFORMIN'S NOOTROPIC POTENTIAL IN A HYOSCINE-INDUCED AMNESIA MODEL USING ADULT DANIO RERIO

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Amnesia is an emerging neurodegenerative condition characterized by progressive cognitive decline, commonly associated with oxidative stress and impaired cholinergic signaling. In this study, adult zebrafish (Danio rerio) were used as a model organism to investigate the potential nootropic effects of metformin, a widely used antidiabetic agent. Although primarily prescribed for glycemic control, metformin's impact on cognitive functions was the primary focus of this research. A T-maze model was used to evaluate spatial learning and memory. Cognitive deficits were induced using hyoscine, a muscarinic antagonist known to impair memory. Metformin was administered at varying concentrations via water immersion. To assess oxidative stress, levels of lipid peroxidation and reduced glutathione (GSH) in zebrafish brain tissue were quantified. The findings shows that metformin significantly ameliorated hyoscine-induced memory deficits. Zebrafish treated with metformin showed enhanced memory performance, evident through increased entries into the yellow reward arm ($p < 0.05$) and reduced latency time ($p < 0.05$). Among the tested doses, 1.6 mg/mL exhibited the most pronounced cognitive

benefits. Biochemical analyses revealed that metformin treatment significantly decreased lipid peroxidation and elevated GSH levels ($p < 0.0001$), indicating reduced oxidative stress. These outcomes suggest that metformin not only improves cognitive performance in the zebrafish model of amnesia but also exhibits antioxidative properties. The observed cognitive enhancement may be attributed to the mitigation of ROS and subsequent protection of cholinergic neurons.

Keywords: Metformin, amnesia, zebrafish, hyoscine, cognition, nootropic

BCR/NATCON/25/P-042

REACTIVE OXYGEN SPECIES: DRIVERS OF BREAST CANCER PROGRESSION

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Researchers have recently focused more regarding free radicals and how they contribute to the tumour microenvironment. The free radicals are extremely unstable and reactive molecules because of the unusual quantity of electrons in their atoms' outermost orbits. Reactive oxygen and nitrogen species are examples of free radicals and are important participants in the growth and dissemination of cells and improve their ability to spread. Indeed, they are becoming more widely recognized as a feature of cancer. Nonetheless, both reactive species could enhance the results of radiation therapy for cancer patients. Moreover, high amounts of reactive oxygen species could indicate genotoxic damage in healthy tissues that have not been exposed to radiation. This article summarizes Current studies on carcinogenesis and free radicals to better understand the processes that result in tumour aggressiveness. This review explains Free radicals' function in the etiology of breast cancer. They also increase mitogenic signals, influence genetic instability caused by growth factors and tumour suppressor genes, and participate in cell remodelling, autophagy, apoptosis, senescence, and proliferation. The possible connection between inflammation and free radicals is also investigated. Further, attempts were made to review the drugs which are being investigated for management of breast cancer through suppressing oxidative stress and reactive oxygen species. This review will be helpful for the researchers who are actively working on breast cancer.

Keywords: Oxidative stress; DNA damage; oncogenesis; cancer stem cells; angiogenesis; metastasis

BCR/NATCON/25/P-043

ECO-FRIENDLY SYNTHESIS OF COPPER NANOPARTICLES USING JATROPHA CURCAS LEAF EXTRACT: INSIGHTS INTO PHOTOCATALYTIC, ANTIBACTERIAL ACTIVITIES AND CALF THYMUS DNA INTERACTIONS

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This study presents an innovative and sustainable approach to combating antimicrobial resistance through the eco-friendly synthesis of copper nanoparticles (CuNPs) using Jatropha curcas leaf extract. The synthesis method leverages green chemistry principles, avoiding the use of hazardous chemicals and reducing environmental impact. The resulting JC-CuNPs were characterized using various analytical techniques like UV-Visible spectroscopy, FT-IR, X-RD to confirm their size, morphology, and crystalline structure. The photocatalytic activity of the JC-CuNPs was evaluated, demonstrating their potential for environmental remediation by degrading organic pollutants under visible light irradiation. Furthermore, the antibacterial properties of the JC-CuNPs were assessed against Staphylococcus aureus (gram positive) and Escherichia coli (gram-negative) bacteria, showcasing their efficacy in inhibiting bacterial growth and biofilm formation. Additionally, the interaction of JC-CuNPs with calf thymus DNA was investigated to understand their potential biological implications. The findings highlight the dual functionality of JC-CuNPs as both antibacterial agents and photocatalysts, offering a promising avenue for sustainable drug discovery and development.

Keywords: Copper nanoparticles, Jatropha curcas, green synthesis, antibacterial properties, DNA interactions, antimicrobial resistance.

BCR/NATCON/25/P-044

6-SHOGAOL AS A DUAL-ACTION ANTIFUNGAL: SUPPRESSING BIOFILM FORMATION AND VIRULENCE IN MULTIDRUG-RESISTANT

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Ginger (Family-Zingiberaceae) have been used in traditional medicine and food. Ginger represents many popular herbal bioactive molecules in various healing systems. Ginger contains major bioactive compounds like 8-Gingerol, 6-Shogaols, and 10-Gingeriols. Ginger extract containing bioactive molecules that showed predominantly antibiofilm, antifungal and antimicrobial activities. *Candida auris* and *Candida albicans*- the third most common of cutaneous and systemic infection in immune compromised patients. Both species *Candida auris* and *Candida albicans* are main causes of hospital-acquired fungal infections with high therapeutic failure. Both species are multi-drug-resistant organisms that have been identified as a rapidly emerging pathogenic agent. *Candida auris* and *Candida albicans* species can develop biofilm. Biofilms are complex structured community of micro-organisms enclosed by polysaccharides. Biofilms make the cells more resistant to predation by macrophages and natural killer cells and also protect cells against toxic chemicals. Thus, biofilms are resistant to disinfection and even to antibiotics. It was found that 6-Shogaol effectively reduces the biofilm formation and inhibit the virulence activity. The rate of inhibition and anti-biofilm activity were further confirmed through time-kill assay. Cellular metabolic activity of Biofilm was also confirmed through XTT reduction assay. The effect of 6-Shogaol on *Candida auris* and *Candida albicans* biofilms was visualized by confocal laser scanning microscopy. The data indicates that ginger extract bioactive agent 6-Shogaol could be considered as promising alternative to antibiotic & strategies targeted to reduce the production of biofilm of *Candida auris* and *Candida albicans*. This study also concluded that ginger extract contains bioactive agent 6-Shogaol which is a promising and potent bioactive agent against drug resistant *Candida auris* and *Candida albicans* species virulent fungi.

Keywords: Antibiofilm, ginger, 6-Shogaol, *Candida auris, Candida albicans*

BCR/NATCON/25/P-045

PREDICTIVE PRELIMINARY INTEROGATIVE EVALUATION OF METRONIDAZOLE AND CIPROFLOXACIN MICROBIOFLORA DRUG RESISTANCE: A PHARMACOVIGILANCE INVESTIGATION

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Antibiotics disrupt the composition of the infectious agent, leading to bacterial adaptation and in turn, new resisted strain is developed which results from the inappropriate use of antibiotics in one patient that spreads to other patients, which makes this issue a critical and urgent public health initiative. Ciprofloxacin and metronidazole are two commonly

prescribed antibiotics used to treat a variety of bacterial infections. The present study aims to identify patterns in antibiotic resistance emergence and assess contributing factors like usage practices and local stewardship programs. 150 prescriptions were collected from patients in various hospitals and they were analysed for any relation of prescribing the above two medicines for the treatment of diarrhoea. The results suggest that the combination of ciprofloxacin and metronidazole were very rarely prescribed within a specific population in Barasat. To understand the reasoning behind this, a vigilance survey with doctors in that area was conducted, asking about their views and experiences with these two antibiotics. After gathering their responses, a biostatistical analysis on both the prescription data and the doctors' feedback was carried out. The result of linear regression of the data revealed that the values of the key statistical parameters were found to be t-value-0, correlation coefficient: -0.38, R-value: -0.36. Our findings suggest that these two medications are showing signs of reduced effectiveness in this population, indicating a growing trend of antibiotic resistance over time. In summary, tackling antibiotic resistance demands a comprehensive strategy that incorporates infection control practices, and the exploration of alternative treatment options.

Keywords: Adverse reaction, ciprofloxacin resistance, inappropriate use, metronidazole resistance, stewardship.

BCR/NATCON/25/P-046

REWRITING THE RULES OF BRAIN DRUG DELIVERY: NANOPARTICLES VS. THE BBB

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BBB (The blood-brain barrier) is both a barrier and protector of the brain. While it plays a important role in protecting the CNS (central nervous system) from harmful substances, its selective nature also poses a insuperable barrier to delivering drugs where they're needed most—particularly in neurodegenerative diseases like Alzheimer's, Parkinson's, and stroke. With the increasing age these conditions rise globally, the need for effective brain-targeted therapies has grown higher. In recent years, nanoparticles (NPs) have emerged as one of the most favourable tools in the quest to deliver therapeutics across the BBB safely and efficiently. Engineered to be smart, small, and adaptable, Nano Particles can be functionalized with ligands or coatings that allow them to hijack the brain's own transport systems, like receptor- mediated or adsorptive transcytosis. More intriguingly, disease-related changes in the BBB previously seen only as hurdles—can now be turned into therapeutic entry points. This poster reviews the innovative works on Nano Particle-mediated brain drug delivery, exploring how various Nano Parties types (polymeric, inorganic, and natural), surface modifications, and sizes influence their ability to cross the BBB. It also highlights how dealt with BBB physiology in neurological disorders may offer new therapeutic windows. By merging new findings and emerging delivery

strategies, this poster showcases how nanomedicine is reshaping our approach to treating brain diseases—offering not just hope, but useful possibilities.

Keywords: Alzheimer's disease, blood–brain barrier (BBB), brain drug delivery, neurodegenerative diseases, nanoparticles, Parkinson's disease

BCR/NATCON/25/P-047

ADVANCES IN THE MANAGEMENT OF DIABETIC NEPHROPATHY: CURRENT TRENDS AND FUTURE DIRECTIONS

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Diabetic nephropathy (DN) is a prevalent complication of diabetes mellitus and leading to end-stage renal disease (ESRD) worldwide, affecting approximately 20–30% of individuals with diabetes. In diabetic patients, kidney disease can develop over several years. It is influenced by a complex interplay of genetic susceptibility and environmental factors, occurring in both types of diabetes mellitus. Persistent hyperglycemia, hypertension, dyslipidemia, smoking, excessive dietary protein intake, and genetic predisposition are major risk factors for diabetic nephropathy. Clinical strategies such as glycemic and blood pressure control, and the inhibition renin-angiotensin-aldosterone system (RAAS) have demonstrated efficacy in slowing disease progression. However, despite these measures, the incidence of ESRD among diabetic patients remains concerningly high. In recent years, research has expanded to explore innovative therapeutic targets, including interventions aimed at mitigating oxidative stress, inflammation, endothelin pathway dysregulation, and vitamin D receptor modulation. This review highlights the current understanding of DN pathophysiology, standard treatment practices, and emerging therapeutic strategies, and also the perspectives of novel-anti DN agents, offering insight into future directions that may enhance disease prevention and management.

Keywords: Diabetic nephropathy, renin-angiotensin-aldosterone system, hypertension, albuminuria, novel therapeutics.

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ADVANCEMENTS IN MULTI-TARGET DRUG DISCOVERY FOR ALZHEIMER'S DISEASE: A NEW PARADIGM IN THERAPEUTIC DEVELOPMENT

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Alzheimer's disease (AD) is the most prevalent form of dementia in older adults and is marked by a gradual decline in cognitive abilities, including memory and reasoning. As a complex, multifactorial neurodegenerative disorder, AD cannot be effectively managed by the traditional "one drug–one target" strategy. Historically, treatments have focused on inhibiting acetylcholinesterase to boost acetylcholine levels in the brain, but this approach has offered only limited benefits. Recent advances in medicinal chemistry have introduced the concept of multi-target drug design, which aims to address the multiple biological pathways involved in AD progression. A key strategy in this approach involves the use of privileged scaffolds chemical structures known for their ability to interact with multiple targets. Researchers are now developing hybrid compounds that combine these scaffolds to create more effective therapies. These hybrid molecules show promise in modulating several AD-related mechanisms simultaneously, offering a more holistic way to tackle the disease. The ongoing development of these compounds represents a significant shift in how we approach not only AD but other complex conditions like cancer and diabetes. With continued research, multi-target therapies could become a cornerstone in the future of Alzheimer's treatment. In conclusion, the shift toward multi-target drug design, particularly through the development of hybrid compounds based on privileged scaffolds, holds great promise for transforming Alzheimer's treatment by addressing its multifaceted nature more effectively than traditional single-target approaches.

Keywords: Alzheimer's disease, multi-target drugs, hybrid compounds, privileged scaffolds, neurodegeneration

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UNVEILING THE THROMBOPOIETIC POTENTIAL OF SPINACH: A PRECLINICAL STUDY

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Thrombocytopenia, characterized by an unusually low platelet count, poses significant clinical challenges, increasing the risk of hemorrhagic complications and signalling potential underlying health issues. Spinacia oleracea (spinach), with its rich nutritional profile and bioactive phytoconstituents—including quercetin, kaempferol and carotenoids—has garnered attention for its potential haematological benefits. These compounds exhibit anti-inflammatory, antioxidant, and immunomodulatory properties, which are believed to affect in platelet production or its metabolism. Here we investigate the spinach's potential as a therapeutic agent for thrombocytopenia. This study evaluates

the effects of the aqueous extracts of Spinacia oleracea on platelet count in heparin-induced thrombocytopenic (HIT) rat model. Two dosages of spinach extracts, obtained from maceration process, were administered to HIT rats. 30 rats were divided into 5 different groups. Platelet counts and other parameters were measured at 5 intervals. Preliminary results indicated that both doses of spinach extracts contributed to a gradual increase in platelet counts in the treated rats over the 15-day study period. These effects suggested a potential restorative or protective impact on platelet levels. This study supported that aqueous extract spinach may exert a thrombopoietic effect, potentially offering a natural intervention for thrombocytopenia. Further research is needed to explore optimal dosages, mechanisms of action, and long-term effects.

Keywords: Heparin-induced thrombocytopenia, platelet, spinach, thrombopoiesis

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NEXT-GENERATION VACCINOLOGY: THE IMPACT AND FUTURE OF MRNA PLATFORMS

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Messenger RNA vaccines came up as a life changing platform in modern vaccination system, which offers rapid, safe, and adaptable solutions for both infectious diseases and potentially non-communicable conditions like cancer. Initially hampered by concerns over instability and delivery inefficiency, mRNA-based therapeutics have experienced a scientific renaissance, driven by advancements in molecular design, delivery systems, and immunological understanding. The COVID-19 pandemic became a revolutionary moment for mRNA technology, increasing the pace of global collaboration and unprecedented speed in vaccine development. Within months, companies like Pfizer–BioNTech and Moderna delivered highly effective vaccines using nucleoside modified mRNA encapsulated in lipid nanoparticles—a milestone made possible by decades of foundational research. These vaccines not only proved effective in viral transmission but also showcased the platform's scalability, flexibility, and capacity to show strong immune responses. mRNA vaccines don't carry risks of genomic integration and can be produced quickly with cell-free methods, which allows near-instant responses to new variants or novel pathogens. Technological innovations such as modified nucleosides, and sophisticated purification techniques have addressed challenges which are related to innate immune response and protein expression. Still the ongoing journey aims in optimizing delivery to specific immune cells, minimizing dose while maintaining efficacy, and expanding the platform beyond SARS-CoV-2. The success of mRNA vaccines against COVID-19 hasn't only helped in preparedness of global health but also opened effective ways for cancer immunotherapy, personalized vaccines, and therapeutic protein delivery.

As the field advances, mRNA vaccines are to become central pillars in future medical strategies.

Keywords: COVID-19, infectious disease, mRNA vaccines, nucleoside modification, vaccine delivery systems, synthetic biology.

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PHARMACOLOGY OF ANTIULCER DRUGS

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Peptic ulcer disease treatment aims to reduce discomfort, promote healing, and prevent recurrence. The H2-receptor antagonist is considered as first-line medications for oesophagitis, gastric ulcers, and simple duodenal ulcers. However, these drugs have a high likelihood of ulcer recurrence after stopping treatment, making them continuously provided for those susceptible. Misoprostol is the only medication that can stop ulcers caused by nonsteroidal anti-inflammatory medicines and is successful in treating both duodenal and stomach ulcers. Sucralfate and organic bismuth salts are mucosal protective medications that do not prevent gastric acid production.The four main types of drugs used to treat peptic ulcers are H2 blockers (ranitidin, famotidin), proton pump inhibitors (rabiprazole, esmoprazole, omeprazole), antacids, and ulcer protective drugs (sucralfate). These drugs need to have a large margin of safety when used regularly in clinical settings. Side effects of anticholinergic drugs include dry mouth, constipation, and urine retention. Some muscarinic antagonists should produce antisecretory medications with minimal side effects. Newer medications like rabiprazole, esmoprazole, omeprazole and prostaglandin analogues have a bright future.

Keywords: Peptic ulcer, healing, protect, antacids, proton pump inhibitor

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A REVIEW ON THE ROLE OF VITAMIN D IN MANAGEMENT OF DEPRESSION

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Depression is a most common psychiatric disorder worldwide. The mechanisms of depression related to various neural function impairing all human activity. Observational data of patients having depressive disorder and conducted Randomized Clinical Trials (RCTs) shows low level of serum Vitamin D3 is a common risk factor in depression mechanism. Vitamin D is a fat-dissoluble vitamin which hypothesis related to managing mood disorder by various mechanism like homeostasis, neurotrophic activity, neurotransmission, Hypothalamic-Pituitary-Adrenal axis activity, immunomodulatory action in parts of brain like prefrontal lobe, substantia nigra, hippocampus, hypothalamus has now recently emerged. But the evidences are not enough strong to recommend supplementation of Vitamin D3 in depression. But the link between Vitamin D3 and depression directs the current research and clinical trials to a positive result in management of this type of mental disorders around the globe. It may be an easy and affordable remedy by which patients' can be benefited over a long duration of time.

Keywords: Depression, vitamin D, homeostasis, sunlight exposure, neurotrophy, immunomodulation.

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CROSSING THE BARRIER: NOVEL STRATEGIES TO DELIVER DRUGS TO THE BRAIN

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The blood-brain barrier (BBB) serves as a critical protective mechanism that regulates the passage of substances between the circulatory system and brain tissue. While it is essential in preventing harmful substances from entering the central nervous system (CNS), it also creates significant challenges for delivering drugs intended to treat neurological conditions such as Alzheimer's disease, Parkinson's disease, and brain tumors. To address this limitation, researchers are developing a variety of advanced drug delivery strategies designed to either cross or bypass the BBB. These strategies include the use of nanocarriers, receptor-mediated transport, focused ultrasound, and intranasal drug administration. Among these methods, nanotechnology has garnered considerable attention due to its ability to improve drug targeting, regulate release rates, and minimize unwanted side effects. In addition, efforts are underway to modify drug formulations and exploit the brain's natural transport pathways to improve the effectiveness of treatments. Despite the promising potential of these techniques for advancing CNS disorder therapies, challenges remain, particularly regarding safety, long-term outcomes, and practical clinical application. The ongoing success in this area will rely on the collaborative efforts of researchers across various scientific disciplines.

Keywords: Blood-brain barrier (BBB), neurological disorders, nanotechnology, focused ultrasound, nanocarriers, intranasal administration

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OXIDATIVE STRESS IN ALZHEIMER'S DISEASE: NOVEL THERAPEUTIC APPROACHES

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Alzheimer's disease, the predominant form of dementia in the elderly impacting approximately 15 million people worldwide, is associated with amyloid beta-peptide, the primary constituent of senile plaques in the brains of individuals with Alzheimer's disease. This peptide is found in trace amounts in spinal fluid and blood and is typically synthesized in a monomeric soluble form. This peptide has neurotrophic and neuroprotective properties at healthy concentrations; but, as people age, and especially in Alzheimer's disease, it builds up, promotes the development of insoluble fibrils, and results in neurotoxicity. Free radical production, which in turn encourages lipid peroxidation and protein oxidation, has been linked to beta-amyloid peptide toxicity. The beta-amyloid peptide is internalized as aggregates when it makes contact with certain receptors, like the scavenger receptor. Whatever the peptide's mode of entry into the cell, it causes oxidative stress, which ultimately leads to neurotoxicity and cell death. The brain uses a lot of oxygen, has a lot of easily oxidized fatty acids, and has low antioxidant levels, making it particularly vulnerable to oxidative damage. Antioxidant therapy is a promising strategy for mitigating disease development, given that oxidative damage may contribute to the cognitive and functional deterioration seen in Alzheimer's disease.

Keywords: Alzheimer's disease, free radical, beta-amyloid peptide, neurotoxicity, oxidative stress, antioxidant

BCR/NATCON/25/P-055

PHARMACOLOGICAL EVALUATION OF PURIFIED ROOTS OF *PLUMBAGO ZEYLANICA* IN INFLAMMATION

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Plumbago zeylanica is an important plant which is used for the treatment of various inflammatory conditions in traditional system of medicine *i.e.* Ayurveda. Hence the current study investigated the in-vitro anti-inflammatory and antioxidant activity of the different extracts of the purified roots of *P. zeylanica* and after that the potent extract was evaluated for *in-vivo* anti-inflammatory activities. The shodhana process was done to detoxify the roots and after that standardization was done. The purified roots were subjected to Soxhlet extraction by different solvents of increasing polarity. The obtained extracts were undergone in-vitro anti-inflammatory activity *i.e.* protein denaturation and membrane stabilization assay. The in-vitro antioxidant activity was evaluated by various in-vitro methods *i.e.* DPPH the free radical scavenging assay and H_2O_2 hydroxyl radical scavenging and reducing power assay. The analgesic activity was evaluated by formalin induced pain model and anti-inflammatory activity was evaluated by carrageenan induced paw edema in rats. Results of *in-vitro* and *in-vivo* studies revealed that the methanolic extract was found to be most potent.

Keywords: *Plumbago zeylanica*, inflammation., ayurveda, anti-inflammatory, antioxidant

BCR/NATCON/25/P-056

THE WINGED ENEMY: A PHARMACOLOGICAL OVERVIEW OF AVIAN INFLUENZA OUTBREAKS

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Avian Influenza, widely known to us as bird flu, which is a viral disease that mostly affects birds, but when it jumps to humans, it becomes a serious public health concern. In early 2025, India saw a worrying rise in H5N1 outbreaks across multiple states, including Maharashtra, Andhra Pradesh, and Jharkhand. Not only has this impacted the poultry industry, but it has also raised alarms due to its zoonotic potential, with a tragic human case recently reported. This poster explores the pharmacological landscape of avian influenza—what's currently being done, what's working, and what isn't. Antiviral drugs like Oseltamivir and Zanamivir are frontline treatments, but resistance is becoming a growing concern. We also look into the science behind these drugs, how they target the virus, and why mutations can limit their effectiveness. Beyond existing treatments, the world is racing to develop effective vaccines. But with how quickly the H5N1 virus evolves, vaccine development is a challenge. That's why scientists are also exploring newer approaches like monoclonal antibodies and even herbal or plant-based antivirals. This presentation not only highlights these scientific strategies but also emphasizes the role of pharmacologists in managing such health crises. From drug development to outbreak control, pharmacological research is essential in preventing the next pandemic.

With stronger surveillance, smarter drug design, and better preparedness, we can hope to stay one step ahead of this winged enemy.

Keywords: Avian Influenza, drug resistance, H5N1, oseltavir, pandemic preparedness

BCR/NATCON/25/P-057

IN-VITRO STUDIES OF LARVICIDAL AND MOSQUITOCIDAL ASSAY OF TAGETES ERECTA PLANT, AS WELLAS THE EXTRACTION OF ESSENTIAL OILS AND HERBAL NUTRITIONAL SUPPLEMENTS THAT ENHANCE GUPPY FISH COLORING AND METABOLIC PARAMETERS

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In both traditional and allopathic medicine, the use of medicinal plant extracts and secondary metabolites as a natural substitute for artificially manufactured chemicals is growing in popularity worldwide. The medical benefits of Tagetes erecta (compositae), commonly referred to as genda phul (marigold), as documented between 2006 and 2014 are covered in this article. Numerous significant phytochemical elements from various plant parts are present in Tagetes erecta. Anti-nociceptive, anti-inflammatory, antioxidant, insecticidal, larvicidal, hepatoprotective, antipyretic, wound healing, antibacterial, antimicrobial, antiepileptic, and antifungal. Deadly diseases like dengue fever, zika virus, yellow fever, and malaria are spread by bloodsucking mosquitoes. Mortality and economic cost are caused by diseases spread by mosquitoes. Diseases transmitted by mosquitoes are a major cause of illness and mortality on a global scale. Fascinatingly, Tagetes erecta, or marigold, was used to treat a guppy fish and lessened its allergic reaction. Marigold is used in traditional medicine to lessen allergic responses and inflammation because of its well-known anti-inflammatory qualities. Following that, we collected the flowers, allowed them to air dry, extracted them using the appropriate solvent, and used the resulting extract to make a mosquitocidal spray that also had the ability to heal guppy fish wounds. The goal of the current study was to assess scientifically the guppy fishes' (poecilia) greater larvivorous activity against culex mosquito larvae than anopheles' larvae. Guppy reticulata performs well in experiments and exhibits activity in stars. These straightforward tests demonstrated the effectiveness of using these fishes to suppress mosquito larvae.

Keywords: Tageteserecta, phytochemical, mosquitoes, guppyfish, marigold.

BCR/NATCON/25/P-058

THE SCIENCE OF DEPRESSION: BRIDGING NEUROCHEMISTRY AND BRAIN REMODELING

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Depressive disorders are among the most common mental health conditions in today's world, affecting roughly 9% to 18% of people in Western countries. They go far beyond occasional sadness, often involving a deeply persistent low mood, loss of interest in once-enjoyed activities, feelings of guilt or worthlessness, changes in appetite and sexual desire, insomnia, and, in more severe cases, recurring thoughts of death or suicide. One of the leading theories behind the development of depression points to a reduced activity in the brain's monoaminergic systems—those involving neurotransmitters like serotonin, norepinephrine, and dopamine. Most modern antidepressant medications work by increasing the availability of these neurotransmitters in the brain, especially within the synaptic cleft, the space between nerve cells. However, simply boosting monoamine levels doesn't fully explain how these drugs work—especially since their full effects often take weeks to kick in. This delay suggests that it's the longer-term changes in the brain that truly drive recovery. These changes include alterations in how nerve cells communicate, changes in gene expression, and even the growth and remodeling of neural networks. Interestingly, treatments like lithium and electroconvulsive therapy (ECT) also lead to structural changes in the brain and appear to enhance synaptic plasticity—our brain's ability to adapt and form new connections. These findings highlight that recovery from depression involves not just chemical balance, but a true rewiring of the brain. Ultimately, this growing understanding underscores the importance of comprehensive treatment approaches that support both the brain's biology and its capacity for long-term healing.

Keywords: Depression, monoamines, antidepressants, neurotransmission, synaptic plasticity, neuropharmacology

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XERODERMA PIGMENTOSUM: GENETIC DEFECTS IN DNA REPAIR LEADING TO PHOTOSENSITIVITY AND INCREASED SKIN CANCER RISK

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The rare autosomal recessive genodermatosis known as Xeroderma Pigmentosum (XP) is characterized by a malfunction in the nucleotide excision repair (NER) pathway, which impairs the body's capacity to repair UV-induced DNA damage and causes lentiginous pigmentation, along with other symptoms of poikiloderma and an increased risk of early skin cancer development. Extreme photosensitivity, early pigmentary changes, actinic keratoses, and a markedly elevated chance of acquiring cutaneous cancers, such as melanoma, squamous cell carcinoma, and basal cell carcinoma, usually at an early age, are clinical manifestations of XP. The majority of patients pass away from metastases before they reach maturity. The molecular effects of UVL have been investigated in microorganisms where the UVL causes aberrant cyclobutyl-pyrimidine dimers in the DNA. A fraction of patients have neurological problems such sensorineural hearing loss, neuromuscular dysfunction, and gradual cognitive deterioration.At least eight complementary groups (XP-A to XP-G and XP-V), XP is genetically diverse and isassociatedwith mutations in thevarious genes involved in the detection and repair of DNA damage. Clinical evaluation establishes the diagnosis, which is then verified by functional DNA repair assays or molecular genetic testing. Successful topical DNA repair enzyme treatment has also been reported. This recombinant liposomal encapsulated T4 endonuclease V fixes cyclobutan-pyrimidine dimers that are caused by UV light. Early diagnosis and thorough preventive actions can greatly improve patient outcomes and quality of life, even if there is currently no proven cure. Future therapeutic developments may be possible due to ongoing research into gene therapy and molecular treatments.

Keywords: Genodermatosis, ultraviolet light, cyclobutyl-pyrimidine dimers, nucleotide excision repair

BCR/NATCON/25/P-060

EVALUATION OF ANTIMICROBIAL PROPERTIES OF KALMEGH (*ANDROGRAPHIS PANICULATA*) LEAF EXTRACTS

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The growing threat of antibiotic resistance has led to increased interest in alternative antimicrobial agents, particularly medicinal plants. This study explores the antimicrobial potential of Kalmegh (*Andrographis paniculata*) leaves, which are traditionally used in various healing systems. The research aimed to evaluate and compare the antimicrobial effects of methanol and aqueous extracts of Kalmegh leaves against four bacterial strains-*Staphylococcus aureus, Escherichia coli*, *Pseudomonas aeruginosa*, and *Bacillus subtilis* and two fungal strains-*Candida albicans* and *Aspergillus niger*. Kalmegh leaves were collected, dried, powdered, and subjected to extraction using methanol and water. Extracts

were filtered, concentrated, and analyzed for phytochemicals, revealing the presence of alkaloids, flavonoids, tannins, glycosides, saponins, and andrographolide—a compound known for its antimicrobial properties. Antimicrobial activity was assessed using agar well diffusion and minimum inhibitory concentration (MIC) methods. Both extracts showed notable antimicrobial effects, with methanol extracts proving more potent. *Staphylococcus aureus*, *Bacillus subtilis*, and *Candida albicans* were especially susceptible, while *Aspergillus niger* displayed moderate sensitivity. These findings validate the traditional use of Kalmegh and highlight its promise as a natural antimicrobial agent. However, further studies, including *in vivo* testing and compound isolation, are necessary to fully realize its clinical potential. This research supports integrating traditional medicinal knowledge into modern healthcare, contributing to the development of novel herbal treatments to combat antibiotic resistance.

Keywords: *E. coli*, Resistance, bacteria, herbal drugs, methanol

BCR/NATCON/25/P-61

SUSTAINABLE SYNTHESIS OF OFLOXACIN-COPPER NANOPARTICLES: A STUDY ON THEIR BIOMEDICAL AND ENVIRONMENTAL APPLICATIONS

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This research explores the synthesis of ofloxacin-copper nanoparticles (Oflox-CuNPs) through a chemical reduction process, utilizing polyvinylpyrrolidone (PVP) as a stabilizing agent, and evaluates their biomedical and environmental applications. The chemical reduction method ensures the production of stable and effective nanoparticles. The PVP is responsible for producing a uniform size distribution of the copper nanoparticles, and it also prevents aggregation of the copper nanoparticles. The resulting Oflox-CuNPs were characterized using various analytical techniques, including FT-IR, UV spectroscopy, and XRD analysis, to confirm their size, morphology, and crystalline structure. The antimicrobial properties of ofloxacin-copper nanoparticles were investigated using two strains: Staphylococcus aureus and Escherichia coli. In environmental applications, copper nanoparticles show potential in degrading organic pollutants like methylene blue in wastewater, highlighting their role in environmental remediation.In order to comprehend their possible biological implications, the interaction of copper nanoparticles with calf thymus DNA (CT-DNA) at a concentration of 0.1 mg/mL was also examined. This study emphasizes the versatile benefits of Oflox-CuNPs, offering innovative solutions for both healthcare and environmental challenges.

Keywords: Copper nanoparticles, ofloxacin-copper nanoparticles, antibacterial properties, DNA interactions, environmental applications.

BCR/NATCON/25/P-62

IN VITRO ADME LIVER MICROSOMAL IMBIBITIONAL INVESTIGATION OF CARDIOVASCULAR DRUGS WITH FOCUS ON THEIR CYTOCHROME P450 INHIBITION POTENTIAL BY NICARDIPINE

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In clinical practice, the use of multiple drugs is a necessity, as patients often present with various chronic diseases. To enhance convenience and drug adherence, several drugs are frequently administered concomitantly. However, the risk of DDI (drug-drug interaction) increases with polypharmacy, potentially leading to debilitating or even fatal adverse drug events. One of the most common mechanisms underlying DDI is the inhibition of cytochrome P450 (CYP450) enzymes. This study aimed to evaluate Nicardipine, a calcium channel blocker's effect, on metabolism of various cardiovascular drugs, including Diltiazem, Propranolol, Ezetimibe, Quinidine, Pindolol, Amiodarone, and Verapamil. Nicardipine's impact on the above standard cardiovascular agents metabolism was assessed through human liver microsomal (HLM) stability studies conducted in the presence and absence of Nicardipine. A probe substrate-based LC-MS/MS method was established for the CYP inhibition studies. Metabolite formation was examined after incubating probe substrates with HLM in both the presence and absence of Nicardipine. The inhibitory effect of Nicardipine was characterized using kinetic parameters, including IC50 values.Nicardipine significantly reduced the clearance values of Quinidine, Diltiazem, Ezetimibe, and Verapamil by several folds during incubation with human liver microsomes in the presence of Nicardipine compared to incubation with HLM alone. Probe substrate-based CYP inhibition studies demonstrated that Nicardipine inhibited CYP1A2, CYP2B6, CYP2C9, CYP2D6, and CYP3A4 respectively. The findings of this study revealed that Nicardipine inhibits CYP1A2, CYP2B6, CYP2C9, CYP2D6, and CYP3A4, thereby reducing the clearance values of Quinidine, Diltiazem, Ezetimibe, and Verapamil. These results highlight the potential for Nicardipine to cause clinically significant drug-drug interactions

Keywords: Drug-drug interaction, IC_{50}, cytochrome P450

BCR/NATCON/25/P-063

3RS IN ACTION: REPLACING ANIMAL TESTING IN PRECLINICAL DRUG DEVELOPMENT

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Several modern technologies provide suitable alternatives for research that requires animal-based experimental practices or ingredients from animal sources. The new methods enable superior experimental control and improved replication, which elevates research standards. Testing techniques that use in silico modelling combined with bioinformatics and 3D cell culture systems and organ-on-chip platforms have proven effective in reducing the need for animal testing. The advancement of ethical culture methods together with animal-free affinity reagent development improves scientific practices by becoming more humane. The combination of clinical studies using human participants and electronic health record analysis cuts down on the necessity of using animals for biomedical investigations. These methods have two main advantages: they represent ethical responsibility and demonstrate better cost-efficiency together with medical relevance to human health needs. Remarkably, drug evaluations using animal testing have generated adverse human responses throughout history, which challenges the utility of animal models as human response predictors. Alternative testing approaches help decrease the need for animal subjects in research studies, but they lack sufficient capability to eliminate animal-based scientific tests. Research involving animals must continue as a fundamental approach that remains vital to areas requiring no suitable replacement methods. Alternative research approaches remain vital for developing a more moral and human-oriented method of conducting life science research.

Keywords: Animal-free research, organ-on-chip, electronic health records, cost-efficiency

BCR/NATCON/25/P-064

BRIDGING ERAS: INTEGRATIVE MEDICINE UNITING ANCIENT WISDOM & MODERN SCIENCE

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The healthcare model of integrative medicine uses proven traditional approaches alongside contemporary scientific research to redefine medicine. Rooted in the entire person holistic medicine fundamentals, which combine sacred medical traditions from Ayurveda to Traditional Chinese Medicine and herbal modalities with modern biomedical practices. The innovative approach creates a complete care system that evaluates the root illness factors and applies personalized medical strategies to manage symptoms suitably. New investigations through research have confirmed the benefits of traditional approaches, which include acupuncture along with meditation and plant-based remedies, and diet therapy. The implementation of evidence-based traditional approaches together with standard treatments results in improved patient outcomes while lowering medication side effects and fostering lasting health outcomes. Through integrative medicine, practitioners focus on disease prevention together with lifestyle enhancements and patient-focused care, which fits well when treating conditions related to both chronic diseases and mental health as well as stress-related illnesses. Integrative medicine establishes partnerships between traditional healers and medical doctors, and researchers so they can cross cultural barriers and historical separations within healthcare delivery. The collaboration advances modern medical development through integrated innovation systems that uphold traditional cultural aspects and historical significances of ancient medical techniques. Various barriers exist to establish standardization of traditional treatments alongside ensuring safety protocols while following regulatory guidelines. Humankind will encounter a promising healthcare solution by integrating ancient wisdom with modern science to ensure healing while fostering both personal resilience and societal flourishing.

Keywords: Integrative medicine, holistic healthcare, traditional medical practices, evidence-based complementary therapies, personalized treatment strategies

BCR/NATCON/25/P-065

SMART BIOMATERIALS IN ACTION: SELF-HEALING WOUND CARE AND THE FUTURE OF REGENERATIVE THERAPIES

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The application of smart biomaterials modernizes medical practices, especially when used for restoring damaged tissues and treating wounds. The advanced materials demonstrate a dynamic reaction capability toward physiological conditions because they establish real-time interaction with damaged tissues. Self-healing wound care presents a top application for biomaterials that detect changes in wound environment through pH shifts or temperature variations and infected conditions to trigger therapeutic agent releases. These smart materials duplicate natural tissue patterns while they improve healing speed,

together with scar minimization, along with better tissue cellular restoration. Smart biomaterials function as advanced wound dressings by offering biodegradability alongside biocompatibility and stimulus-response features to fill the void between standard wound coverage and processing treatments. Scientists recently developed hydrogels that restore their structure after damage as well as nanofiber scaffolds, which support tissue regrowth, in addition to bioengineered skin substitutes that contain growth factors or stem cells. The continued development of these materials demonstrates their capacity to boost quick tissue healing processes and create a platform for future regenerative therapies targeting complex tissues and organs. Medical care is evolving toward patient-oriented solutions with the adoption of smart biomaterials into clinical settings. Large-scale manufacturing alongside regulatory requirements and long-term biocompatibility issues persist, but the field's current achievements suggest that healing will soon require more than just recovery capabilities. The scientific community has achieved major progress in biomedical science through these advances, which provide optimism for widespread responsive yet regenerative medical solutions.

Keywords: Smart biomaterials, self-healing wound care, stimuli-responsive materials, tissue regeneration, bioengineered skin substitutes

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BIOELECTRONIC MEDICINE: BRIDGING TECHNOLOGY AND BIOLOGY FOR ADVANCED THERAPEUTIC SOLUTIONS

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The advancement of technology is continuing to change the world. Bioelectronic medicine, the convergence of molecular medicine, neuroscience, engineering, and computing, is at the forefront of a potential revolution in disease management. This field emerged from discoveries about how neural circuits regulate biological processes linked to diseases. Instead of relying on pharmaceutical drugs, bioelectronic medicine uses electronic devices to target neural mechanisms, offering greater precision at the anatomical and cellular levels. This minimizes toxicity and side effects from off-target drug effects and enhances adaptability for individualized treatments. Neural reflexes are crucial for maintaining physiological balance (homeostasis) in organ systems. Advances in neuroscience and immunology have identified reflex mechanisms that influence immunity. For example, the inflammatory reflex, mediated by the vagus nerve, controls inflammation and cytokine production to maintain immune balance. Recent clinical trials show the feasibility of targeting the inflammatory reflex in humans, highlighting its potential for treating immune-related conditions. By overcoming challenges in disease management, bioelectronic medicine merges healthcare and science, offering precise

therapies tailored to individual needs. This revolutionary field promises to reshape medical treatment.

Keywords: Bioelectronic Medicine, Disease Management, Neuroscience, Homeostasis, Inflammatory Reflex.

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UNLOCKING THE POTENTIAL OF PLANT-DERIVED COMPOUNDS FOR UV PROTECTION

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The detrimental consequences of excessive exposure to ultraviolet (UV) radiation have long been recognized, encompassing tanning, sunburn, accelerated skin aging, reduced immunity against infections, and elevated risks of skin cancers. Sunscreen products serve as critical barriers against such damage, and plant-derived compounds have emerged as promising alternatives to conventional synthetic agents in this domain. These natural compounds significantly prevent the penetration of harmful radiation into the skin with their inherent UV absorption properties, facilitated by aromatic rings in their structure. Furthermore, the rich antioxidant profiles of flavonoids, carotenoids, phenolic acids, and vitamins neutralize free radicals and reduce oxidative stress, thereby preserving skin integrity and preventing cellular damage. Unlike synthetic sunscreens, plant-based formulations are often hypoallergenic, non-toxic, and sustainable photoprotective solutions for worldwide consumer demand. Beyond UV protection, plant-derived compounds offer multifunctional benefits, including skin hydration, nourishment, anti-inflammation, anti-pigmentation, etc. Natural compound-loaded sunscreens may face challenges like SPF(sun protection factor) standardization, low extinction values, and limited scalability in topical applications. Recent advancements in nanotechnology and bioactive extraction research have focused on optimizing these formulations to enhance their efficacy, stability, bioavailability, and sensory appeals, which can compete with synthetic compounds. The fusion of natural UV filters into modern formulations represents a promising step toward safer, eco-conscious skincare product development in dermatological and cosmetic science.

Keywords: Plant-derived compounds, natural UV filters, sun protection factor, antioxidant, free radicals, sustainable skincare.

BCR/NATCON/25/P-068

NATURAL PRODUCT MODULATORS OF THE GUT-BRAIN AXIS: A NOVEL EPOCH IN NEUROPHARMACOLOGY

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The gut-brain axis (GBA) is a complex bidirectional communication network between the gastrointestinal tract and the central nervous system, essential for sustaining neurological and mental health. Recent advancements have demonstrated the substantial impact of gut microbiota and its metabolites on cerebral function, facilitating innovative therapeutic approaches in neuropharmacology. Natural compounds sourced from plants, microorganisms, and marine organisms have emerged as potent modulators of the gut-brain axis (GBA) owing to their varied bioactivities, which encompass anti-inflammatory, antioxidant, neuroprotective, and microbiota-regulating properties. This talk examines the increasing potential of natural product-based therapies in altering the gut-brain axis, emphasizing significant phytochemicals such as polyphenols, alkaloids, terpenoids, and flavonoids that have demonstrated efficacy in both preclinical and clinical research. Specific focus is directed on their methods of action, encompassing modulation of gut microbial composition, augmentation of intestinal barrier function, and regulation of neuroinflammatory pathways. The integration of knowledge from traditional medicine and contemporary neuroscience positions natural product modulators as a transformative approach in the treatment of neurodegenerative and mental illnesses, heralding a new era in neuropharmacology.

Keywords: Gastrointestinal tract, central nervous system, phytochemicals, neuroinflammatory pathways, gut-brain axis.

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ANTIVIRAL AGENTS INSPIRED BY NATURAL PRODUCTS: A REVIEW OF RECENT DEVELOPMENTS

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Natural products have historically served as a significant reservoir of therapeutic agents, and the ongoing exploration of their structural diversity continues to stimulate the innovation of novel antiviral compounds. This review offers an extensive examination of the recent progress made in the field of antiviral agents that are either derived from or

influenced by natural products over the last ten years. Particular emphasis is placed on compounds derived from plants, metabolites produced by microorganisms, and natural products sourced from marine environments, all of which exhibit efficacy against a wide range of viral pathogens, encompassing influenza, HIV, herpesviruses, coronaviruses, and hepatitis viruses. The fundamental mechanisms of action, including the inhibition of viral entry, replication, and protein synthesis, are thoroughly examined. Additionally, the discussion encompasses insights into structure-activity relationships (SARs) and strategies for synthetic modification that aim to enhance the efficacy of antiviral agents. The review further underscores the importance of incorporating contemporary drug discovery methodologies such as high-throughput screening, computational modeling, and metabolomics into conventional natural product research in order to enhance the processes of lead identification and optimization.

Keywords: Therapeutic agents, Natural products, Microbial metabolites, Computational modeling

BCR/NATCON/25/P-070

EXPLORING THE ANTICOAGULANT EFFECTS OF MANGIFERA INDICA: A NATURAL ALTERNATIVE TO HEPARIN

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Mangifera indica (mango) is one of the most widely cultivated fruit crops with notable importance in traditional medicine. Known for its diverse pharmacological properties including antidiabetic, antioxidant, antiviral, cardiotonic, hypotensive, and anti-inflammatory effects. Recent studies highlight the anticoagulant potential of mangiferin, a bioactive polyphenolic compound abundantly present in mango seeds. Mangiferin demonstrates significant cardioprotective effects by downregulating pro-inflammatory and pro-apoptotic gene expression and by maintaining intracellular calcium homeostasis, thereby reducing doxorubicin-induced cardiac injury. Mango seed extract exhibits up to 72% inhibition of ADP-induced platelet aggregation in a dose-dependent manner, indicating strong antiplatelet activity. Phytochemical investigations reveal that mango seeds are rich in monogalloyl compounds, tetra- and penta-galloylglucose, ellagic acid, mangiferin, and benzophenone derivatives such as maclurin and iriflophenone glucoside. Mangiferin effectively inhibits platelet activation pathways, including ADP-induced aggregation, P-selectin secretion, and GPIIb/IIIa complex formation. The anticoagulant and antiplatelet activities of mangiferin can be assessed through platelet aggregation assays, clotting time analysis, and evaluations of its effects on coagulation factors. These findings suggest that Mangifera indica seed extract holds promise as a natural, plant-based anticoagulant, offering potential for safer, alternative therapeutic applications.

Keywords: Mangiferin, platelet aggregation, downregulation, ellagic acid, apoptosis

BCR/NATCON/25/P-071

NOVEL INDOLE-THIAZOLIDINE DIONE DERIVATIVES: DESIGN, SYNTHESIS, AND BIOLOGICAL ASSESSMENT AS EFFECTIVE ANTIMICROBIAL AGENTS

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Microbial infections have been a curse for all living beings worldwide from ancient times to the present. Advanced microbes are the new threats to our lives as they evolve new variants very fast, which leads to a global challenge to fight them. The commonly available therapies have potential issues and a lot of adverse effects. That is why we have introduced a series of Indole-thiazolidine dione-based novel molecules, where N-benzyl-indole-3-carboxaldehyde and thiazolidine-dione undergo Knoevenagel reaction, and then the amino group of thiazolidinedione-2,4-dione interacts with substituted aniline through Mannich reactions, and 10 molecules have been synthesized. The structures have been confirmed by IR spectrophotometry and NMR. The in vitro study has been evaluated against two microbial species, E. coli, and S. aureus, and screened for inhibition of the cells. Ciprofloxacin was taken as a reference drug. In that case, all compounds show good potency, but the molecule RBSA 6 was the most active. A molecular docking study has been performed for all synthesized molecules on a microbial protein glucosamine-6-phosphate (PDB ID: 2VF5). The docking scores of the series compounds are good, but the compound RBSA 6 has the highest docking score of -9.3 kcal/mol.

Keywords: Indole, Thiazolidine 2,4-dione, Molecular docking, Anti-microbial activity, NMR

BCR/NATCON/25/P-072

DESIGN AND MICROWAVE-ASSISTED SYNTHESIS OF NOVEL BENZYL THIAZOLIDINEDIONE MOLECULES: IN SILICO AND IN VITRO EVALUATION OF ANTIFUNGAL POTENTIAL

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From the ancient period to now, fungal infection has been a burden to the human population. Severe cases of fungal infection can be fatal, and sometimes, they can escalate into a pandemic situation. In medicinal chemistry, heterocyclic compounds play a significant role as they can regulate a wide range of biological activities in the body. Among all heterocyclic rings, the thiazolidinedione ring is reported to have versatile pharmacological activity nowadays, and we are introducing thiazolidinedione scaffold as an anti-fungal agent. We have synthesized a novel series of compounds by N-alkylation of benzyl thiazolidinedione by the utilization of indole chloroacetamide. After the synthesis structure is confirmed through IR spectrophotometry and NMR. A molecular docking study was performed with all of the synthesized compounds against the fungal protein named sterol 14-alpha demethylase (PDB ID: 5TZ1). The results support that all the compounds have a good binding affinity with the protein, and TG 5 possesses the highest docking score with 10.7 kcal/mol. In vitro activity of the molecules was screened against the two fungal species named *Aspergillus niger* and *Candida albicans* calculating zone of inhibition, Amphotericin B is used as standard drug, all the compounds show good anti-fungal effect and TG 5 appeared as most potent compound.

Keywords: Thiazolidine dione, antifungal agent, docking, *in vitro* study

BCR/NATCON/25/P-073

COUMARINS AS POTENTIAL NATURAL THERAPEUTICS AGAINST PROSTATE CANCER

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Prostate cancer remains one of the leading causes of cancer-related illness and death among men worldwide. In the search for new therapeutic agents, natural compounds have gained significant interest. Among these, Coumarins a class of benzopyrone compounds found in numerous plants have demonstrated promising anti-cancer potential. These phytochemicals exhibit a range of pharmacological activities, including anti-angiogenic, pro-apoptotic, and anti-proliferative effects. This review explores the current evidence supporting the role of Coumarins in prostate cancer therapy, highlighting their efficacy in preclinical models, underlying mechanisms of action, and clinical prospects. Coumarins have been shown to modulate several molecular targets, such as inducing oxidative stress, inhibiting cell cycle progression, and altering key signalling pathways like NF-κB and PI3K/Akt. Additionally, their synergistic effects when combined with existing chemotherapeutic agents are also examined. Despite these encouraging findings, further research is essential to understand the pharmacokinetics, optimal dosage, and long-term safety of coumarin-based therapies in prostate cancer patients. A deeper understanding of these factors will be critical to translating preclinical results into clinical practice, ultimately improving therapeutic outcomes and the quality of life for patients. The anti-cancer potential of coumarin has thus attracted significant attention as a promising candidate for prostate cancer treatment.

Keywords: Coumarins, Natural compound, Prostate cancer, NF-kB

BCR/NATCON/25/P-074

BOERHAAVIA DIFFUSA: A SCIENTIFIC EXPLORATION OF ITS PHYTOCHEMISTRY, PHARMACOLOGY AND THERAPEUTIC APPLICATIONS

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"Phytochemical" is a general term for plant molecules with various structures and roles. Phytochemicals may have biological activity when consumed by humans. The most common sources of phytochemicals are plant foods, including fruits, vegetables, whole grains, nuts, and seeds. The perennial creeping herb *Boerhaavia diffusa* L. nom. cons. grows throughout India. It is often known as "Punarnava" in the Indian medical system. Various phytochemicals such as flavonoids (C-methylflavone, 5,7-dihydroxy-3',4'-dimethoxy- 6,8 dimethylflavone, 3,5,4′- dihydroxy-6,7-dimethoxyflavone, 6', 5'-dimethoxy-5, 7, 3-trihydroxyflavone, borhavone, 3,3',5-trihydroxy-7-methoxyflavone, 4',7-dihydroxy-3'-methylflavone), alkaloids (punarnavine), glycosides (punarnavoside), rotenoids (boeravinone A-H), steroids, triterpenoids, lipids, lignans, carbohydrates, proteins, and glycoproteins etc have been claimed from this plant. It is commonly used to treat jaundice in various parts of India. *B. diffusa* is classified as a "Rasayana" plant in Ayurveda, which is said to have life-strengthening, disease-prevention, and anti-aging qualities. These characteristics are believed to significantly influence the prevalence of the disease worldwide and the affordability and availability of healthcare. This one is one of the first Eastern treatments mentioned by Ayurveda as a potential cure for several ailments. Its role in reproductive, gastrointestinal, respiratory, urinary, hepatic/jaundice, cardiovascular, and cancer issues is highlighted in several ethnopharmacological reports. Afterwards, doctors and scientists should use this plant more to discover its biological and therapeutic properties due to the medicinal benefits of flavonoids and polyphenols. This study seeks to ascertain its geographic description, ethnobotanical insights, Chemistry, and different pharmacological features.

Keywords: Punarnava, *Boerhaavia diffusa*, Ethnobotanical, Phytochemical, Polyphenols, flavonoids

BCR/NATCON/25/P-075

STRATEGIC SIGNIFICANCE IN THERAPUTIC DRUG MONITORING THROUGH PATIENT CENTRED COUNSELLING

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To minimize adverse drug reactions (ADRs) and drug-related toxicity the rational and individualized use of pharmacotherapy plays a critical role. From recent studies

antiepileptic drugs have shown consistent positive outcomes, with tailoring of drug regimens based on patient-specific factors such as weight and pharmacokinetic properties has also shown to have enhanced therapeutic efficacy and reduced risk of recurrent unprovoked seizures. Particularly in geriatric patients, to ensure optimal drug dosing and to minimize ADRs a vital tool has emerged in recent days known as Therapeutic Drug Monitoring (TDM). Moreover, Inflammatory Bowel Disease (IBD) can be managed by assessing drug metabolism and therapeutic response, and further guiding the dose. A potential link between prolonged high-dose antibiotic therapy and the onset of infective myocarditis, is likely due to impaired drug clearance. These findings underscore the significance of TDM in enhancing drug safety and efficacy. Though health competence has emerged as crucial factor but to emphasize more on the impact on patients health, communication plays a major role. But due to limited communication skill and least interested patients, leads to an intermediary gap which must be resolved on urgent basis to check the proper usage of drugs and to avoid toxicity, abuse and dependence. Interventions in the improvement of medication adherence may lead to decrease in the number of multimorbidity by making proper adjustment in prescribing exact mediaction and to counsel patient to administer the medication in proper manner.

Keywords: Adverse Drug Reactions (ADRs), Therapeutic Drug Monitoring (TDM), Patient counselling, Drug safety, Drug efficacy, Communication.

BCR/NATCON/25/P-076

PHYTOCONSTITUENTS AS EPIGENETIC MODULATORS: THERAPEUTIC IMPLICATIONS IN CANCER AND CHRONIC DISEASES

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Epigenetic changes play a key role in the development of cancer and chronic diseases, Phytoconstituents have been shown to regulate epigenetic processes for therapeutic purposes. Current treatments for cancer and chronic diseases have many limitations and are not completely effective. Different studies show identifying phytoconstituents and exploring their role as epigenetic modulators in cancer and chronic diseases by investigating mechanisms such as non-coding microRNA expression as well as DNA methylation. Many studies have shown that edibles, botanical medicines create epigenetic goals in cancer producing cells. These phytoconstituents are able to modify their targets to cure cancer. Several studies have shown that phytoconstituents are safe and non-toxic, with potential for use in the prevention and treatment of human diseases. Given the diverse properties of dietary phytochemicals, they may be used to treat or prevent various types of cancer.

Keywords: Epigenetic, Phytoconstituents, Cancer, Diseases, Treatment

BCR/NATCON/25/P-077

TEA POLYPHENOLS IN PROMOTION OF HUMAN HEALTH

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Tea, one of the most consumed beverages worldwide, is rich in polyphenolic compounds such as catechins, theaflavins, and thearubigins, offering significant health benefits. These bioactives act as antioxidants, aid in cancer prevention, support cardiovascular health, and help regulate blood sugar. The composition of polyphenols varies depending on tea type (green, black, oolong), fermentation level, plant species, season, and processing conditions. Among them, epigallocatechin gallate (EGCG) is the most studied compound for its potent therapeutic effects. This study reviews the role of tea polyphenols in preventing diseases and promoting health, backed by scientific and clinical evidence. Continued research highlights tea polyphenols as promising agents for improving overall well-being.

Keywords: Tea, polyphenols, catechins, disease prevention, antioxidants

BCR/NATCON/25/P-078

DEVELOPMENT OF MACHINE LEARNING ASSISTED DRAGON DESCRIPTORS BASED 2D-QSAR MODELLING WITH FARNESOID X RECEPTOR LIGANDS

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Non-alcoholic fatty liver disease (NAFLD) is caused due to over nutrition and sedentary lifestyle leading to its increased effect in adults. 11% of the adolescents are considered to be affected by NAFLD. NAFLD can be considered as a risk factor for cancer as it increases the chance of non-alcoholic steatohepatitis (NASH) which may progress to liver cirrhosis and hepatocellular carcinoma. The farnesoid X receptor (FXR) has been proved to be a very promising target for NAFLD/NASH therapy as obeticholic acid (6α-ethyl-CDCA, OCA), which was developed from the endogenous FXR agonist chenodeoxycholic acid (CDA), depicted clinical efficacy in NASH treatment. In the current work, we collected all compounds with reported EC_{50} values against FXR protein from ChEMBL to construct a dataset containing 1,950 data-points that were subjected to descriptor calculation using Dragon software for creating classification-based non-linear models using a range of machine learning tools. Initially, all pre-treated descriptors (obtained after setting correlation coefficient cut-off of 0.95 and variance cut-off of 0.001) were subjected to model generation. The most promising model was found with random forest (RF) classifier with Matthews Correlation Coefficient (MCC) of 0.660 and 0.683 for the training set (80% of total dataset) and test set, respectively. Since RF may itself rank the descriptors on the basis of importance, we selected 15 most significant independent variables to obtain an interpretable RF model that provided MCC values of 0.602 and 0.614 for the training and test sets, respectively. Subsequently, SHAP analysis was performed with the selected descriptors of the model to understand which factors contributed the most for higher binding potentials for FXR. Two Burden eigenvalues descriptors - SpMax2_BH(p) and SpMax2_BH(v) emerged as the most significant descriptors of the model. The current work may assist in predicting FXR binding potential

for newly designed compounds and at the same time also help understanding crucial structural factors responsible for increased potency towards FXR.

Keywords: Farnesoid X receptor, 2D-QSAR, machine learning, random forest, SHAP.

BCR/NATCON/25/P-079

PLANT-DERIVED NATURAL PRODUCTS USED IN MANAGING NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD)

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NAFLD, or non-alcoholic fatty liver disease, has become a significant worldwide health concern, defined as a common condition characterized by the build-up of fat in the liver not caused by alcohol consumption. As its incidence continues to rise, there is growing interest in the use of plant-derived natural products as complementary treatment options, due to their favourable safety profiles and broad biological effects. This current study describes the potential benefits of several plant-derived natural products, including silymarin (*Silybum marianum*), curcumin (*Curcuma longa*), berberine, resveratrol, green tea polyphenols (*Camellia sinensis*), and extracts from *Gynostemma pentaphyllum* and *Panax ginseng*. These substances have demonstrated hepatoprotective, antioxidant, anti-inflammatory, and lipid-regulating properties in both experimental and clinical settings. Their therapeutic effects are primarily linked to modification of important metabolic processes involved in lipid management, insulin sensitivity, oxidative stress, and inflammatory responses—all critical in the development of non-alcoholic fatty liver disease (NAFLD)—is the main mechanism by which they provide therapeutic effects. While initial data suggests that they can be used in conjunction with traditional treatments, more thorough, extensive clinical research is required to confirm their efficacy, establish safe and efficient dosages, and evaluate long-term results. A complete approach to controlling and preventing NAFLD may be possible by combining these natural agents with lifestyle modifications. To completely determine the safety and effectiveness of these plant-derived medicines in the treatment of NAFLD, more research is required.

Keywords: NAFLD, Hepatoprotective, plant-derived natural products, anti-inflammatory, lipid management.

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THERAPEUTIC POTENTIAL OF BENZIMIDAZOLE AND ITS DERIVATIVES IN INHIBITION OF LEISHMANIASIS

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Leishmaniasis is the second most common parasite infection globally in terms of human mortality, after malaria. Leishmaniasis is a collection of health diseases caused by

Flagellate protozoan infection by one of the genus Leishmaniasis. Leishmania donovani's visceral form causes an estimated 700,000-1 million new cases and 20,000-30,000 deaths per year in tropical and subtropical countries. The parasite can be found in two forms: amastigote (ovoid non-flagellate) and promastigote (flagellate) in sand-flies. Current treatments have severe side effects, medication resistance, little potency, and expensive costs. Vaccines for human L. infections are currently unavailable, and only two vaccines for canine leishmaniosis (CanL) have been licensed in Europe (CaniLeish® and LetiFend®). Benzimidazoles are heterocyclic compounds comprising a benzene ring and an imidazole ring fused at 4 and 5 positions having characteristics of both bases as well as acids. It pursues various pharmacological aims, such as analgesic-anti-inflammatory action, conditioned avoidance response (CAR) inhibition, choleretic activity, gastric protection, antiviral and antitumoral activities. To investigate the biocidal potential of benzimidazole derivatives, the anti-leishmanial activity of 2-alkyl/2-benzyl benzimidazoles was studied with quaternized heterocyclic heads which is similar to Miltefosine and Edelfosine. The folate biosynthesis is one such pathway, in which two leishmanial enzymes, i.e. pteridine reductase 1 and dihydrofolate reductase-thymidylate synthase which is involved in the reduction of folates to tetrahydrofolate (THFA) have been well established as anti-leishmanial targets.

Keyword: Benzimidazole, Benzimidazole derivatives, Leishmaniasis, Flagellate Protozoan Infection, Antileishmanial

BCR/NATCON/25/P-081

COUMARIN DERIVATIVES AS ANTI-LEUKAEMIA AGENT

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Acute leukaemia, a malignant disorder affecting blood-forming organs or bone marrow, involves immature hematopoietic cells. Genetics is a major cause, with factors such as mutations, chromosomal abnormalities, or impaired DNA repair increasing the risk of developing leukaemia. Evolving anti leukemia agents with more potency and less side effects is a major challenge today. Emergence of novel anti-leukemia agents are very much required in today's era, and coumarin derivatives have emerged as promising candidates. Coumarins, characterized by their benzopyrone structure, exhibit diverse pharmacological activities, including significant anti-cancer potential. Researchers have extensively investigated various coumarin-based derivatives as anticancer agents, those derivatives shows different mechanisms, including antimitotic agents, apoptosis inducers, alkylating agents, topoisomerase inhibitors, human carbonic anhydrase inhibitors, telomerase inhibitors, hormone antagonists, angiogenesis inhibitors, etc. Recent research highlights the development of both natural and synthetic coumarin derivatives with anti-leukemic properties. Some coumarin derivatives were found to be effective against breast cancer, so those compounds were gone through a polypharmacology prediction in PLATO webplatform and got Mcl-1 as a potential target which is leukaemia. These compounds were docked in in-silco platform with Mcl-1 and promising results were found. Based on

the polypharmacology prediction a total of 1468 compounds were found from ChEMBL and preformed different QSAR studies. Based on the results obtain from the molecular docking studies few compounds were synthesized and their characterization was done.

Keywords: Coumarin, Molecular Docking, Synthesis, Leukemia, Apoptosis.

BCR/NATCON/25/P-082

TOWARDS DEVELOPMENT OF FXR-PREDICTOR, A WEB-BASED APPLICATION FOR PREDICTING BINDING POTENTIAL TOWARDS FARNESOID X RECEPTOR BASED ON FINGERPINT BASED MACHINE LEARNING MODEL

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Nonalcoholic fatty liver disease (NAFLD) is a significant public health concern worldwide. It mostly associated with obesity and other metabolic risk. NAFLD is basically accumulation of fat in the liver not related to alcohol consumption. If that is not treated well then it eventually leads to cirrhosis and hepatocellular carcinoma. Considering that farnesoid X receptor (FXR) is one of the most promising biomolecular targets for the treatment of NAFLD, we collected a dataset containing 1,950 data-points from ChEMBL where each data-point contains one unique chemical compound with EC_{50} value for FXR. The dataset was prepared for classficiation analysis by selecting a EC_{50} cut-off value of 1000 nM. In this work, we generated 2D- Quantitative Structure Activity Relationship (QSAR) models with various molecular fingerprints (Morgan, Rdkit, MACCS as well as Klekota and Roth) by applying five machine learning (ML) techniques - namely k-nearest neighbourhood (KNN), random forest (RF), gradient boosting (GB), support vector classification (SVC), multilayer perceptron (MLP) using Scikit-learn tools. All these binary fingerprints are calculated with RDKit tool. Before generating the model, the dataset was divisded into a training set (80%) and a test set (20%). For each ML tool, hyperparameter optimization was carried out to select the most suitable parameter for model generation using 5-fold cross-validation on the training set. The most predictive classification model provided satisfactory Matthews Correlation Coefficient (MCC) values of 0.646 and 0.639 respectively towards training and test set. With another test set, generated with newly added compounds in ChEMBL after a time gap of six months, the model produced an MCC of 0.694 and emerged as the most predictive model. Considering high predictive predictive accuracy of this model, we generated a web-based application named FXR-Predictor that may be used for predicting FXR bidning potential for any chemical compound, the structure of which should be provided as SMILES notation. At the same time, this application also predicts whether the compounds lies within applicability domain or not and provides a similarity map plot to show favorable and unfavorable moieties of structure responsible for increased or decreased binding potential for FXR.

Keywords: Farnesoid X receptor; 2D-QSAR, molecular fingerprints, machine learning, web- application

BCR/NATCON/25/P-083

ROLE OF COUMARINS IN PROSTATE CANCER

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Prostate cancer (PCa) is a prevalent malignancy with significant global morbidity and mortality. Androgen receptors (AR) play a pivotal role in its pathogenesis, making them a prime target for therapeutic intervention. Coumarin derivatives, known for their diverse biological activities, have garnered attention for their potential anticancer properties with minimal side effects. In this study, we utilized computational methods to design novel coumarin compounds targeting AR and after getting a satisfactory result, future work shall be done through synthesizing and characterizing those derivatives as well as finding the anti-proliferative activity against PCa. Identification of the promising candidates against AR was done through molecular and predictive modeling. Three coumarin deerivatves was synthesized and spectral analysis was done through FTIR, NMR and Mass spectrometry. These findings support the potential of synthesized coumarin derivatives as anti-prostate cancer agents by targeting AR, paving the way for further biological activity assessment and clinical translation.

Keywords: Coumarins, synthesis, spectral analysis, androgen receptor, prostate cancer

BCR/NATCON/25/P-084

APPLICATION OF FLAVONIOD-BASED NUTRACEUTICALS IN THE MANAGEMENT OF CARDIOVASCULAR DISEASE

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Flavonoid-rich diets have long been linked to dietary guidelines, a healthy way of living, and the avoidance of chronic illnesses. However, it has been difficult to identify certain positive benefits from particular flavonoids and foods high in flavonoids, most likely because flavonoids have a conditional or non-essential role in human nutrition. Research on flavonoids has received particular focus recently due to the discovery of their certain effects on the cardiovascular management. They have positive side for their anti-oxidant qualities, which come from their capacity to minimize the oxidation of low-density lipoproteins and enhance lipid profiles. Their other beneficial effect is on the cardiovascular management, and their capacity to cause vasodilation and control endothelial cell death. Additionally, the studies show several potential pathways and pleiotropic effects of flavonoids that might be involved in lowering the possibility of cardiovascular disorder. Flavones, flavonols, flavanones, catechins, isoflavones, proanthocyanidins, and anthocyanidins are some of the subclasses of

flavonoids that may be involved in the apparent positive effects. Also other studies are required for confirmation of the beneficial effects, identification of dose-response relationships, and identification of the active flavonoids.

Keywords: Lipoproteins, Vasodilation, Endothelial, Pleiotropic

BCR/NATCON/25/P-085

A REVIEW ON THE ROLE OF PHARMACEUTICAL ANALYSIS IN DRUG DISCOVERY AND DEVELOPMENT

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Pharmaceutical analysis is a vital support in every stage of drug discovery and development, verifying the identity, purity, potency, and safety of investigational and approved drug products. Pharmaceutical analysis is essential from initial identification of lead compound and structure elucidation to final formulation and regulatory submission. In early stages of discovery, analysis enables exploration of structure-activity relationship (SAR) and high-throughput screening and helps identify lead drug candidates. During development, analysis takes central stage for optimization of process, characterization of impurities, process validation, stability, and quality control. Integration of recent advanced analytical technologies like High-Performance Liquid Chromatography (HPLC), Ultra-Performance Liquid Chromatography (UPLC), Liquid Chromatography–Mass Spectrometry (LC-MS/MS), Nuclear Magnetic Resonance (NMR), and other hyphenated technologies significantly enhanced analytical precision, sensitivity, and throughput. Moreover, application of Analytical Quality by Design (AQbD) encourages further use of systematic, risk-based method development for ensuring robustness and reliability. Compliant enforcement of international regulatory guidelines by organizations like the International Council for Harmonisation (ICH) and the U.S. Food and Drug Administration (FDA) ensures international regulatory acceptability and protects public health. Defective pharmaceutical analysis and poor manufacturing practices lead to marketing of substandard or unsafe drugs, an immediate public health hazard. Pharmaceutical analysis, therefore, not only facilitates scientific discovery but also ensures the validity of the pharmaceutical industry through supply of high-quality, effective, and safe therapeutics on a consistent basis.

Keywords: Pharmaceutical Analysis, Drug Discovery, Analytical Techniques, Quality Control, AQbD, Regulatory Compliance.

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CHIRAL CHROMATOGRAPHY: CURRENT APPROACHES IN PHARMACEUTICAL ANALYSIS

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Chiral chromatography Is an important technique in the qualitative and quantitative analysis of enantiomerically pure drug substances. Many pharmaceutical substances exist as chiral compound and one enantiomer of the chiral compound is therapeutically active in nature while other enantiomer may be inactive or less active or even may have toxicological profile. So, the enantioseparation is an extremely important phase in the drug development process for the marketed drug and drugs waiting for marketing authorization too. This poster presents an outline of chiral chromatography, focusing on the significant advancements with high-performance liquid chromatography or HPLC based on chiral stationary phases or CSPs, which is mostly used and efficient method of enantioseparation of drug. This presentation explores the various class of chiral stationary phases or CSPs with specific chiral selectors or CSs, Pharmaceutical compounds (separated analyte) and composition of mobile phase, also demonstrating the continuous evolution, importance and future aspects of chiral chromatography in modern drug development.

Keywords: Chiral Chromatography, Enantioseparation, Advancements, HPLC, CSPs, CSs

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NUTRACEUTICAL PRODUCTS FOR MANAGEMENT OF PCOS (POLYCYSTIC OVARY SYNDROME)

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PCOS or Polycystic Ovary Syndrome is an endocrine disorder which is characterized by disbalance of gonadotropin secretion, hyperandrogenism etc. that impacts on women's fertility, and causes irregular periods, excess hair growth on the face, chest, abdomen, or back, acne, and weight gain which causes obesity, and can lead to infertility and other health complications. It elevates the risk of hyperinsulinemia, inflammation, cardiovascular disease, as well as cancer. Allopathic medicines like oral contraceptives with anti-androgenic activity and others can improve the disease but it also carries lots of adverse effects. While nutraceutical products which are a broad category of items derived from food sources and offer health benefits, treat or prevent various disorders, are often perceived as safe due to their natural origins. Nutraceutical products have been recognized as a supplementary therapy and in cases of the women who are effected with PCOS aged18+, nutraceutical supplements can also be effective. We identified different types of variation and cases of PCOS in which nutraceutical supplements are used. Specific vitamins like Inositols, Folate, Vit-D, E, K, B12, minerals like Calcium, Zinc, Selenium, Chromium, and others (Cinnamon, Curcumin, Ginger, Flaxseeds) may be beneficial in management of PCOS. Improving the lifestyles can also help in management of PCOS.

Keywords: PCOS, Nutraceutical products, Vitamins, Minerals

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CONVENTIONAL TOOLS FOR DRUG DISCOVERY METHOD BY *IN-SILICO* STUDIES

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Development of new drugs is a long, uncertain and costly process as it often time consuming and expensive to bring a single drug to market, with many potential drugs failing due to poor effectiveness or safety concerns. To make this process more efficient, researchers are increasingly using computer-aided drug discovery (CADD). CADD involves in using software or tools to predict how drug candidates might behave in the body before in –vivo studies. There are two main approaches in CADD: Structure-based Drug Discovery (SBDD)and Ligand-based Drug Discovery (LBDD). SBDD uses the known target protein which helps in designing and interaction of compounds with it, where LBDD depends on prior information about known active compounds for specific target. These techniques help to identify promising molecules and predict their binding strength to the targets. Molecular dynamics simulations and Molecular docking allow scientists to explore how molecules interact at the atomic level. Additionally, modern computational models can estimate how drugs will be absorbed, distributed, metabolized, and excreted by saving time and reducing the need of lab extensive experiments. Moreover, machine learning supports drug discovery by predicting ADME-Toxic properties. This approach minimizes the risk of harmful side effects in early testing stages and enhances the overall efficiency of the development process. Although challenges remain such as improving prediction accuracy and simulating real-life biological environments, CADD has already contributed to successful drug development and continues to play a growing role in modern pharmaceutical research.

Keywords: Computer-aided drug discovery (CADD), Structure-based drug discovery (SBDD), Ligand-based drug discovery (LBDD), Molecular docking, ADME.

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DESIGN AND EVALUATION OF SYNTHETIC SUBSTITUTED CHLOROISATIN FOR ANTICONVULSANTS

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This research focuses on developing and testing a new compound that may help treat epilepsy by a series of chloro-substituted Isatin clubbed with Benzothiazole moiety. These were then combined with a compound called isatin and a benzothiazole base using a method known as linker-based drug design. The new molecule evaluated using computer-based techniques (*in silico*) to see how well it might work as an antiepileptic drug. The *in-silico* analysis helped to predict how the new compound interacts with target proteins using a method called blind docking. These tests showed encouraging

results, suggesting the compound could be effective. A multi-step synthesis using reflux, bromination and acylation yielded purified compounds monitored by TLC and crystallized for purity.

Keywords: Benzothiazole, Chloroisatin, Anticonvulsants, Docking

BCR/NATCON/25/P-090

DE NOVO BASED DESIGNING OF NOVEL EP_3 LIGANDS FOR THE MANAGEMENT OF PEPTIC ULCER IN AN INDIRECT APPROACH

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Disease of the Peptic Ulcer (PUD) results from damage to the gastrointestinal (GI) tract lining due to the infiltration of excessive gastric acid or pepsin into the enters the stomach epithelium's muscularis propria layer. A structure-based de novo drug design approach was utilized to develop indirect proton pump inhibitors through EP3 activation. The ligands underwent screening involving molecular docking, assessment for drug likeness, and MMGBSA analysis. After evaluating the binding properties through various scoring methods (Mol dock, extra precession, and MMGBSA). Ligand S7 was identified as the most effective within the series. Additionally, FMO analysis was conducted to assess the reactivity and stability of the selected compound.

Keywords: Peptic Ulcer, MMGBSA analysis, Proton pump inhibitor, De novo drug design, EP3 ligand.

BCR/NATCON/25/P-091

2D-QSAR ANALYSIS OF PYRIMIDINONE AMINE DERIVATIVES AS ROCK2 INHIBITORS IN THE TREATMENT OF PSORIASIS

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Psoriasis is a chronic skin disorder in which skin cells build up and form scales and itchy dry patches. Psoriasis, a chronic autoimmune ailment, results in the rapid accumulation of skin cells, forming thick, red patches adorned with silvery scales. Affecting approximately 2-3% of the global populace, it can manifest at any age, commonly appearing between 15 and 35. Though its precise cause remains elusive, a blend of genetic predisposition, environmental triggers, and immune system dysfunction is implicated. Symptoms range from inflamed, scaly patches to itching and occasional discomfort. Psoriasis presents a multifaceted challenge, necessitating tailored treatment approaches to manage its diverse manifestations effectively. ROCK2 inhibition stands out as a promising therapeutic avenue for addressing

psoriasis. ROCK2, pivotal in psoriasis pathogenesis, triggers the release of inflammatory cytokines like IL-17α, IL-17F, IL-21, and IL-22 via Th17 pathway activation. In psoriasis, dendritic cells overproduce IL-23, stimulating Th17 to secrete IL-17, which activates keratinocytes and other immune cells, inflammation. ROCK2 inhibitors like KD025 (Belumosudil) target this cascade, reducing Th17 activity and associated cytokines while bolstering anti-inflammatory IL-10. This dual mechanism curbs inflammation, offering improved outcomes for psoriasis patients. This study is dedicated to finding the structural features of the compounds which contribute to the ROCK2 inhibitory potential. The findings suggest importance of lipophilic and electronegative components of the ligands which promote or deteriorate the biological activity.

Keywords: Psoriasis, ROCK 2, Inflammatory cytokines,Belumosudil, dendritic cell.

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OPTIMIZATION OF MICROBIAL DEGRADATION PROCESS OF PHARMACEUTICAL PLASTIC WASTES AND ANALYSIS OF BY PRODUCT

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Plastic pollution is a major problem in India due to lack of proper protocols for plastic waste disposal and subsequent treatment. This indiscriminate use and disposal of plastic often lead to water and land pollution across the country. An alternative solution of waste treatment is bioremediation which involves reducing contaminant levels in through biological treatment. Following this pursuit, two plastic degrading strains such as *Staphylococcus aureus MG105* for PET and *Pseudomonas monteilii RAS131* for Syringe degradation have been isolated from pharmaceutical waste plastics. While the solitary microbes showed degradation efficiency 41-53% within 4-5 days, The FT-IR analysis of the plastic before and after degradation, showed certain peak shifts as well formation new peaks to suggest the change of polymeric structure after degradation. This research focuses on the optimization of a microbial degradation process for fresh perspective for established environmentally accommodating biocatalytic approaches to solve plastic degradation, specifically polyethylene terephthalate (PET) and syringe. The entire biocatalyst has now been subjected to lab scale bioreactor to optimize the biodegradation conditions such as pH, temperature and amount of biocatalyst for such degradation. Optimize process showed maximum plastics degradation at 37 °C, pH 6.2, and a cell weight/plastic weight ratio 1.25. Under same conditions, the degradation efficiencies 61.25% for PET and 47.5% for syringe. On other hand, by products are collected after degradation under optimized conditions and characterize chemical and physical properties using analytical techniques (FTIR, NMR, MASS Spectroscopy) to assess the environmental impact and safety of the by-products.

Keywords: Plastics Pollution, Plastic Degradation, Bioreactor, Process optimization, Analytical techniques

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COORDINATED GLOBAL EFFORT: AN ESSENTIAL STEP REQUIRED FOR COMBATING ANTIMICROBIAL RESISTANCE (AMR)

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A increasing worldwide concern, antimicrobial resistance (AMR) jeopardises public health, food security, and economic stability by reducing the efficacy of necessary medications. A multinational, cross-sector, multidisciplinary effort is needed to combat AMR. The World Health Organization's (WHO) Global Action Plan is one of the most important international policies; it provides guidance to nations on how to create national AMR action plans, improve surveillance, and encourage safe use of antibiotics. The One Health concept promotes cross-sector cooperation by highlighting the connections between environmental, animal, and human health. Standardised data collection and policy development are made easier by surveillance systems such as WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS). Global access is ensured and research and development of new antibiotics are supported by international alliances and partnerships like GARDP and the AMR Action Fund. The goals of research partnerships, public awareness initiatives, and antibiotic stewardship programs are to prevent abuse and foster innovation. Global solutions to AMR are further strengthened by coordinated regulatory frameworks, policy lobbying, and capacity-building programs. In order to lower the prevalence of drug-resistant illnesses and maintain the efficacy of present and upcoming therapies, these coordinated efforts are crucial. Reducing the long-term effects of AMR on global health and development requires persistent dedication and cooperation at all levels.

Keywords: Antimicrobial Resistance (AMR), Global Action Plan, One Health, Surveillance (GLASS), Antibiotic Stewardship, International Collaboration.

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DEVELOPMENT OF 2D AND 3D-QSAR MODELS FOR UNVEILING STRUCTURAL REQUIREMENTS OF D835Y MUTATED FLT3 KINASE INHIBITORS

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FLT3 inhibitors, a type of tyrosine kinase inhibitor, are used to treat acute myeloid leukemia. Recently, it was found by NGS next generation sequencing based myeloid panel that 30% patient carry D835Y mutations in FLT3 after treatment with FLT3 inhibitors and this mutation increases the mortality rate. In this work, we aimed to develop 3D-QSAR or 2D-QSAR models with 104 compounds with biological activity against D835Y mutated FLT3 inhibitors. The dataset used in this work to the development of 2D-QSAR models based on AlvaDesc descriptors. Descriptors were calculated following geometrical optimization with Rdkit, and two feature selection methods, SFS and GA, were applied to select eight key descriptors for (multiple linear regression) MLR model generation. The

dataset was split into an 80% training set and a 20% test set. In SFS-MLR, four scoring functions and two cross-validation strategies were tested, yielding the most predictive model with reliable statistical performance ($Q^2_{LOO} > 0.6$ and $R^2_{Pred} > 0.5$). This model was identifying structural features that contribute to higher binding affinity of compounds against the mutated FLT3 kinase. For 3D-QSAR analysis, compound structures were generated from SMILES and optimized using the Universal Force Field, with minimized structures employed for conformer generation and structural alignment via Rdkit. This work compared two electrostatic field generation strategies (MM-based and QM-based) and two feature selection methods (FFD-SEL and UVE-PLS) for model development, using the Open3DQSAR tool to analyze aligned structures. The quantum chemical force field was calculated using the open-access Firefly tool with the EMSL 3-21G force field. The most predictive model showed strong internal and external statistical accuracy, as indicated by Q^2_{LOO} and R^2_{Pred} values. It identified the steric and electrostatic factors influencing the inhibitory potential against the D835Y mutated FLT3. This work holds potential for the future design of novel FLT3 inhibitors.

Keywords: Acute myeloid leukemia; FMS-line tyrosine kinase 3; D835Y mutation; 2D-QSAR; 3D-QSAR; electrostatic field

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COMPARATIVE STUDY OF ANALYTICAL METHOD VALIDATION BETWEEN INTERNATIONAL GUIDELINES OF DIFFERENT AUTHORITIES

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Analytical method validation is a fundamental aspect of pharmaceutical development, ensuring that an analytical method is reliable, accurate, and suitable for its intended purpose. Analytical method development is a multi-stage process requiring methods tailored to specific phases. Validation is not only critical for regulatory submissions but also for studies involving biological fluids, pharmacokinetics, bioavailability, and impurity profiling. It is required when implementing new methods, modifying existing ones, or adapting methods for new applications or conditions. This process is vital throughout drug development and post-approval to guarantee the quality, safety, and efficacy in drug products. Key criteria like specificity, selectivity, linearity, range, accuracy, precision, limit of detection (LOD), limit of quantitation (LOQ), robustness, and ruggedness are all evaluated as part of the method validation process. Guidelines for validation procedures have been developed by a number of regulatory bodies, including the US Food and Drug Administration (USFDA), the US Pharmacopeia (USP), the both International Conference on Harmonization, the (ICH), AOAC, JP, and IUPAC. While many parameters are commonly accepted, variations exist in methodologies and acceptance criteria among these organizations. This is an attempt to review all guidelines and compare with each other with respect to their individual acceptance criteria.

Keywords: Method validation, Analytical, compare, Guidelines

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DEVELOPMENT AND VALIDATION OF UV-SPECTROPHOTOMETRIC METHOD FOR SIMULTANEOUS ESTIMATION OF GLICLAZIDE AND METFORMIN IN TABLET DOSAGE FORM

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A simple, accurate, precise, and cost-effective UV spectrophotometric method has been developed for the simultaneous estimation of Gliclazide (GLZ) and Metformin Hydrochloride (MET) in tablet dosage form. This work promotes a greener strategy by using distilled water with less ethanol as a co-solvent, in contrast to previously published techniques that mostly rely on organic solvents. The technique, which is tailored for both medications, is based on simultaneous equation analysis at certain wavelengths.Following Beer's Law, linearity was found between 0 and 25 µg/ml for GLZ and 0 and 15 µg/ml for MET. Accuracy was within acceptable bounds, with recoveries of 100.296±0.832%, 100.051±0.433%, and 100.418±0.888% at 80%, 100%, and 120% levels, respectively, for GLZ.MET displayed similar values of 100.061±1.401%, 99.47±0.521%, and 99.225±0.443%. Both medications had precision, defined as %RSD, below 2%. The mean assay findings were 100.186±0.978% for MET and 99.909±0.471% for GLZ, demonstrating strong repeatability and specificity.Recovery studies verified the method's dependability, and validation was carried out in accordance with ICH principles. This technique provides a specific, quick, economical, and environment friendly and can be used as a substitute for conventional GLZ and MET quality monitoring in pharmaceutical formulations.

Keywords: Gliclazide, Metformin Hydrochloride, Method Development, Uv-visible spectroscopy

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SYNTHESIS AND CHARACTERIZATION OF SOME ASPIRIN AMIDES IN SEARCH OF NEW ANTIMICROBIAL AGENTS

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In this study, structural modifications of aspirin have been done in search of new antimicrobial agent. The derivatives were synthesized via condensation reactions between aspirin with different amines to form amide bonds using N, N-dicyclohexylcarbodiimide (DCC) as coupling agent by two step method. Steps involve activation of carboxylic group using DCC followed by coupling reaction of corresponding anhydride with amines. The structures of the synthesized compounds were confirmed using several analytical techniques likes UV-Visible spectrophotometer, FTIR, ^{1}H NMR and ^{13}C NMR, and mass spectrometry. FTIR spectrum of synthesized compounds showed. UV spectrum of each compounds were obtained to get absorption maxima. FTIR spectrum showed

characteristic N-H stretching for amide around 3320-3340 cm^{-1} and C=O amide stretching at 1670-1690 cm^{-1}. All compounds showed characteristics molecular in peak in their mass spectrum and characteristic peaks in ^{1}H NMR and ^{13}C NMR spectrum. Antimicrobial activity of all these compounds will be evaluated against Gram positive, Gram negative and fungal strains in near future.

Keywords: Aspirin, amides, characterization, coupling

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A COMPREHENSIVE REVIEW ON NANOMATERIAL BASED DRUG DELIVERY SYSTEMS IN OVERCOMING ANTIBACTERIAL RESISTANCE

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All living beings and human beings face serious threats from antibiotic resistance which has become a major worldwide problem. Antibiotic resistance causes antimicrobial medications to have diminished effectiveness thus making treatments more costly and deaths more likely. Technology development represents an essential solution for reducing existing crises. The scientific field of nanotechnology focuses on transforming small particles measuring between 1 and 100 nanometers while gaining physical control over them in order to develop nano systems. After scientists recognized their potential values in medicine the research interest in nanoparticles and nanomaterials has significantly grown. Nanoparticles (NPs) demonstrate two key properties that help fight microorganisms in addition to functioning as antimicrobial carriers thus providing optimal solutions for resistant bacteria. The medicinal properties of nanoparticles (NPs) include silver (Ag), copper (Cu), nickel (Ni), zinc oxide (ZnO) and titanium dioxide (TiO_2) along with selenium (Se). The antibacterial methods based on nanoparticles currently include liposomes, micelles, solid lipid nanoparticles, nanogel carriers, nanocapsules, nanotubes, dendrimers, emulsions, lipids in nanostructures and quantum dots, polymeric nanoparticles. All antibacterial qualities exist in three groups of nanomaterials which are metal nanoparticles and carbon-based nanomaterials and polymeric nanostructures. The antibacterial process of nanomaterials works through three main mechanisms including ROS generation and membrane-attacking functions and antibiotic delivery enhancement. Both nanomaterials and conventional antibiotics combine their effects to simplify the destruction of germs while permitting patients to require fewer medicinal doses.

Keywords: Antibiotic resistance, nanotechnology, Nanoparticles (NPs), solid lipid nanoparticles, antibiotic delivery

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DEVELOPMENT AND EVALUATION OF BLACK CURCUMIN NANOPARTICLE-LOADED BUCCAL FILMS FOR THE TREATMENT OF ORAL MUCOSAL ULCERS BY APPLYING THE 3^2 FULL FACTORIAL DESIGN

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Oral mucosal ulcers are painful, recurrent oral cavity lesions that frequently occur due to trauma, stress, or systemic disease. Successful treatment involves site-specific and prolonged drug delivery to facilitate healing, minimize inflammation, and avoid secondary infection. Herein, we report a new buccal film containing black curcumin nanoparticles to improve bioavailability and local therapeutic effect. Black curcumin nanoparticles were prepared in the initial phase using sodium alginate through the ionotropic gelation method with calcium chloride as the cross-linker. The Scanning Electron Microscopy (SEM), Differential Scanning Calorimetry (DSC), and X-Ray Diffraction (XRD) were used to characterize the nanoparticles to ascertain morphology, thermal profile, and crystallinity. In the second stage, the optimized nanoparticles were introduced into the buccal films by employing polyvinyl alcohol (PVA), sodium alginate, glycerol, DMSO, and ethanol. The 3^2 full factorial design was utilized (F1–F9) through Design of Experiments (DOE) software to assess the influence of polymer composition on key quality attributes like surface pH and thickness. Among all the formulations, F7 showed excellent physical properties and drug release upon prolonged time. In vitro drug release kinetics and dissolution profile validated the controlled release profile, suggesting the applicability of the formulation for buccal treatment of oral mucosal ulcers. The newly synthesized black curcumin nanoparticle-loaded buccal film represents a novel and promising approach for the targeted treatment of oral mucosal ulcers, characterised by enhanced solubility, biocompatibility, and mucoadhesion.

Keywords: Black Curcumin Nanoparticles, Buccal Film, Oral Mucosal Ulcers, Ionotropic Gelation, Controlled Drug Release.

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MICRONEEDLE BASED TRANSDERMAL DRUG DELIVERY -A PANIC APPROACH

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Microneedles are a revolutionary advancement in drug delivery technology, offering a less painful and minimally invasive alternative to traditional hypodermic injections. These tiny needles are 50 and 1500 micrometers in height for that it called microneedle. It is designed

to penetrate only the upper layers of the skin by creating temporary microchannels, they bypass the stratum corneum—the outermost layer of skin that usually acts as a barrier to drug absorption—allowing for more effective and comfortable treatment .It is usually made of metals or biocompatible polymers which enhanced structural strength and controlled drug release. This system not only minimizes pain and tissue damage but also improves patient comfort, reduces anxiety, and helps ensure better compliance with treatment regimens.oral dosage forms are degrade into stomach and reduced bioavailability due to first-pass metabolism, microneedles are deliver medication directly through the skin. This localized delivery can increase drug concentration at the target site while reducing systemic side effects.Depending upon the design and purpose microneedles are 5 types. They are - solid, coated, dissolving, hollow, and hydrogel-forming. They are widely used in the treatment of skin-related conditions such as psoriasis, dermatitis, and melanoma, and are also effective in managing chronic conditions like rheumatoid arthritis, psoriatic arthritis, and atopic dermatitis.

Keywords: Microneedle-based drug delivery, transgender hormone therapy, localized delivery, pain-free, minimally invasive

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DIATOM BIOSILICA IN BIOMEDICAL INNOVATIONS: A COMPREHENSIVE REVIEW

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The extensive use of diatom biosilica as a promising biomaterial for various biomedical applications has arisen from its unique physicochemical properties, high surface area, porosity, biocompatibility and functionalization ease. Biosilica from diatom is examined thoroughly as a potential drug carrier, tissue engineering material, biosensor and regenerative medicine, among others. By providing a nanostructured porous framework with efficient drug loading and controlled release as well as surface modifications for targeting capabilities for cancer and other kinds of treatments, it also has excellent performance. Diatom silica scaffolds are used in tissue engineering to promote cell adhesion and growth for the purpose of bone and cartilage regeneration. It has also optical properties and high sensitivity is also an excellent substrate for the biosensors and diagnostic devices. Currently we present recent advances in the diatom biosilica extraction, purification, and functionalization techniques with emphasis on the scalable production methods. The critical challenges including developing biocompatible ways for replication, reproduction, and addressing long term degradation needs are also analyzed. This may function so that future perspectives can include integration of diatom biosilic technologies with smart biomaterials and 3D printing technologies for next generation medical solutions. Diatom biosilica provides a unique opportunity to bridge the gap between natural materials science and biomedical engineering, to establish itself as a sustainable, cost effective and superior alternative to synthetic nanomaterials for therapeutic and diagnostic approaches. Based on this review, further interdisciplinary research of diatom diard biosilica is required to fully exploit the potentials of the biosilica in both clinical and industrial applications.

Keywords: Diatom Biosilica, Drug Delivery, Biocompatibility, Surface Functionalization, Nanostructured Materials, Biomedical Applications

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CARBON-BASED QUANTUM DOTS AND NANOTUBES FOR CANCER TARGETING AND DRUG DELIVERY

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Carbon based nanomaterials (CQDs and CNTs) possess unique physicochemical properties and multivalence, which are good candidates for cancer targeting and drug delivery. Here, recent developments of the synthesis, functionality, and biomedical applications of both CQDs and CNTs in oncology are carefully reviewed using results from a broad survey. Carbon quantum dots, possessing excellent photoluminescence, low toxicity and high modifiability on surface can be applied for specific tumor imaging and therapy. Carbon nanotubes also provide high drug loading and enabling delivery of chemotherapeutic agents, nucleic acids and immune-therapeutics across biological bariers and cancer cells simultaneously. In order to address potential toxicity and poor blood circulation, surface engineering strategies, including PEGylation or ligand (e.g., folic acid, antibody, peptide) conjugation, are utilized to stabilize, innocuous and tumor specific target the nanomaterials. In addition, these materials have elementary optical and electronic properties suitable for the use as external trigger responsive drug release sources, such as NIR lights or pH changes, without significant side effects. In preclinical studies, they are efficacious to improve therapeutic outcomes and reduce the systemic toxicity. However, there are long term biosafety and synthetic at large scale production, and regulatory approval challenges. This review emphasizes the promise of carbon based quantum dots and nanotubes as emerging theranostic agents and discusses present but also future limitations and clinical translation perspectives. These materials integrate cancer and oncology progress to allow for a transformative precision cancer medicine.

Keywords: Carbon based nanomaterials, drug delivery, Carbon quantum dots, chemotherapeutic agents, nanotubes

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CO-DELIVERY OF DRUGS USING NANOCARRIERS IN SKIN CANCER MANAGEMENT

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Cancer is a progressive disease of multi-factorial origin, probably, as some of the reasons, due to changes in lifestyle, food intake, and environmental changes. Skin cancer is a major public health problem; its incidence is rising rapidly across the world. As surgery, chemo and radiation therapy have their limitations which include toxicity, resistance, and poor

patient outcomes, traditional treatments have limitations including needing to treat patients at advanced disease when treatment options are limited; being associated with significant adverse events (toxicity) and these toxicities may impact future patients from having treatment; and because many patients with advanced Hodgkin lymphoma fail to respond to treatment, declines in performance status occur; and these agents may also be limited in their effectiveness. Thus, nanocarrier based approaches have been developed to deliver co-drugs in skin cancer management to overcome these challenges. Multiple drugs can be encapsulated by nanocarriers, i.e., nanoparticles, liposomes, hydrogels, which improves their solubility, stability and bioavailability. The possibilities for targeting certain skin cancer cells and thereby reducing side effects and improving therapeutic efficacy are these systems offer. Physical disruption of the blood brain barrier and improved delivery can overcome resistance mechanisms, increase synergistic effects, enhance patient outcome, and co delivery of drugs using nanocarriers. Being a good drug carrier system, nanoparticles allow to improve the solubility of poorly water-soluble drugs, modify the pharmacokinetics, increase the drug half life through immunogenicity reduction, improve the bioavailability, and decrease the degree of drug metabolism. In addition, we discuss challenges and opportunities of these systems assuming scale, toxicity and regulatory issues. Finally, hollow ordered growth nanocarriers based co delivery systems are a promising approach to skin cancer treatment. This increases therapeutic outcome and gives new hope to patients and better cancer management.

Keywords: Nanocarriers, Co-delivery, Skin cancer, Targeted delivery, Nanoparticles, Liposomes.

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MULTI-RESPONSIVE IN-SITU SMART HYDROGEL SYSTEMS: A NEW FRONTIER IN DRUG DELIVERY

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Due to its biocompatibility, biodegradability, and the potential responsive property to various stimuli, hydrogels have attracted great attention where they have been used as a promising drug delivery platform. Drug delivery using multi-responsive in-situ smart hydrogel systems has emerged as a new frontier in the field. These hydrogels are multiphoto responsive to a variety of stimuli including temperature, pH, light, as well as enzymes for the highly selective uptake of drugs. They're in situ gelling; so the hydrogel forms in situ, meaning in the body, and it releases the therapeutics locally and sustained. Multiple responsiveness mechanisms integrated in the hydrogel increases the flexibility of this hydrogel to biological environments that are complex and more effective for the therapeutic and reduces side effects to the off. Due to their unique advantages in terms of delivering localized drugs for treatment of cancer, infection, and inflammatory disorders over time and space, these systems are useful. Overall, such multimodal in-situ smart hydrogels are promising for enhanced drug delivery outcomes. These systems give the power to control drug release precisely and to enhance therapeutic efficacy which will make the delivery field of drug revolutionized. These systems may become important in

combating some diseases and conditions with continued research and development. This review addresses the recent advances in multi responsive in situ hydrogels, as well as the mechanism of action, material design strategy and the applications in drug delivery towards establishing the in situ hydrogels as a new frontier in personalized and precision medicine.

Keywords: Hydrogels, In-situ gelation, Smart drug delivery, Biocompatibility, Biodegradability.

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ELECTROSPUN ANTIBACTERIAL NANOFIBERS FOR CHRONIC WOUND MANAGEMENT

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Chronic wounds such as diabetic ulcers and pressure sores have increased significantly as a health problem promoting serious complications and delayed healing. Infection due to bacteria is one of the major challenges in treating these wounds and slowing down the healing process. In order to cope with this, researchers are working on new methods to get antibacterial agent directly to the wound site. One of the possible approaches is the use of antibacterial nanofibers made by electrospin. Nanofibers spun from an electric current offer a promising solution for the management of wound healing as many choices exist in terms of the compounds that can be loaded onto the nanofiber webs. Advantages in using electrospun antibacterial nanofibers include improved patient outcome, lower healthcare costs and improved patient comfort. The potential revolutionizing application of these nanofibers has the ability to treat and significantly improve the treatment of chronic wounds with sustained antimicrobial activity and wound healing. Towards these systems, however, there are challenges as well, i.e., scalability, regulatory approval and clinical trials. These challenges need to be overcome in further research to enable these systems to reach clinical practice. The aim of this review is to describe some novel electrospun antibacterial nanomaterials presented as wound dressings recently proposed. We first describe electrospinning of nanofibers in wound healing in general and thereafter we present studies of electrospun fibers loaded with various antimicrobial agents for use in wound dressings. The antibacterial nano fibers of electrospinning are proposed as a method of chronic wound management in the final section. On behalf of the company, he combined the benefits of advanced drug delivery with the protective and healing properties of modern wound dressings. Further research and development in this field may produce more efficient, cheaper and comfortable for patients chronic wound treatment.

Keywords: Electrospinning, Antibacterial Nanofibers, Chronic Wound Management, Wound Healing, Antimicrobial Activity, Diabetic Foot Ulcers, Pressure Ulcers, Venous Leg Ulcers, Tissue Regeneration, Biocompatibility.

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MULTIFUNCTIONAL NANOPARTICLES FOR ORGANELLE SPECIFIC DRUG TARGETING IN CANCER TREATMENT

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Organelle-targeted drug delivery or multifunctional nanoparticles for organelle-specific drug delivery are the drug carriers which are able to deliver the drugs to a specific organelle such as nucleus, mitochondria or lysosomes etc. for better therapeutic efficiency and least toxic effects. This approach is revolutionary and imposes further improvements on today's direction towards cancer and it is even more accurate than the previous practices. Medical treatment for cancer like chemotherapy has its drawback as it's systemic toxic, not site targeted, thus has side effects and low cure rate. Nanotechnology appear to be a preferable technique because it helps in the targeted delivery of therapeutic agents to the cancer cells without affecting the healthy cells. Some of the recent developments focus on targeting the nanoparticles to particular cellular structures in cancer cells such as nucleus, mitochondria, ER and Lysosomes. All these organelle specific approaches enhance the selectivity and the potency of anticancer drugs based on the biological functions and vulnerabilities of such organelles. It is also possible to functionalise targeted nanoparticles with ligands, antibodies or peptides that interact with overexpressed receptors on the surface of cancer cells; this also helps in selective uptake of the nanoparticles. Intracellular, the payload of the NPs can be modified to release the drug in response to the pH, redox potential or by the action of a certain enzyme of the distinct organelle. Most of the efforts have been directed towards increasing the size, biocompatibility and targeting capacity of these nanoparticles for acute diseases. The amalgamation of these advanced nanocarriers can be the core of cancer treatment in the future having impressive performances in treatment with lesser side effects.

Keywords: Nanotechnology, organelle-targeted drug delivery, organelle, multifunctional nanocarriers, theranostics.

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THERMOGELS FOR SUSTAINED DRUG DELIVERY: A REVIEW ON IT'S DIVERSE THERAPEUTIC APPLICATION

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Thermogel, or thermo-sensitive hydrogel, is a subset of hydrogels and can be defined as an aqueous polymer system that undergoes a transition state from it's solution form to a gel when an increase in temperature is observed, and demonstrate excellent promise for sustained drug delivery systems through their pathological temperature-dependent sol-gel transition behavior. These intelligent polymers demonstrate compatibility with biological systems along with straightforward administration methods along with adjustable release

properties which make them suitable for numerous therapeutic applications. This study examines the scientific principles behind thermogelation while studying poloxamer and chitosan-based components that change state according to temperature changes. Thermogels provide sustained drug delivery that makes treatment more effective by reducing side effects. Localized chemotherapy in oncology represents one of their diverse applications along with regenerative medicine for growth factor delivery and pain management through prolonged analgesia and ophthalmic disorder treatment using intravitreal injections. Thermogels function as supporting structures for tissue engineering applications which enables cell multiplication along with tissue regenerative processes. Thermogels have experienced significant advancement through recent research on stimuli-triggered multi-purpose gels which enhanced their therapeutic capabilities. This review highlights current developments, clinical progress, and future prospects of thermogels in personalized medicine and sustainable healthcare. By addressing existing limitations, thermogels could revolutionize drug delivery systems, offering precise, patient-tailored treatments for a wide range of diseases.

Keywords: Thermogels, sustained drug delivery, thermosensitive hydrogels, controlled release, therapeutic applications, smart polymers.

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PHYTO NANOMEDICINE: NANOTECHNOLOGY APPLICATIONS IN HERBAL DRUG DELIVERY

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Herbal therapy possesses a profound historical significance in addressing numerous maladies; nonetheless, its therapeutic efficacy is frequently constrained by inadequate solubility, diminished bioavailability, and non-specific delivery mechanisms. Phyto nanomedicine, a novel multidisciplinary strategy, integrates nanotechnology with herbal therapies to address these constraints and enhance clinical efficacy. This poster presentation examines the impact of nanotechnology on transforming herbal medicine delivery systems. Essential nanocarriers, including nanoparticles, nanocapsules, liposomes, and nanoemulsions, are examined for their capacity to improve the pharmacokinetic and pharmacodynamic characteristics of plant-derived bioactive chemicals. These nanosystems enhance solubility, safeguard active components from degradation, and provide regulated and targeted distribution. Recent breakthroughs in targeted delivery are emphasized, demonstrating how nanocarriers can reduce systemic adverse effects and improve therapeutic efficacy. Integrating traditional herbal knowledge with contemporary nanotechnological technologies, phyto nanomedicine promises the development of more effective, safer, and patient-friendly herbal compositions. This talk examines the existing hurdles, including formulation stability, scale-up difficulties, and regulatory issues, while also considering future perspectives that may influence the next generation of herbal therapies.

Keywords: Phyto nanomedicine, Herbal Drug Delivery, Nanotechnology, Nanocarriers, Bioavailability, Targeted Delivery.

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DOPED CARBON NANOTUBE IN CONTEXT OF BETA- AMYLOID AGGREGATION: ALZHEIMER DISEASE

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Beta-amyloid (Aβ) aggregation is a central pathological hallmark of Alzheimer's disease and represents a major target for novel therapeutic strategies. This study explores the potential of doped carbon nanotubes (CNTs) as modulators of Aβ aggregation. Doping CNTs with specific atoms alters their electronic configuration and surface properties, enabling enhanced interaction with Aβ peptides. It is proposed that doped CNTs interfere with aggregation through multiple various pathways. Their modified electronic surfaces demonstrate high affinity for Aβ monomers and oligomers, effectively sequestering them and preventing the formation of neurotoxic fibrils. Additionally, the altered electronic structure of the CNTs may disrupt the hydrophobic and electrostatic interactions, critical for fibril assembly. By adjusting the type and concentration of dopants, it is possible to fine-tune the binding characteristics and inhibitory effects of CNTs on Aβ aggregation. Beyond inhibition, doped CNTs show promising results in broader neuro-therapeutic applications, such as targeted drug delivery across the blood-brain barrier and the design of nanoscale biosensors for early Alzheimer's diagnosis. Ongoing research aims to characterize the molecular dynamics between various doped CNTs and Aβ species, providing insights into their potential for in vivo efficacy. This nanotechnology-based approach introduces a flexible and targeted platform for disrupting amyloid pathology and advancing diagnostic and therapeutic innovations in Alzheimer's disease.

Keywords: β-Amyloid, Carbon Nanotubes, Blood brain barrier, Alzheimer's Disease, Nanotechnology.

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MICRONIZATION BY PRECIPITATION METHOD IN PHARMACEUTICS

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Micronization is a vital technique in pharmaceutics aimed at enhancing the solubility and bioavailability of poorly water-soluble drugs. Among the various micronization techniques, precipitation is a widely used method due to its simplicity, cost-effectiveness, and ability to produce particles in the submicron range. The precipitation method involves the formation of fine drug particles through the rapid mixing of a drug solution with an antisolvent in which the drug has low solubility, leading to nucleation and growth of microcrystals. Critical process parameters such as solvent-antisolvent ratio, stirring speed, temperature, and drug concentration significantly influence particle size and morphology. Surfactants or stabilizers are often added to prevent agglomeration and ensure uniform particle distribution. This method is particularly advantageous for thermolabile

compounds as it avoids high temperatures used in other techniques. The micronized product exhibits enhanced dissolution rates, which directly impact the drug's therapeutic efficacy. Despite its benefits, challenges such as particle aggregation and scalability remain and are subjects of ongoing research. Overall, precipitation-based micronization continues to be a prominent approach in the development of advanced pharmaceutical formulation.

Keywords: Micronization, poorly water-soluble drugs, precipitation, microcrystals.

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MICROSPHERES FOR TARGETED DRUG DELIVERY- A PROMISING DRUG DELIVERY SYSTEM AND THERAPEUTIC EFFICACY

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Microspheres are small spherical particles that play a crucial role in the field of targeted drug delivery due to their ability to encapsulate and release therapeutic agents in a controlled manner. Recent applications of microspheres focus on various innovative strategies to enhance treatment efficacy and minimize side effects. The summary highlights different types of microspheres, including polymeric, lipid-based, and inorganic microspheres, each offering distinct properties suitable for specific drug delivery needs. Recent advancements in microsphere technology have enabled targeted delivery systems that can direct drugs specifically to diseased tissues, thereby enhancing therapeutic effects while reducing systemic toxicity. With the rise in use, the summary also addresses challenges and standards that need to be met when developing and utilizing microsphere-based drug delivery systems. Continued research and development of microsphere technology hold great promise for improving patient outcomes in drug delivery systems. Pharmaceutical microspheres have transformed the landscape of drug delivery and modern medicine. They offer precise, controlled, and patient-friendly solutions for delivering a wide range of drugs, improving treatment outcomes, and enhancing the quality of life. As research and technology continue to advance, the significance of microspheres in modern medicine is expected to grow even further. In conclusion, microspheres represent a promising platform for targeted drug delivery, with ongoing research aimed at optimizing their design and applications to enhance patient outcomes in various therapeutic areas.

Keywords: Microspheres, tumours, efficacy, toxicity, treatment, therapeutic

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IN SITU OPTHALMIC HYDROGEL SOLUTION: A NOVEL THERAPEUTIC SOLUTION

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The primary objective of this investigation was to formulate an innovative *in situ* gelling system utilizing poloxamer-407 (PM) for the sustained release of an ophthalmic drug, which is critical for enhancing therapeutic efficacy and patient compliance. To optimize the formulation, efforts were made to decrease the concentration of PM while maintaining its gelling properties, as well as to prolong the duration of drug release. To achieve this, xanthan gum (XG) and guar gum (GG) were strategically incorporated into the PM to create a variety of formulations with distinct properties. The experimental findings demonstrated that at PM concentrations of 18% and above, the formulation was capable of undergoing a sol-to-gel transition when exposed to temperatures below normal body temperature (37°C). Furthermore, it was observed that a careful combination of XG and GG at a weight ratio of 3:7 facilitated the conversion of the PM solution into a gel even at PM concentrations lower than 18%. This is particularly significant as it allows for the reduction of PM content while still achieving effective gelling. Comprehensive assessments using both *in vitro* and *in vivo* models indicated that the formulation comprising PM with the XG and GG blend exhibited superior drug retention capabilities compared to PM alone. These results underscore the potential of the developed *in situ* gelling formulations containing PM, XG, and GG as a more effective alternative to conventional eye drops, providing innovative approaches to ocular drug delivery and potentially improving patient outcomes in therapeutic interventions.

Keywords: Ophthalmic, hydrogel, *in situ*, formulation, body temperature.

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SMART HYDROGELS FOR ON-DEMAND DRUG RELEASE

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Hydrogel nanoparticles are gaining attention in the field of drug delivery thanks to their unique combination of features: they blend the biocompatibility and high-water content of hydrogels with the size and adaptability of nanoparticles. This hybrid nature makes them particularly useful for enhancing drug solubility, achieving controlled release, and enabling targeted delivery. Researchers are exploring both to create these systems, each bringing distinct advantages. Natural polymers like chitosan and alginate are popular for their biodegradability and low toxicity, while synthetic ones—such as poly (vinyl alcohol), poly (ethylene oxide), poly(ethyleneimine), poly (vinyl pyrrolidone), and poly(n-isopropylacrylamide)—offer customizable properties and consistency in production. From hydrogel nanoparticles don't follow a one-size-fits-all approach. It typically depends on a mix of mechanisms, including the diffusion of the drug through the hydrogel, the swelling of the material, and interactions at the chemical level between the drug and the hydrogel matrix. Another crucial factor shaping their performance is the method used to

crosslink the polymer network, which can be either chemical or physical. These techniques directly impact the nanoparticle's structure, stability, and how the drug is released over time. In summary, hydrogel nanoparticles represent a promising, flexible platform for delivering therapeutic agents. Ongoing research and development continue to improve their effectiveness and expand their potential in modern medicine.

Keywords: Hydrogel nanoparticles, drug delivery, biocompatibility, cross linking, controlled release.

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DESIGN, DEVELOPMENT AND EVALUATION OF MULTI-PARTICULATE DRUG DELIVERY SYSTEMS CONTAINING NATURAL GUM

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It is very needful to develop pharmaceutical novel drug delivery system. For highly cheap and suitable effective natural excipient which can be beneficial for an alternative in pharmaceutical formulation. For their nontoxic property and easily availability. For having biodegrability and biocompatibility property dosage form must be popular. The main aim of this research is to development and evaluation of sustained release matrix tablet of 5-amino salicylic acid based on natural gum exudates of Butea monosperma. Butea monosperma gum-based polymer was characterized for its properties such as compressibility index, angle of repose, viscosity and moisture content. The interaction between gum and 5-amino salicylic acid was studied through different Scanning colorimeter and furrier transform infrared spectroscopy. Matrix tablets were prepared by Wet granulation method with different concentration of Butea monosperma gum a Sodium alginate and evaluated for their physical properties such as wet variation, hardness, friability and content uniformity. A dissolution study was conducted to characterize the release mechanism from matrix system. The inflammatory bowel syndrome is not a curable disease. The inflammatory bowel syndrome can be relief by this special polymer also. The novel polymer which has non irritating property and remove side effect than comparatively other marketed product. Preparation of microbeads was done by ionic gelation technique. This formulation is multi particulate gastro retentive drug delivery system which can control drug release pattern according to patient need. The polymer is eco-friendly and sustainable nature as attractive alternative to synthetic polymers. It must have industrial application.

Keywords: Inflammatory bowel syndrome, butea monosperma gum, beads, ionic gelation technique.

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UNLOCKING THE POTENTIAL OF COSMETIC DERMAL DELIVERY WITH ETHOSOMES

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Ethosomes, advanced lipid-based nanocarriers, have emerged as a powerful tool in cosmetic dermatology for enhancing dermal delivery of active ingredients. This presentation explores their use in treating hair loss, acne, pigmentation, and skin aging. Ethosomes are composed of ethanol and phospholipids, which promote deeper skin penetration and improved bioavailability. Their advantages include high drug-loading capacity, non-invasiveness, and enhanced stability. The poster outlines ethosomal preparation methods, characterization techniques, and cosmetic applications including skin whitening, hydration, and anti-aging solutions. Despite challenges such as formulation stability and irritation potential, ethosomes offer a promising, patient-friendly alternative to conventional skincare systems.

Keywords: Ethosomes, nanocarrier, pigmentation, skin delivery, cosmetic therapy.

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APPLICATION OF HERBAL MEDICINE IN ALLOPATHY

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The international interest in alternative medicine brings attention to investigations about combining herbal treatments within conventional medical approaches. The abstract reviews how herbal remedies pair with conventional allopathic methods both in practical use and research and identifies prevailing difficulties in this approach. While allopathy focuses on evidence-based, pharmacologically active compounds, herbal medicine offers a holistic approach with complex mixtures of bioactive substances. 1 Integrating these two systems necessitates rigorous scientific validation of herbal efficacy and safety through clinical trials, standardization of herbal preparations, and a thorough understanding of potential herb-drug interactions. 2 Collaborative research efforts are crucial to identify synergistic or additive effects, reduce allopathic drug dosages, mitigate side effects, and ultimately enhance patient outcomes. The abstract demonstrates an immediate requirement for regulatory structures together with doctor-to-herbal practitioner communication to safely use herbal medicine inside conventional healthcare practice.

Key words: Herbal treatments, pharmacologically active, bioactive substances, doctor-to-herbal, healthcare practice

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ADVANCEMENT IN APPLICATION OF NANO BOTS IN TREATMENT AND REMEDY OF CARDIOVASCULAR DISEASE

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Cardiovascular diseases (CVDs) are a Wide range of disease which are a group of disorders of the heart and blood vessels. Nowadays, we know about new technology which is known as nanorobots or nanobots. This is called nanorobotic technology. Nanobots are so small that they can work on a microscopic level and interact with human cells. CVDs are revolutionized for patient treatment by nanobots or cellular robots. Drug delivery, real-time monitoring, plaque removal, and tissue regeneration tasks can be performed by them with high accuracy. Biosensors combined with nanobots so that they can identify early heart issues, enabling fast healing strategies. When challenges include similarity with the living body, technological growth, and regulatory approval, the possible advantages for patients and updated treatment patterns are important. In CVD treatment, nanobots can be used as a drug delivery system.

Key words: Cardiovascular diseases (CVDs), Nanobots, microscopic, revolutionized, tissue regeneration, Biosensors, regulatory approval.

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PACLITAXEL NANOFORMULATIONS AIDING IN CANCER THERAPY

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Paclitaxel, a diterpene taxane extracted from the bark of *Taxus brevifolia*, is a potent chemotherapeutic agent widely used in the treatment of various cancers, including breast, lung, and ovarian cancer. Despite its effectiveness, paclitaxel's poor aqueous solubility and systemic toxicity limit its clinical utility. To overcome these limitations, nanotechnology-based formulations have emerged, utilizing nanoparticles to enhance solubility, target delivery, and improve pharmacokinetic profiles. Nanobots and ligand-mediated drug carriers allow site-specific targeting, improving therapeutic index and minimizing side effects. This poster explores the pharmacokinetics of paclitaxel, challenges in nanoparticle delivery, and the role of nanocarriers in optimizing its cancer-fighting efficacy. Such innovations promise significant advances in oncology by increasing drug bioavailability and therapeutic success.

Keywords: Paclitaxel, nanoparticles, nanobots, cancer therapy, targeted drug delivery, nanotechnology.

BCR/NATCON/25/P-119

PHARMACISTS ON THE FRONTLINES: THEIR CRUCIAL ROLE IN PANDEMIC MANAGEMENT

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Pharmacists play a crucial role in pandemic management, as highlighted during the COVID-19 crisis. This poster explores their expanding responsibilities, including vaccination, medication safety, patient education, and chronic disease management. It also examines the challenges they face, such as increased workload, exposure risks, and supply chain disruptions. Innovations like telepharmacy, AI integration, and personalized medicine have enhanced pharmacy practice. Case studies from past pandemics, including H1N1, Ebola, and SARS, illustrate pharmacists' vital contributions. A regional analysis of COVID-19's impact is also presented. The conclusion emphasizes the ongoing importance of pharmacists in both pandemic and general healthcare settings, advocating for their continued leadership in public health.

Keywords: Pharmacists, pandemic management, vaccination, telepharmacy, healthcare.

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GOLD NANOPARTICLES: A MODERN APPROACH IN DRUG DELIVERY SYSTEM

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Gold nanoparticles (AuNPs) have gathered significant attention in various fields due to their unique optical electronic and catalytic properties. Various synthetic methods including chemical reduction, biological synthesis and green synthesis roots cover this topic along with their advantages and limitations. Characterization techniques such as transmissions electron microscopy (TEM), UV visible spectroscopy, and X-ray diffraction (XRD) are essential for understanding the morphology, size and crystallinity of AuNPs. The application of gold nanoparticles in biomedical, catalysis, sensing, and imaging are included. Bio medical applications include drug delivery, cancer therapy and biosensing due to their biocompatibility and surface functional capacities. AuNPs exhibit remarkable catalytic activity in organic transformations for green chemistry applications. Sensing and imaging applications benefit from the unique optical properties of AuNPs enabling detections of analytes of high sensitivity and selectivity. The growing interest in AuNPs undergoes the need for further research to explore their potential in emerging fields such as nanomedicines, energy, and environmental sciences. Environmental applications involve AuNPs in pollutant detections and remedial processes contributing to sustainable development. Overall, this abstract provides brief into the various roles of Gold Nanoparticles.

Keywords: Gold nano particle, drug delivery, transmission electron microscopy, XRD

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APPLICATION OF ARTIFICIAL INTELLIGENCE AND NANOROBOTICS TO CROSS THE BLOOD BRAIN BARRIER

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The blood-brain barrier (BBB) is a semipermeable membrane that is an extremely selective system in the central nervous system of most vertebrates, working to separate blood from the brain's extracellular fluid. It is of great importance for clinicians to maintain homeostatic function. For delivering therapeutic agents to the brain, traditional methods that are currently available have been limited. At present, in recent days, advancements in Nanorobots and AI are emerging as a very important tool for drug delivery systems, especially for targeted and particularly in crossing the blood-brain barrier. By integrating AI and as well as machine learning and predictive modeling, the enhanced adaptability of nanorobots for navigation, target, and payload across the BBB without any large toxicity, and can easily optimize design as well as delivery of the drug, which can penetrate the BBB. This paper mainly explores to overcome the BBB, AI, and nanorobots how works. Nanorobots can transport therapeutic agents directly to a particular area of the brain. Particularly in this review article, we mostly focus on nanoparticles that are based on biomolecular engineering. We also focus on information about the outline of a particular case, which addresses payload in various neurological disorders as well as brain tumors. Through the interdisciplinary approaches in the future, a variety of brain diseases can be treated more effectively.

Keywords: Machine learning, predictive modeling, nanorobots, blood brain barrier, artificial intelligence

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NANO WARRIORS: ADVANCING CANCER THERAPY WITH PRECISION NANOPARTICLES

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Nanotechnology in oncology medicine has established precision cancer treatment as the future by creating advanced therapeutic possibilities for targeted cancer therapy. The term "nano warriors" describes engineered nanoparticles that function as powerful cancer fighters by moving through intricate biological structures to reach tumour destinations. These nanoparticles receive instructions to detect cancer-specific markers, which allow them to avoid healthy tissues and achieve superior therapeutic results. The drug delivery advantages of precision

nanoparticles surpass older methods by allowing controlled substance release together with improved bioavailability and biological barrier penetration abilities, which enhance existing treatments such as chemotherapy and radiation therapy. The development of precision nanoparticles involves the creation of liposomes and dendrimers and gold nanoparticles, and polymeric carriers for particular cancer treatments. Some nanoparticles combine diagnostic imaging functions with therapeutic abilities to perform theragnostic applications, which enable continuous treatment monitoring. Nano-based platforms are currently being researched for three distinct applications beyond drug delivery, such as gene therapy and immunomodulation, and photothermal treatment to expand their therapeutic boundaries. Demanded advancements provide opportunities to deliver cancer treatment strategies that are specific to individual patients while minimizing procedural invasiveness. The path toward large-scale manufacturing and long-term safety evaluation, as well as regulatory compliance, requires continuous research. The upcoming generation of cancer treatment depends on precision nanoparticles, which represent specific targeted and non-toxic treatment methods. Smart, adaptable, highly effective treatment strategies show great promise to defeat cancer while using intelligent therapeutic approaches.

Keywords: Precision nanoparticles, targeted cancer therapy, theragnostic applications, nano drug delivery systems, nanotechnology in oncology

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GENE THERAPY: PIONEERING THE FUTURE OF PRECISION MEDICINE

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Gene therapy represents a transformative step in healthcare, aiming to correct the genetic roots of diseases rather than just alleviating their symptoms. This innovative approach works by altering, replacing, or adding genetic material within a person's cells, opening new paths for the treatment of conditions once thought untreatable. Advances in technologies like CRISPR-Cas9 for gene editing, along with improved delivery systems and genomic sequencing, have expanded the reach of gene therapy across a broader range of diseases. Notable progress has been made in addressing single-gene disorders such as hemophilia, spinal muscular atrophy, and certain inherited forms of blindness. In oncology, personalized approaches like CAR-T cell therapy have delivered encouraging results, especially in treating blood cancers. Researchers are also exploring its potential for complex disorders like Alzheimer's and Parkinson's, as well as common chronic diseases including heart disease and diabetes. Despite its promise, gene therapy still faces challenges such as immune system reactions, limited data on long-term safety, accidental genetic alterations, and ethical issues—particularly concerning heritable genetic changes. However, ongoing improvements in delivery methods and precision targeting continue to push the field forward. As research advances, gene therapy is set to become a key part of personalized medicine, reshaping the future of disease treatment.

Keywords: Gene therapy, genetic modification, CRISPR-Cas9, gene editing, CAR-T cell therapy.

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NANOLIPOSOMES AS VERSATILE NANOCARRIERS: A PROMISING PLATFORM FOR TARGETED DRUG DELIVERY AND BIOMEDICAL APPLICATIONS

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Nanoliposomes are advanced nanoscale vesicles composed of phospholipid bilayers that serve as efficient carriers for delivering active compounds. Nanoliposomes might contain an extensive spectrum of active compounds, which include medications, nutraceuticals, and cosmetics. Due to their modest structure, excellent biocompatibility, and biodegradable nature, nanoliposomes are utilized across multiple fields such as gene therapy, cancer treatment, cosmetic science, and agricultural food technology. They are typically prepared in aqueous media to improve the solubility, stability, and bioavailability of active ingredients. By reducing the adverse reactions frequently connected to traditional drug formulations, nanoliposomes help to achieve the intended dose at the target site by enhancing the delivery of drugs efficiency. Structurally, nanoliposomes comprise phospholipids that are concentric bilayers surrounding an aqueous core, offering both hydrophilic and lipophilic environments. This unique amphiphilic nature enables the encapsulation of both water-soluble and fat-soluble drugs within the same carrier system. As these vesicles are typically made from naturally occurring phospholipids and cholesterol sources, biological applications can manage in a safe and efficient manner. Moreover, nanoliposomes support targeted and controlled drug release, ensuring that active agents are delivered steadily at specific tissues or organs. This targeted approach improves therapeutic outcomes and reduces systemic toxicity, making nanoliposomes a promising tool in modern drug delivery and biomedical applications. This review concluded that nanoliposomes represent a highly promising and versatile delivery system that combines biocompatibility, targeted release, and dual drug encapsulation capabilities, offering significant potential to enhance therapeutic efficacy across a wide range of biomedical applications.

Keywords: Nanoliposome, naso therapy, nanocarrier, biomedical applications.

BCR/NATCON/25/P-125

MONOCLONAL ANTIBODIES IN PERSONALIZED CANCER TREATMENT: A STEP TOWARDS PRECISION ONCOLOGY

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Monoclonal Antibodies (mAbs) have enhanced cancer therapy by providing targeted and personalized drug therapy. In traditional chemotherapy, both healthy and cancerous cells whereas in monoclonal antibodies selectively bind to specific antigen on cancer cells which leads to increase in efficacy and reduced its adverse effects. The monoclonal antibodies treatment aligns with the core principles of precision oncology. The Treatment depends upon the genetics and molecular profiles of individual patients. A number of monoclonal antibodies, including Cetuximab (Epidermal Growth Factor Receptor (EGFR)-positive colorectal cancer), Pembrolizumab (Programmed Cell Death Protein 1 Inhibitor (PD-1 Inhibitor)), and Trastuzumab (Human Epidermal Growth Factor Receptor 2 (HER 2)-positive Breast Cancer), have been authorized for clinical use. By preventing cancer growth signals, boosting the immune system, or delivering lethal drugs straight to tumour cells, these treatments demonstrate their efficacy. In order to improve therapy outcomes, biomarker-driven methods like HER 2 and PD-L1 testing are crucial in assessing a patient's eligibility for a particular mAb treatment. Emerging innovations in monoclonal antibody therapy include bi-specific and tri-specific antibodies capable of simultaneously targeting different cancer pathways, along with antibody-drug conjugates (ADCs) that enhance the accuracy of drug delivery to malignant cells. In conclusion, these advanced antibody-based strategies offer significant potential for more effective and targeted cancer treatments in the future.

Keywords: Monoclonal antibodies (mAbs), precision oncology, targeted cancer therapy, biomarker-based treatment; antibody-drug conjugates (ADCs)

BCR/NATCON/25/P-126

EMERGING TRENDS IN POLYMERIC HYDROGELS: FROM STRUCTURAL DESIGN TO BIOMEDICAL APPLICATIONS AND DRUG DELIVERY

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Hydrogel is a three-dimensional structure formed by water-insoluble polymers that have the potential to absorb bodily fluids in biological environment. This polymer network is created through various chemical crosslinking techniques, such as optical polymerization, enzymatic reactions, and physical crosslinking methods like temperature- and pH-sensitive together with ionic interactions. Hydrogels fall into one of several categories' physical hydrogels, which rely on weak secondary forces, and chemical hydrogels, which are held together by covalent bonds. Biopolymer-based hydrogels can be created through various synthesis methods. Their essential features including their ability to swell, structural strength, and compatibility with biological systems play an important part of shaping their form and internal architecture. In addition to careful formulation, different strategies and environmental settings are utilized to refine and enhance the hydrogel fabrication process. In recent times, hydrogels have emerged as a promising platform for drug delivery applications. Numerous innovative polymeric hydrogel nanoparticle formulations have been developed using materials from synthetic and natural sources origins, each presenting its own set of benefits and potential drawbacks. The versatility of hydrogels makes them valuable in the bounds of medical applications, including tissue engineering, wound care, contact lenses, and CR of therapeutic agents, thanks to their resemblance to the extracellular matrix (ECM) and their able to retain water. In conclusion, the

structural and functional versatility of hydrogels continues to drive innovation in biomedical science, particularly in the controlled and targeted delivery of therapeutic agents.

Keywords: Hydrogel, polymer network, crosslinking, swelling, drug delivery, tissue engineering.

BCR/NATCON/25/P-127

DEVELOPMENT OF ATORVASTATIN-LOADED SODIUM ALGINATE-PECTIN FILM FOR CHRONIC WOUND HEALING

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Chronic wounds are a significant healthcare issue, healing slowly and carrying a higher risk of infection. There is a need for simple, low-cost, and effective treatment options. In this study, we prepared a transdermal film using natural polymers-sodium alginate and pectin (1:1 ratio) and incorporated atorvastatin calcium, a lipid-lowering drug. Although atorvastatin is commonly used to reduce cholesterol, studies have shown it can also aid wound healing by reducing inflammation, increasing nitric oxide production, and promoting new tissue formation (angiogenesis). The film was prepared using the solvent casting method. A 5% w/v polymer solution was made with glycerol as a plasticizer. Atorvastatin was dissolved in pH 8 phosphate buffer and added to the film-forming solution. Calcium chloride (5%) was used as a cross-linker. The final drug-loaded formulation containing 9 mg of atorvastatin was labelled as SA-PC-A. Both blank (SA-PC) and drug-loaded (SA-PC-A) films were evaluated for drug content, swelling index, moisture content, moisture uptake, water vapor transmission rate, opacity, and total soluble matter. The results showed that SA-PC-A films had good physical stability, appropriate mechanical strength, and effective drug incorporation. The formulation exhibited characteristics suitable for wound healing applications, indicating its potential as a promising treatment for chronic wounds.

Keywords: Chronic wound, transdermal film, atorvastatin, sodium alginate, pectin, wound healing.

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REPURPOSING OLD DRUGS WITH NEW ALGORITHMS: THE ROLE OF AI IN DRUG REPOSITIONING

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Drug repurposing, also known as drug repositioning, is the process of identifying new therapeutic uses for existing or previously approved drugs that are outside the scope of their original indication. Drug repurposing is gaining significant attention due to its potential to

reduce cost, time and risk associated with traditional drug development. Two fundamental principles of this approach include drug application against multiple diseases due to their

interdependence and secondly diseases involving overlapping targets and pathways. The integration of AI in this process is revolutionary enabling faster, data-driven, and more accurate predictions, allowing conventional methods to cope up with enormous datasets, data mining and finding new links among various genes, biological entities and diseases combining with their success possibilities. AI driven drug repurposing presents several promising opportunities too such as screening of drug libraries, prediction of drug treatment interactions and analysis of biological networks with gene expression profiles. Platforms like IBM Watson, Helax and *In-silico* Medicine have already demonstrated success in this domain by opening new horizons. Till date several challenging diseases including cancer and COVID-19 have been tested for the same. It can also facilitate precision targeting by integrating multi-omics data with patient specific profiles. But this road is not without bumps, including limited access to high quality data, ethical concerns, and much needed clinical validation of AI predictions. In this era of data-driven science, perhaps the greatest discovery lies not in new molecules-but in new perspectives and AI will provide the head start.

Keywords: Drug repurposing, artificial intelligence (AI), machine learning (ML), personalized medicine, future possibilities

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DEVELOPMENT AND EVALUATION OF NON-PROPELLANT FOAM FORMULATIONS FOR ENHANCED WOUND HEALING

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Cutaneous wounds, such as abrasions, burns, and lacerations, are prone to microbial invasion that hinders healing. Topical antimicrobial foams offer a promising solution by reducing infection risk and improving patient comfort and compliance. An initial NPF formulation with gelatine, fructose, ciprofloxacin hydrochloride, benzalkonium chloride was developed and evaluated for rheology and foaming capacity. It was observed that the foam exhibited a significant enhancement in its expansion capacity, reaching 302.31%, along with an improvement in foam volume stability, which increased to 60.52%. The optimized formulation showed an extended collapse time of 2 hours and 47 minutes, enhancing its clinical suitability for treating infected burn wounds. The formulation exhibited notably high foam strength (0.12), as determined by the slope of the collapse curve, wherein a lower slope corresponds to enhanced foam stability. The foam exhibited a drug content exceeding 90%, indicating efficient drug incorporation and suggesting substantial transfer of the active pharmaceutical ingredient into the foam matrix. The formulation exhibited a highly efficient drug release profile, delivering 97.79% of the active pharmaceutical ingredient to the wound site, thereby ensuring optimal therapeutic efficacy. This study demonstrated remarkable efficacy against both Gram-negative and Gram-positive bacteria, with the foam exhibiting antimicrobial activity equivalent to 95% of the original foaming solution. This study shows that non-propellant foams improve bioavailability, antibacterial efficacy, and skin retention while reducing application discomfort.

The formulated foam presents a superior alternative to conventional topicals, enhancing therapeutic outcomes and patient adherence in wound care.

Keywords: Non-propellant foam, ciprofloxacin hydrochloride, topical drug delivery, antimicrobial efficacy, wound healing.

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BRAIN BOUNDARY: UNLEASHING THE POWER OF LIPOSOMES FOR TARGETED THERAPY

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The Blood Brain Barrier (BBB) may limit the delivery of the drugs to the brain, liposome-based drug delivery techniques have been deviced to overcome this. Numerous research has been conducted on experimental animals due to the limited access to the human brain. Liposomes can encapsulate chemo-therapeutic medications and enable targeted distribution to the BBB because of their surface conjugation properties, biocompatibility, and non-toxicity. Furthermore, methods for creating liposomes that react to external and/or internal stimuli to release their cargo in a restrained manner have been investigated. Although studies on utilizing liposomes to teat brain tumours are still in their early stages, these systems have the potential to significantly alter the way drugs are delivered. These investigations might be improved to offer a mechanical understanding of the rapidity of certain BBB transport and intra brain distribution processes that collectively control neural target release of the free medication, even though they are producing compelling outcomes. With a focus on identifying the distinct processes that assess the duration of the free drug concentrations in the brain after their oversight both as an entire and in liposomes. Both cationic and stealth liposomes are being investigated a possible medication delivery method for brain targeting; cationic liposomes help breach the BBB through electrostatic interactions, while stealth liposomes lengthen circulation time and decrease clearance. Liposome formulations might offer intriguing modifications to BBB transport. To better predict of liposomal drug distribution in human based on animal findings, more mechanistic research is required to investigate pertinent ways in this delivery system.

Keywords: Blood brain barrier (BBB), stealth liposomes, longer circulation time, cationic liposomes, brain targeting, electrostatic interaction.

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TINY TOOLS, BIG IMPACT: TUMOR TARGETING WITH NANOPARTICLES

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Targeting of pharmaceuticals is a rapidly developing strategy to overcome the challenges of therapeutic delivery, particularly to the tumour site. Nanoparticles (NPs) have become a game-

changing tool in cancer diagnosis and treatment because of their distinct physicochemical characteristics, tunable surface features, small size, capacity to encapsulate a variety of medications and offers a longer circulation time as well as facilitate easy cellular membrane

penetration. Through the enhanced permeability and retention (EPR) effect, their nanoscale size permits preferential accumulation in tumour tissues and surface modifications with targeting ligands facilitate the active recognition of tumour-specific markers. The precision and effectiveness of drug delivery are greatly increased by this dual targeting capacity, which also reduces systemic toxicity and improves the therapeutic outcome. Different types of nanoparticles such as dendrimers, liposomes, inorganic nanoparticles (e.g. iron oxide, silver, gold), polymeric nanoparticles are being studied for their capability to deliver the chemotherapeutics, genes or diagnostic agents directly to tumour sites. Targeting accuracy is further improved by stimuli-responsive nanoparticles, which release their payload in response to tumour-specific triggers (such as an acidic pH, hypoxia, enzymes and temperature). Nanoparticles based tumour targeting also has the potential to transform personalised cancer treatment and enhance patient outcomes. So, it can be concluded that nanoparticle-based tumour targeting represents a transformative approach in oncology, offering precise, efficient, and personalized therapeutic delivery that holds immense promise for improving cancer diagnosis, treatment, and patient outcomes.

Keywords: Nanoparticles, tumour site, targeting, tumour-specific triggers, chemotherapeutics, circulation time.

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MIXTURE DESIGN SUPPORTED OPTIMIZATION OF *IN-SITU* GEL SYSTEMS FOR TOPICAL ADMINISTRATION

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The direct drug application offered by topical drug delivery systems minimizes systemic negative effects. Traditional formulations frequently have inconsistent adherence, short residence times, and low stability. Since *in-situ* gels improve drug retention and prolonged release via undergoing a sol-to-gel transition in physiological milieu, while maximizing ease of application, they have drawn wide interest. Precise optimization is necessary for effective *in-situ* gel formulations by trial-and-error techniques are ineffective. Statistical designs provide a systematic and efficient means to determine the ideal concentrations of polymers, improving formulation reliability with fewest trials. A statistical approach called D-Optimal mixture design (13 runs) was used to optimize the ion-sensitive and pH-sensitive polymers levels used in this study. These polymers were picked by assessing various parameters enabling formulation to adapt to changes in the environment. The ideal concentrations of each polymer for achieving stable gel formation were determined by preliminary studies. Then using suitable mixer design, the synergistic effects of both polymers were rigorously assessed in order to determine which formulation would have the best physical properties, such as uniform appearance, desired viscosity, high spreadability, and robust bioadhesion. Several formulations were evaluated

through experimental runs, and when observed data and predicted values were compared, the model's accuracy was confirmed with a percentage error of <10%. The improved formulation demonstrated excellent gelation behaviour making it a versatile topical drug delivery system. This study offers a pathway to a platform technology for multiple model drugs by proving the efficiency of statistical designs in in-situ gel system optimization.

Keywords: *In-situ* gel, topical delivery, mixture design, ion-sensitive polymers, pH-sensitive polymers, optimization.

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COLD HOMOGENIZATION-ASSISTED FORMULATION OF KETOCONAZOLE-LOADED SOLID LIPID NANOPARTICLES

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Abstract: This study focuses on the preparation of ketoconazole-loaded solid lipid nanoparticles (SLNs) using the cold homogenization method. The formulation involved the use of tween 80, cholesterol, methanol, and acetone as key components in the preparation process. The lipids (cholesterol) and surfactant (tween 80) were selected for their ability to stabilize the nanoparticles and enhance the encapsulation of ketoconazole. To prepare the SLNs, a lipid phase containing cholesterol was first dissolved in a mixture of methanol and acetone. The drug, ketoconazole, was then incorporated into this lipid matrix. The cold homogenization process was performed by adding the lipid-drug mixture to an aqueous phase containing tween 80. The mixture was subjected to homogenization at low temperatures to ensure efficient dispersion and to prevent drug degradation. The resulting nanoparticles were characterized for size, zeta potential, and encapsulation efficiency. The cold homogenization method was optimized to achieve uniform particle size distribution without compromising the stability of the system. This technique provided a controlled and reproducible means of preparing ketoconazole-loaded SLNs for potential applications in improving the drug's bioavailability and therapeutic efficacy.

Keywords: Ketoconazole, cold homogenization, prevent drug degradation, solidparticles.

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AI AND MACHINE LEARNING IN PHARMACOKINETICS – HOW AI MODELS PREDICT DRUG ABSORPTION, METABOLISM, AND PERSONALIZED DOSING

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The application of artificial intelligence (AI) and machine learning (ML) technologies has impacted our ability to predict and understand drug absorption, distribution, metabolism, and

excretion (ADME) in pharmacokinetics. Traditional models have served their purpose; however, they often encounter significant problems with the variation regarding the responses

of individual patients. AI and ML, particularly deep learning, neural networks, and ensemble models, can sift through vast and intricate datasets to analyze specific patient characteristics and distinguish patterns to how drugs are processed in the body. These technologies enhance the accuracy of forecasts on an individual and population basis, which facilitates optimal dose calculations and treatment customization. For example, available information like an individual's genes, age, and physical characteristics have trained ML models to predict plasma drug concentrations, estimate AUC, and even forecast first-pass metabolism. Further, AI can estimate how a drug would work under numerous situations to minimize the need for clinical trials. Moreover, AI technologies can constantly adapt to changing conditions, enabling effortless real-time adjustments for monitoring patients' drug levels and customizing dosages. Nonetheless, issues remain—for example, maintaining data accuracy, interpreting intricate models, and adhering to medical compliance protocols. Integration of these technologies into practice necessitates teamwork among pharmacologists, data scientists, and clinicians. In general, the application of AI and ML can significantly enhance the safety, efficacy, and personalized care of medications tailored to patients.

Keywords: Pharmacokinetics, artificial intelligence (AI), machine learning (ML), personalized medicine, dose optimization

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WEARABLE BIOSENSORS FOR PHARMACOKINETIC MONITORING – CONTINUOUS DRUG MONITORING USING SMARTWATCHES AND BIOSENSORS

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Therapeutic Drug Monitoring (TDM) is important for maximizing therapy effectiveness and reducing adverse drug reactions for drugs with limited therapeutic windows. However, the limitations associated with traditional TDM techniques include their dependence on centralized laboratories, delayed feedback, and invasiveness. An innovative solution is provided by current advances in wearable biosensor technology, which make it possible to continuously and effectively monitor drug concentrations in real time. Recent advancements in biosensor technologies, including those based on electrochemistry, colorimetric and aptamers have made it possible to detect drugs in biofluids like blood, sweat, and interstitial fluid with high sensitivity, low power consumptions, and real-time detection. Non-invasive platforms that can track drug concentrations like lithium, propofol, and paracetamol with cloud-based data sharing for clinical decision making are provided by smartwatches and flexible biosensor integrated wearables. Advanced materials like carbon nanotubes and nanocomposites are used in these biosensors to improve biocompatibility, stability, and sensitivity. From the recent research wearable biosensors provide low power wireless data transmission, and AI assisted analytics. By facilitating real-time input for both patients and clinicians, these technologies improve

medication adherence and make it possible to customize doses according to physiological requirements. Additionally, the incorporation of these devices into wearable platforms facilitates the treatment of chronic diseases and remote healthcare delivery.

Keywords: Therapeutic Drug Monitoring, Wearable biosensors, personalized medicine, Wireless data transmission, real time drug detection

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FORMULATION DEVELOPMENT STUDIES ON PULLULAN-BASED ORALLY DISINTEGRATING FILMS OF FLUVOXAMINE MALEATE

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Orally disintegrating films are a convenient and patient-friendly alternative to traditional solid dosage forms, with special benefits for children, geriatric, and dysphasic patients. Pullulan, a natural, water-soluble polysaccharide, was chosen as the film-forming polymer due to its high film-forming capability, low toxicity, and rapid dissolution. Fluvoxamine Maleate was introduced into the film matrix via the solvent casting method, which included various quantities of pullulan and appropriate plasticizers to optimize mechanical strength and disintegration time. The films were evaluated for physicochemical properties such as thickness, folding durability, pH of surface, drug content, DT, and in vitro drug release. FTIR analysis examined Fluvoxamine Maleate's compatibility with the excipients used. The improved formulation demonstrated quick disintegration (within 30 seconds) and uniform medication distribution. The results suggest that Pullulan-based ODFs are a promising platform for the rapid and effective delivery of drug substance, potentially improving patient compliance and therapeutic outcomes.

Keywords: Orally disintegrating films, Pullulan, Fluvoxamine Maleate, Solvent casting, Fast drug release.

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FROM BENCH TO BEDSIDE: THE ROLE OF CRISPR IN MODERN GENE THERAPY

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Genome editing technologies have revolutionized biomedical research and therapeutic development by enabling precise and efficient modifications of the human genome. The targeted treatment of a variety of hereditary and acquired disorders has been improved because to CRISPR-Cas systems and previous instruments like zinc finger nucleases (ZFNs) and transcription activator-like effector nucleases (TALENs). By causing site-specific DNA

double-strand breaks, these instruments enable gene disruption, correction, or insertion through cellular repair processes such as homology-directed repair (HDR) or non-homologous end joining (NHEJ). Recent advances in genome editing have produced encouraging preclinical

and clinical uses for the treatment of cancer, viral infections like HIV, and monogenic illnesses like sickle cell disease, hemophilia, and Duchenne muscular dystrophy. By allowing single-nucleotide modifications without double-strand breaks, reducing off-target effects, and enhancing safety profiles, the development of base editing and prime editing technologies has significantly improved editing precision. There are still difficulties in spite of these developments. Careful attention must be paid to effective and tissue-specific delivery methods, possible off-target activities, immunological reactions, and ethical issues surrounding germline editing. In the future, genome editing could revolutionize regenerative and customized medicine. Transforming these technologies into safe, efficient, and broadly available treatments will require ongoing research and regulatory improvement. Genome editing has the potential to be a key component of the focused therapy of human diseases as research advances.

Keywords: Genome editing, CRISPR-Cas, Gene therapy, Targeted therapy, Base editing, Prime editing

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FORMULATION AND EVALUATION OF LOSARTAN POTASSIUM BASED MICROSPHERES USING MUCILAGE OBTAIN FROM NATURAL ORIGIN

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This study was designed to develop and assess microspheres containing losartan potassium, utilizing mucilage which has been extracted from the unripe fruits of *Diospyros malabarica* (Indian Persimmon) as a natural polymer base. With the rising interest in environmentally friendly and biologically safe drug delivery options, *Diospyros malabarica* mucilage was explored as a potential candidate for achieving prolonged drug release. The extracted mucilage underwent testing to determine its capability in sustaining drug release over an extended duration. The microsphere formulations were evaluated for several evaluation parameters including particle size, drug entrapment capacity, micromeritic study, *in-vitro* drug release behaviour etc. Results demonstrated that the microspheres possessed strong mucoadhesive qualities and high encapsulation efficiency. Surface morphology analysis via FE-SEM indicated that the particles were predominantly spherical with a coarse exterior. Overall, this research supports the use of *Diospyros malabarica* mucilage as a promising and sustainable excipient in the development of extended-release formulations, particularly for antihypertensive medications such as losartan potassium.

Keywords: Microspheres, natural polymer, anti-hypertension, sustain release.

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DEVELOPMENT AND ASSESSMENT OF PROMETHAZINE HYDROCHLORIDE MOUTH DISSOLVING FILM

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Quick-dissolving pharmaceutical delivery methods are gaining attention as patient-friendly alternatives to conventional oral dosage forms. Among these, mouth dissolving films offer a promising approach by bypassing hepatic first-pass metabolism and delivering the drug

systemically to the target site. Promethazine Hydrochloride, a first-generation antihistamine commonly used to treat allergies, nausea, and motion sickness, has poor bioavailability due to its high solubility and low permeability. This research aims to create a rapid-dissolving film formulation of Promethazine Hydrochloride using polymer-based techniques to enhance its therapeutic effectiveness and patient compliance. The drug directly blocks mesolimbic dopamine receptors as well as alpha-adrenergic receptors, and also exerts antihistaminic effects through H1-receptor blockade. This formulation was specifically designed for populations such as pediatric and geriatric patients who often experience difficulty swallowing traditional dosage forms. The films were formulated using the solvent casting method, incorporating Pullulan as the natural polymer, Sodium Starch Glycolate as the super-disintegrant, and PEG-400 as the plasticizer. The resulting films were evaluated for a range of parameters, including FTIR analysis, folding endurance, weight variation, content uniformity, thickness, drug release profile, moisture content, and opacity. Each experiment was performed three times, and the results are presented as the mean value with the standard deviation (Mean ± SD). The film was found to dissolve within 31.95 seconds when immersed in stimulated media, and released upto85.58% of the drug at 12 minutes. In conclusion, Mouth-dissolving films of Promethazine Hydrochloride present a potential drug delivery method, ease of administration.

Key words: Promethazine Hydrochloride, Mouth Dissolving Films (MDFs), Pullulan, Sodium Starch Glycolate, PEG-400, Bioavailability, H1-Receptor Blocker.

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GENE THERAPY FOR CANCER: AN INNOVATION AND FUTURE PROSPECTS

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Human genomics research has shown during the last 20 years that somatic abnormalities in the host genome are the root cause of cancer. This finding has increased the enthusiasm of cancer specialists and many are using genetic modification treatment techniques to encourage cancer regression and seek a possible cure. Viral or bacterial vectors can be used to introduce genetic code into a host cell, as well as non-viral methods, alongside immunomodulation strategies targeting tumor cells or the immune system of the host, and adjustments to the tumor microenvironment are all essential aspects of gene therapy. The objective is to diminish the tumor's blood vessel formation or enhance its antigenicity to promote better recognition by the host's immune system. Some progress has been made in cancer treatment with minimal side effects. Older methods that involved risks like gene changes, immune responses, and treatment

resistance have improved with new viral and non-viral approaches. Although several tumor-specific antibodies, genetically engineered immune cells, and vaccinations have been created, only a small number are already on the market, and many more are still undergoing clinical studies. In the future, gene therapy is expected to play a significant role in cancer therapy as a component of a multimodal strategy, either in conjunction with or after other cancer treatment modalities such chemotherapy, radiation, and surgery. The approach and method of gene therapy will be tailored to each patient's genetic makeup, tumor characteristics, and immune status, enabling a personalized, multimodal treatment strategy.

Keywords: Gene transfer technique, immunomodulation, Molecular targeted therapy, Retroviruses, Adenoviruses, Suicide transgenes.

BCR/NATCON/25/P-141

FABRICATION AND EVALUATION OF BIODEGRADABLE CHITOSAN-COLLAGEN BASED SCAFFOLDS IN TISSUE ENGINEERING

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The development of biodegradable scaffolds plays a critical role in advancing tissue engineering by providing temporary structural support and promoting cell growth and tissue regeneration. This study focuses on the fabrication and evaluation of biodegradable scaffolds composed of chitosan and collagen, two biopolymers known for their biocompatibility, biodegradability, and resemblance to the natural extracellular matrix (ECM). Scaffolds were developed using freeze-drying (lyophilization) technique to achieve a porous architecture suitable for nutrient diffusion cell and infiltration and crosslinking methods were employed to improve the mechanical stability and degradation profile of the scaffolds under physiological conditions. Various formulations of chitosan and collagen were prepared and characterized for their physicochemical properties, including porosity, water vapor transmission rate, moisture content, moisture uptake. The optimized scaffold exhibited a well-interconnected porous structure, adequate mechanical integrity, and enhanced cellular response, making it a promising candidate for tissue engineering applications. This research highlights the potential of chitosan-collagen scaffolds as effective platforms for regenerative medicine and provides insights into the optimization of scaffold composition for improved tissue regeneration outcomes.

Keywords: Biodegradable scaffolds, Chitosan, Collagen, Tissue engineering, Freeze-drying, Crosslinking.

BCR/NATCON/25/P-142

DIGITAL PILLS & SMART PHARMACOTHERAPY: THE FUTURE OF MEDICATION

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Ingestible sensors, or digital pills, are pharmaceuticals combined with microscopic sensors to track a number of health indicators. Since FDA approval in 2017, it has led toadvancements in patient care and medical diagnosis. The sensor with 1 the size of agrain of sand passes through digestive system after ingestion and is activated when itcomes in contact with stomach acid. It then communicates with external devices (like awearable patch or smartphone app) for about 10–15 minutes before becoming inactive.These sensors assist in monitoring if patients have taken their prescription drugs asdirected by doctors, patients, family members, and healthcare professionals who canaccess the data through mobile health applications. Digital pills can track physiologicalparameters and organ function in addition to drug adherence. Doctors can tailor treatmentby using real-time monitoring to determine dosage requirements and identify any sideeffects early. In the long run, it may save time and money since it improves communicationbetween patients and doctors, and lessen in-person visits. However, the sensor is onlyoperational for a brief period of time, usually 10 to 15 minutes. Besides, high cost and dataprivacy are some of its limitations. Sensor-enabled pills are a potential development inspite of these obstacles which may revolutionize healthcare for more individualized,responsive, and precise treatment in future.

Keywords: Digital pills, Ingestible sensors, 2 Medication adherence, Real-time health, monitoring, Personalized medicine.

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INVESTIGATION AND IMPROVEMENT OF SOLUBILITY AND DISSOLUTION OF BCS CLASS II DRUG BY SOLID DISPERSION TECHNIQUE

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Solubility is a key physicochemical property that affects a drug's absorption, as well as its dissolution rate in the aqueous fluids of the gastrointestinal tract, which in turn impacts its therapeutic efficacy and bioavailability. This current research targeted to achieve on enhancement of dissolution and solubility of telmisartan through the solid dispersion by using hydrophilic carrier. The solid dispersion was synthesized using solvent evaporation method with different drug and carrier ratios by employing chloroform as a solvent. Solid dispersion involves dispersing the drug within an inert carrier, which helps increase solubility by transforming the drug crystallinity to an amorphous form.The prepared solid dispersion preliminary characterized by melting point determination, trinocular study, solubility analysis, drug content study, dissolution study, etc. and through the said studies select the optimized formulation. Characterize the optimized solid dispersion by FESEM, FT-IR, etc. FESEM was employed to investigate the structural and surface characteristics, while FT-IR was utilized to verify the compatibility between telmisartan & carrier. The findings revealed that the prepared solid dispersion demonstrated a marked improvement in both solubility and dissolution

compared to pure telmisartan. The analysis indicated that prepared solid dispersion formed with hydrophilic carrier significantly enhanced the solubility and dissolution profile of telmisartan in comparison to its unmodified form. Hence it could be concluded from the above experimental result that optimized formulation could be able to improve the solubility and dissolution of telmisartan by solid dispersion techniques.

Keywords: Solubility enhancement, dissolution, solid dispersion, bioavailability, physicochemical property.

BCR/NATCON/25/P-144

BIODEGRADABLE BREAKTHROUGHS: EMERGING FRONTIERS IN POLYMER-BASED DRUG DELIVERY

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A major advancement in pharmaceutical sciences, the quick development of biodegradable polymer-based drug delivery systems (DDS) offers improved therapeutic efficacy while reducing systemic and environmental toxicity. To overcome the drawbacks of conventional drug delivery techniques, these systems take advantage of the special qualities of biodegradable polymers, such as biocompatibility, controlled breakdown, and customized drug release patterns. New developments in nanotechnology and polymer chemistry have made it possible to create increasingly complex DDS that include multifunctional composite materials, self-assembling nanostructures, and stimuli-responsive polymers. By facilitating targeted and sustained release, these developments not only improve the stability and bioavailability of medications but also lower the frequency of drug delivery and increase patient compliance. Additionally, the use of renewable, 1 natural polymers like chitosan, polylactic acid (PLA), and poly (lactic-co-glycolic acid) (PLGA) offers eco-friendly substitutes for traditional synthetic materials, satisfying the increasing need for sustainability in the medical field. This study examines the most recent developments in biodegradable polymer-based DDS, emphasizing its possible uses in gene delivery, cancer treatment, and the management of chronic illnesses. This research explores 1 the latest advancements in drug delivery systems (DDS) utilizing biodegradable polymers, focusing particularly on their promising roles in gene therapy, cancer management, and long-term disease treatment. It aims to showcase the potential of these systems as foundational tools in precision medicine and sustainable pharmaceutical innovation. Special attention is given to current challenges such as inconsistencies in production and regulatory complexities. In conclusion, biodegradable polymer-based DDS hold great promise for revolutionizing modern therapeutics by combining targeted treatment with environmental responsibility

Keywords: Biodegradable Polymer-Based Drug Delivery Systems (DDS), Nanotechnology, Bioavailability, Chitosan, Chronic Disease Management.

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REVOLUTIONIZING DIABETES CARE: THE FUTURE OF MICROSYRINGE TECHNOLOGY: 3D PRINTING, AND SMART INSULIN DELIVERY

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Diabetes management has evolved significantly with advancements in drug delivery

technologies, particularly through microsyringe devices and 3D printing. Microsyringes provide precise, controlled insulin delivery, addressing the challenge of accurate dosing and minimizing discomfort for patients. These small, high-precision syringes ensure efficient use of insulin, reduce waste, and improve patient adherence to treatment, ultimately leading to better blood glucose control. Additionally, 3D printing enables the customization of insulin delivery devices, such as pumps and syringes, to meet individual patient needs. Personalized designs offer enhanced comfort, portability, and functionality, while integrating smart technologies like continuous glucose monitoring (CGM) allows for real-time adjustments in insulin delivery. This integration results in more responsive and efficient diabetes management.

The future of insulin delivery is poised for even greater innovation, with potential developments in bioprinting to create insulin-producing cells and AI-driven devices that autonomously adjust insulin doses. These innovations promise to reduce the burden on patients, offering improved treatment outcomes and a better quality of life. Overall, the combination of microsyringe technology, 3D printing, and smart devices holds great promise in revolutionizing the treatment of diabetes, offering more precise, personalized, and accessible solutions for millions of people worldwide.

Keywords: Microsyringes, 3D Printing, Insulin Delivery, Continuous Glucose Monitoring (CGM), Smart Devices

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ENHANCED DRUG LOADED MAGIC POLYMER POLYCAPROLACTONE BASED NANOCARRIERS OF MANGIFERIN

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Polycaprolactone is a biocompaticle synthetic polymer which is reported to exhibit excellent controlled release characteristics when compared to other synthetic polymers. When loaded with mangiferin, a naturally occurring polyphenolic phytoconstituent, the nanocarriers exhibited excellent drug loading as compared to other polymers such as chitosan and poly lactic-glycolic acid (PLGA). Mangiferin, being a poorly soluble drug was loaded into PCL nanoparticles (MPCLNPs) using solvent evaporation technique.Comprehensive characterization of developed nanoparticles was carried out using various analytical techniques.

Particle size range of around 250nm for all formulationswas observed withfairstabilityconfirmed by zeta potential measurements. Surface morphology was observed through Scanning Electron Microscopy (SEM). Encapsulation efficiency of more than 90%was found for all formulations and drug loading confirmed effective incorporation of mangiferin into nanoparticles.To assess drug-polymer compatibility, FTIR spectral analysis was performed; X-Ray Diffraction (XRD) analysis was conducted to examine crystallinity of drug within nanoparticle matrix, while Differential Scanning Calorimetry (DSC) provided information on thermal behavior, melting point, and phase transitions of both polymer and drug, all of which suggested no incompatibility and successful drug loading.The in vitro drug release study demonstrated a sustained and controlled release profile of mangiferin of around 54% over

24 hours from the PCLNPs, indicating their potential as an effective nanocarrier system. The optimized formulation thus showed successful encapsulation, improved solubility, and enhanced bioavailability, suggesting a promising strategy to enhance the therapeutic performance of mangiferin with the help of polycaprolactone.

Keywords: Mangiferin, Polycaprolactone (PCL), Nanoparticles, PCLNPs, Bioavailability, Particle Size

BCR/NATCON/25/P-147

DEVELOPMENT AND CHARACTERIZATION OF TAMARIND GUM & SODIUM ALGINATE BASED OFLOXACIN LOADED FLOATING MICROSPHERE FOR SUSTAINED RELEASE

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The present study focuses on to develop and assess gastroretentive floating microspheres of Ofloxacin using tamarind kernel powder (TKP) and sodium alginate as natural biopolymers.Ofloxacin, a broad-spectrum fluoroquinolone antibioticused for treating bacterial infections caused by Gram-positive and Gram-negative organisms, has a short biological half-life and demands frequent dosing.To address these limitations and enhance gastric residence time, floating drug delivery system was formulated by usingIonotropic gelation technique.In this study inclusion of TKP with sodium alginate as polymer for ionotropic gelation was intended to overcome the rigidity & shrinkage of sodium alginate under acidic condition by ensuringthe optimum sustained release activity.TKP, a naturalgel-forming polysaccharide was blended with sodium alginate to formulate microspheres that could remain buoyant in the gastric environment. Dry TKP atfirst dissolved in cold water, centrifuged and mucilage was precipitated using acetone and dried for further use. Drug-polymer compatibility was checked by FTIR.Differentformulationswere prepared following TaguchiOrthogonal Array designbyvaryingcuring time, the ratios of drug polymer, paraffin oil, crosslinking agent andformulations were evaluated for parameters such as particle size,percentage yield, entrapment efficiency, floating lag time, floating time, swelling index, in vitro drug release. After screening the parameters, formulations are being prepared and evaluated on a full factorial design to develop an optimized formulation. This study highlights the potential of combining TKPand Sodium alginate as natural, biodegradable polymers in developing efficient gastroretentive drug delivery systems.

Keywords: Ofloxacin, Gastroretentive, Floating Microspheres, Controlled Drug Release.

BCR/NATCON/25/P-148

DESIGN AND CHARACTERIZATION OF ALGINATE-TAMARIND BASED RAFT FORMULATION FOR THE TREATMENT OF GASTROESOPHAGEAL REFLUX DISEASE

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Gastroesophageal reflux disease (GERD) is a prevalent gastrointestinal disorder characterized by the backward flow of stomach contents into the esophagus, causing discomfort and mucosal damage. The goal of this study is to control GERD symptoms by developing and characterizing a novel raft-forming formulation that uses natural polymers, specifically tamarind seed polysaccharide and alginate. The formulation was designed to form a floating gel or "raft" in the acidic gastric environment, creating a physical barrier that prevents reflux. A 2-level factorial design was employed to evaluate the effects of key formulation variables—sodium alginate, tamarind polysaccharide, calcium carbonate and sodium bicarbonate—on the performance of the raft system. Various physicochemical parameters, including viscosity, gel strength, floating lag time, and duration, were evaluated to assess the effectiveness of the formulation. In vitro studies confirmed the raft's buoyancy and acid- neutralizing capacity. Compatibility and stability of the polymers were analyzed using FT-IR. The factorial design allowed for the systematic investigation of individual and interactive effects of variables, leading to the identification of an optimized formulation.After screening the parameters, formulations are being prepared and evaluated on a full factorial design to develop an optimized formulation. The results suggest that the alginate-tamarind based raft system offers a promising, natural, and effective approach for managing and alleviating GERD symptoms.

Keywords: Gastroesophageal reflux disease, raft-forming formulation, natural polymers, factorial design, acid-neutralizing capacity

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OPTIMIZATION OF NANO EMULSION WITH TERNARY PHASE DIAGRAM

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Phase diagrams are essential for the manufacture of nanoemulsions because they offer a methodical way to optimize their formulation. The parameters for emulsion that forms may all be predicted with the aid of these diagrams such as its miscibility, phase behavior, globule size, and thermodynamic stability. Researchers can establish the optimized ratio of water, oil, and surfactant concentrations required for stable nanoemulsion generation by creating pseudo-ternary phase diagrams. This technique makes it possible to identify monophasic zones, which are necessary to produce stable and clear nanoemulsions. In addition to decreasing the possibility of metastable formulations and guaranteeing the lowest surfactant concentration which is essential for lowering toxicity and improving stability. Phase diagrams also help in the selection of the proper surfactant and co-surfactant concentrations. Overall, phase diagrams are crucial tools for optimizing nanoemulsion formulations, ensuring their stability and efficacy in a variety of applications, including medicine and cosmetics.

Keywords: Phase diagrams, nanoemulsions, formulation, surfactant, stability.

BCR/NATCON/25/P-150

MANGIFERIN LOADED GREY METAL NANOPARTICLES: DEVELOPMENT AND CHARACTERIZATION

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Mangiferin, a bioactive polyphenolic compound derived from the mango tree (*Mangiferaindica*), has demonstrated various therapeutic properties, including antioxidant, anti-inflammatory, and anticancer activities. However, its poor bioavailability limits its clinical applications. To enhance its bioavailability, mangiferin-loaded silver nanoparticles (AgNPs) were synthesized as a potential nanocarrier system. In this study, mangiferin-loaded silver nanoparticles were prepared using a chemical reduction method. Silver nitrate ($AgNO_3$) was reduced to silver nanoparticles in the presence ofascorbic Acid as a reducing agent & Didodecyldimethyl ammonium bromide (DDAB) as a stabilizing agent. Optimization of the nanoparticle synthesis process was achieved by varying parameters such as concentration of silver nitrate, reducing agent, and reaction time. The particle size, surface charge, and drug encapsulation efficiency were evaluated using dynamic light scattering (DLS), transmission electron microscopy (TEM), and UV-Vis spectroscopy. Results indicated that the mangiferin-loaded silver nanoparticles exhibited a significant improvement in the solubility and bioavailability of mangiferin. The particle size was found to be around 200 nm, which is suitable for enhanced cellular uptake. In vitro release studies demonstrated a controlled release profile of mangiferin of about 58% over a period of 8hours, indicating the potential of AgNPs as a promising carrier for drug delivery. DPPH assay of the formulation suggested that it exhibited significant anti-oxidant potential when compared to mangiferin alone. Thus, a mangiferin-loaded silver nanoparticles offer a promising strategy to enhance the therapeutic potential of mangiferin.

Keywords: Mangiferin, silver nanoparticles (AgNPs), bioavailability, chemical reduction method, nanocarrier system, particle size

BCR/NATCON/25/P-151

DEVELOPMENT AND EVALUATION OF TAMARIND GUM BASED VALSARTAN LOADED HYDROGEL MATRIX TABLETS FOR CONTROLLED DRUG DELIVERY

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The present study focuses on the development and evaluation of hydrogel matrix tablets incorporating tamarind gum as a natural polymer for the controlled release of Valsartan, an antihypertensive agent. The aim was to formulate a controlled drug delivery system capableof maintaining prolonged therapeutic levels, reducing dosing frequency, and enhancingpatient compliance. Tamarind gum, known for its biocompatibility, biodegradability, and mucoadhesive properties, was employed as the primary matrix-forming agent. A series of formulations were prepared usingthe direct compression method with varying concentrations oftamarind gum. The physical parameters of the tablets, including hardness, friability, weight variation, and drug content uniformity were evaluated and found to be within acceptable limits. Further, release characteristics, swelling studies and matrix erosion profiles are being evaluated to optimize the formulation. Initial results from the study indicate tamarind gum as a promising natural polymer for designing controlled-release matrix tablets. This novel approach not only leverages the advantages of a plant-based excipient but also presents a cost-effective and safe alternative for sustained drug delivery of Valsartan.

Keywords: Tamarind Gum, Valsartan, Anti-hypertensive agent, Matrix Tablets, Hardness, Swelling studies

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QUERCETIN LOADED FUNCTIONALIZE TAMARIND GUM BASED HYDROGEL MATRICES FOR INFLAMMATORY BOWEL DISEASE TREATMENT

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Inflammatory Bowel Disease (IBD), encompassing Crohn's disease and ulcerative colitis, represents a group of chronic gastrointestinal disorders marked by persistent inflammation of the intestinal tract. Conventional therapies often suffer from systemic side effects and limited site-specific efficacy. To address these limitations, this study explores the development of ROS sensitive quercetin-loaded hydrogel matrices based on functionalized tamarind gumwith3, 3'di-thio-di-propionicacid for targeted and controlled drug delivery in IBD treatment. Tamarind gum, a natural polysaccharide with good gelling and mucoadhesive properties, enabling the formation of a robust hydrogel network suitable for oral delivery. Quercetin, a potent anti-inflammatory and antioxidant flavonoid, was encapsulated within these matrices to leverage its therapeutic potential while overcoming its poor solubility and

stability in the gastrointestinal environment. These hydrogel beads synthesized through ionotropic gelation method. The resulting hydrogels were characterized through physicochemical analyses including UV, FTIR, Drug loading & Drug entrapment, Particle size study, swelling study, Mucoadhesion study. The novel quercetin-loaded tamarind gum-based hydrogels would present a promising, bio-friendly, and effective strategy for site-specific drug delivery in IBD treatment, minimizing systemic exposure and enhancing local therapeutic efficacy. This approach would also integrate natural polymer science and targeted drug delivery to offer a sustainable and patient-friendly alternative for the management of chronic gastrointestinal inflammation.

Keywords: Inflammatory Bowel Disease (IBD), Tamarind gum, Quercetin-loaded hydrogels, Hydrogel Matrices, Targeted Drug Delivery

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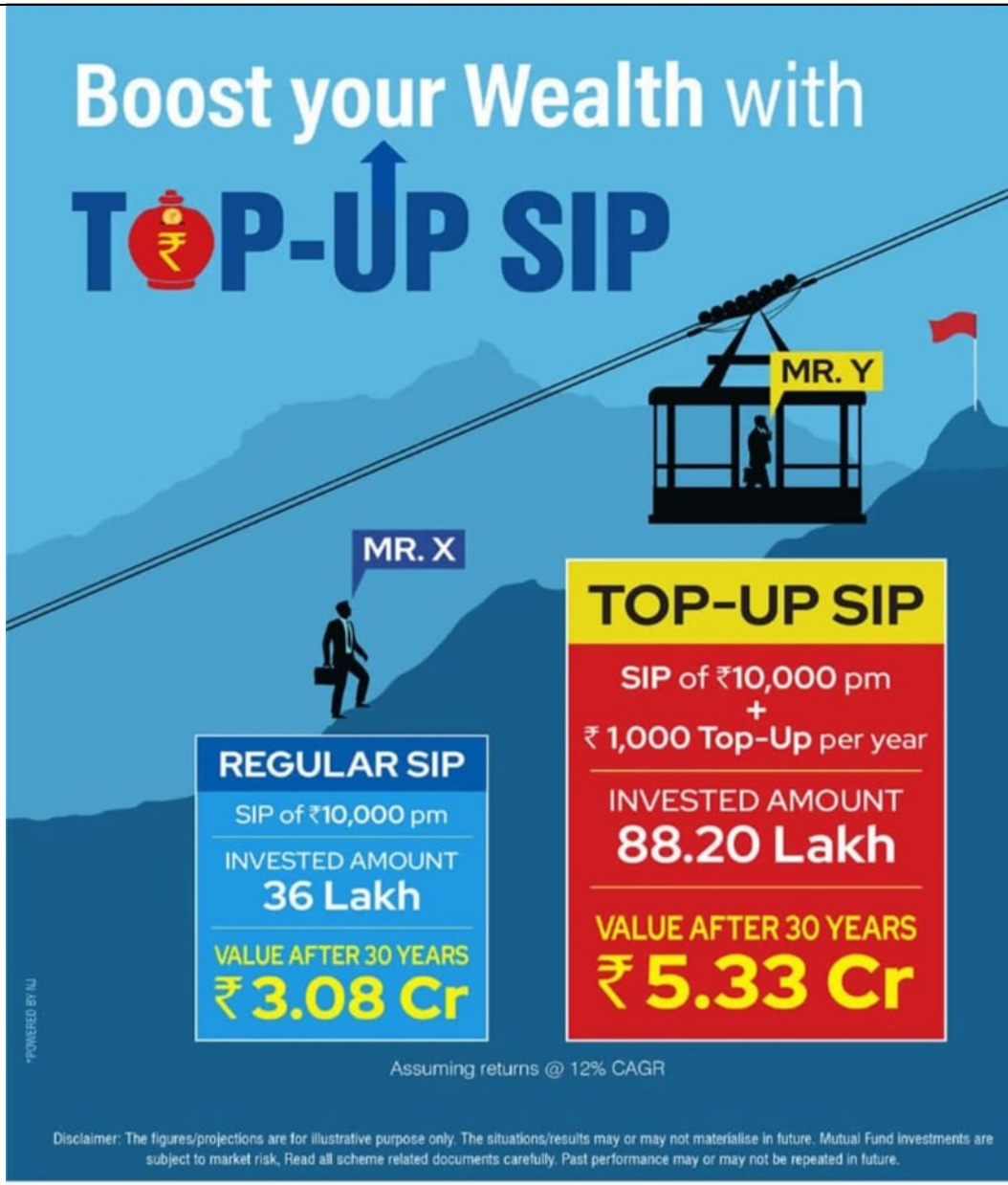

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