INDIRA UNIVERSITY

SCHOOL OF PHARMACY

Two Days International Conference

on

"AVENUES AND OPPORTUNITIES IN PHARMACEUTICAL RESEARCH & PRACTICE"

Tuesday 13th & Wednesday 14th January 2026

Conference Proceedings

Dr. Dayanand M. Kannur

Dr. Suvarna Ingale • Dr. Madhur Kulkarni

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ABOUT INDIRA UNIVERSITY

Indira University, an epicentre of a thriving educational ecosystem, aims to provide transformative education to students. As a beacon of academic brilliance and innovation, Indira University (Pune) empowers individuals with the right skills, forward-thinking approach, and leadership pursuit to enhance the nation's economic and societal growth. We strive to augment students' potential, create career opportunities, and guide them towards success.

The university believes in fostering an environment of lifelong learning, nurturing a generation of futuristic leaders, and empowering the youth to contribute towards the needs of the rapidly evolving world. We envision elevating excellence and driving global impact! - www.indirauniversity.edu.in

VISION

To be a global centre of academic excellence and a leader in higher education, distinguished for its innovative teaching, cutting-edge research, and commitment to societal impact, fostering an environment where students, faculty, and staff thrive to create a learned, healthy, and cultured society and a sustainable planet.

MISSION

- Create globally competent and responsible human capital
- Inculcate human values
- Instill environmental sensitivity amongst the youth
- Promote value based and lifelong learning
- Promote health and wellbeing amongst students and staff
- Nurture inquisitiveness and creative thinking

ABOUT SCHOOL OF PHARMACY

(SCES's Indira College of Pharmacy, Pune, NAAC-A+ Accredited)

At the 'School of Pharmacy', we empower the students to excel in the fields of pharmaceutical sciences, healthcare, and management. By imparting immersive learning in a collaborative workspace, we nurture competent professionals to fulfil industrial and community needs. Adhering to work ethics and social responsibility, we train the students to work towards reducing the suffering of mankind by offering impeccable pharmaceutical care.

Our UG & PG programs equip the students with in-depth knowledge and practical skills to excel in the pharmaceutical industry & clinical research. Our experiential teaching- learning methods enable the students to remain updated with emerging trends, enabling them to contribute to innovation and elevation of the standards of healthcare. By emphasizing theoretical concepts along with practical applications, we train our students to tackle new challenges of the evolving world.

ABOUT THE CONFERENCE

"Avenues and Opportunities in Pharmaceutical Research and Practice" are expanding rapidly as the industry evolves. The pharmaceutical market is expected to increase at a compounded annual growth rate (CAGR) of at least 8% from its current estimate of US $1.77 trillion in 2025 to over US $3 trillion in the early 2030s. Approximately 60 % of pharmaceutical R&D processes now incorporate Al-based technologies, and more than 65% of clinical trials are supported by digital tools. These technologies are creating new growth opportunities, increasing efficiency, and reducing development cycles.

Consequently, emerging roles are expanding in regulatory affairs, clinical research & trial management, and digital healthcare & tele-pharmacy services. The upcoming international conference will unite experts to explore advances in pharmaceutical research, focusing on innovation in drug discovery and healthcare solutions. Key deliberations will cover the global landscape of advances in drug development & delivery further highlighting the scientific and regulatory challenges in bringing new treatments to market.

Emphasis will also be on enhancing patient care strategies and optimizing pharmacy practices. Additionally, the conference will delve into aspects of F&D, NDDS, Traditional medicine in modern healthcare. This event promises a valuable platform for knowledge exchange, collaboration, and driving progress in pharmaceutical sciences.

DR. TARITA SHANKAR
President Designate
Indira University

Hon. President's Message

I am truly delighted to extend a warm and heartfelt welcome to all the delegates, eminent dignitaries, and esteemed resource persons to the International Conference on **"Avenues and Opportunities in Pharmaceutical Research and Practice"**, organized by the **Indira University – School of Pharmacy**, Pune.

Indira University is an epicentre of a vibrant educational ecosystem, dedicated to nurturing young minds and transforming them into responsible global citizens. Guided by the University's vision of becoming a global centre of academic excellence and a leader in higher education—distinguished by innovative teaching practices, cutting-edge research, and a deep commitment to societal impact—we strive to foster an environment where students, faculty, and staff flourish together to build a learned, healthy, and culturally enriched society, while contributing towards a sustainable planet. In tune with our inspiring motto, **"Up Your Game,"** the University is committed to provide comprehensive training, global exposure, and professional grooming that empower our students to excel in an ever-evolving world.

In this rapidly advancing landscape, **Artificial Intelligence is transforming pharmaceutical research** by accelerating drug discovery, optimizing clinical trials, and enabling precision medicine. The integration of AI-driven tools is redefining how data is analyzed, decisions are made, and innovative therapies are developed for improved patient outcomes. The pharmaceutical and healthcare sectors are among the fastest-growing and most dynamic domains globally, where research and innovation play a pivotal role in driving progress and improving quality of life. Keeping this in focus, the School of Pharmacy has brought together an exceptional panel of accomplished and experienced experts from across the globe. Their insights and shared expertise will undoubtedly guide our students and researchers in shaping meaningful career pathways and advancing the collective goal of delivering better and more accessible healthcare for humanity.

I am confident that this meaningful academic endeavour will be highly enriching and enlightening for all participants, particularly our budding pharmaceutical professionals who represent the future of healthcare. Once again, I extend a warm welcome to all delegates and wish each one of you a fruitful, intellectually stimulating, and highly successful conference.

Thank you, and I wish the conference every success.

DR. ANAGHA JOSHI

Vice Chancellor (In-Charge) - Indira University

Vice Chancellors Message

It is my great pleasure to extend warm greetings to all the contributors and readers of the Conference Proceedings of the International Conference on **"Avenues and Opportunities in Pharmaceutical Research and Practice,"** organized by the School of Pharmacy under the aegis of Indira University.

The pharmaceutical sciences continue to play a critical role in advancing global healthcare through innovation, research excellence, and translational outcomes. At Indira University, we are committed to fostering an academic environment that encourages scientific inquiry, interdisciplinary collaboration, and ethical professionalism, thereby preparing future-ready pharmacists and researchers who can address emerging healthcare challenges. In advancing pharmaceutical research and practice, equal emphasis must be placed on sustainability, as responsible use of resources, environmentally conscious research, and sustainable healthcare solutions are intrinsically linked to the quality of human life and the well-being of future generations.

The global pharmaceutical sector is witnessing rapid expansion, driven by advancements in drug discovery, novel drug delivery systems, clinical and translational research, biotechnology, and regulatory sciences. In this context, academic forums such as this international conference serve as essential platforms for disseminating research findings, sharing best practices, and catalyzing meaningful collaborations between academia, industry, and regulatory bodies.

This Conference Proceedings volume comprises abstracts of invited speakers' presentations along with more than **250 research abstracts** submitted by postgraduate students, doctoral scholars, and faculty members from institutions across the country. The diversity and quality of contributions reflect the growing emphasis on pharmaceutical research and innovation within academic institutions and underscore India's evolving role as the **"Pharmacy of the World."** I congratulate the organizing committee and the School of Pharmacy for their dedicated efforts in bringing out this scholarly compilation. I am confident that this Proceedings Book will serve as a valuable reference for researchers, academicians, and professionals, and will inspire further advancements in pharmaceutical research and practice. I wish the conference every success and extend my best wishes to all contributors.

DR. PUNAM BHOYAR
Pro-VC
Indira University, Pune

Pro Vice - Chancellors Message

In an era where science must move at the speed of global health challenges, pharmaceutical research stands at the intersection of innovation, responsibility, and human impact. The International Conference on "Avenues and Opportunities in Pharmaceutical Research and Practice", organized by the School of Pharmacy, Indira University, is a timely and significant platform that reflects this very spirit.

This conference brings together a vibrant confluence of students, researchers, academicians, and industry professionals to engage in meaningful dialogue on cutting-edge developments across the pharmaceutical spectrum. Such interdisciplinary and industry-academia interactions are no longer optional; they are essential to translating scientific knowledge into societal benefit.

Indira University remains committed to fostering a strong research ecosystem that encourages interdisciplinary collaboration, industry engagement, and innovation with societal relevance. I am confident that the scholarly discussions and research outcomes presented in these proceedings will contribute significantly to advancing pharmaceutical research and practice.

I commend the School of Pharmacy for curating a conference that aligns academic excellence with real-world relevance, and for fostering a culture where research is not confined to laboratories, but connected to practice, policy, and people.

DR. DAYANAND M. KANNUR

Convener & Dean

School of Pharmacy, Indira University, Pune

It is a matter of immense pleasure for me and my team to present the Scientific Abstract Book of the *International Conference on "Avenues & Opportunities in Pharmaceutical Research and Practice"*, featuring over 250 high-quality research abstracts contributed by academicians, researchers, industry professionals, and young scholars from diverse domains of Pharmaceutical Sciences.

This compilation reflects the dynamic and evolving landscape of pharmacy, where scientific innovation, technological advancement, interdisciplinary research, and patient-centric practice converge to address emerging global healthcare challenges. The conference theme, *"Avenues & Opportunities in Pharmaceutical Research and Practice,"* strongly aligns with our institutional motto, "Empowering Future Pharmacists, Enhancing Global Health," by fostering research-driven education, professional excellence, and global perspectives that prepare the next generation of pharmacists to contribute meaningfully to healthcare systems worldwide.

The depth, originality, and interdisciplinary nature of the submissions stand as a testimony to the robust research culture nurtured across institutions and the collective commitment of our academic and professional fraternity toward advancing healthcare outcomes and societal well-being. The conference and its proceedings serve as a vibrant platform for knowledge exchange, collaborative research, innovation, and the translation of scientific discoveries into effective patient care.

I express my heartfelt gratitude to our esteemed Chief Guest, Mrs. Pratibha Pilgaonkar, for her gracious presence and inspiring guidance. I also extend my sincere thanks to all eminent speakers and distinguished delegates whose valuable insights, scholarly contributions, and active participation have significantly enriched the conference deliberations.

I sincerely appreciate the dedicated efforts of all contributors, review committee members, the organizing team, and supporting institutions whose commitment and perseverance have made this academic endeavour a meaningful success. I extend my best wishes to all participants and hope that this abstract compendium inspires continued exploration, innovation, and excellence in pharmaceutical research and professional practice, in alignment with our shared vision of empowering future pharmacists and enhancing global health.

TWO DAYS INTERNATIONAL CONFERENCE ON

"Avenues & Opportunities in Pharmaceutical Research & Practice"

Tuesday 13th & Wednesday 14th January 2026

PROGRAM OF THE CONFERENCE

DAY 1 - 13TH JANUARY

TIME	NAME OF THE SPEAKER	DESIGNATION AND AFFILIATION	Chairman/Co Chairman	MODE	TOPIC TITLE
8.30 AM - 10.15 AM	REGISTRATION				
9.00 AM -10.00 AM	BREAKFAST & TEA				
10.30 AM - 11.30 AM	INAUGARATION				
11.30 AM – 12.15 PM	Dr. Matthias Wacker	Professor Department of Pharmaceutical and Pharmacological Sciences at KU Leuven, Belgium	Chairman: Dr. N. S. Vyawahare Co- Chairman: Dr. Abhijit Gothoskar	ONLINE	Biomolecular Transformation of Complex Injectables under Dynamic Physiological Conditions
12.15 PM – 1.00 PM	Dr. Chirag Trivedi	Global head, Clinical Study Units(CSU) Early Operational Strategy -Sanofi		OFFLINE	Current Clinical Trial Scenario: Collaborative approach from Academia and Industries
1.00 PM – 2.00 PM	LUNCH BREAK				
2.00 PM – 2.45 PM	Dr. Mohammed Hisham	Clinical Pharmacist, Cleveland Clinic, Abu Dhabi,UAE.	Chairman: Dr. L. Sathiyanarayan Co- Chairman: Dr. Deepti Bandawane	OFFLINE	Transforming Clinical Pharmacy Services: Value-based Model and Measuring Impact
2.45 PM – 3.30 PM	Dr. Pralhad Wangikar	Director Founder, PRADO-Preclinical Research and Development Organization, Pune		OFFLINE	Advances and Opportunities in Preclinical Safety Evaluation
3.45 PM – 5.00 PM	HIGH TEA AND POSTER PRESENTATION				

DAY 2 - 14TH JANUARY

9.30 AM – 10.15 AM	Dr. Shilpa Sant	Professor, Department of Pharmaceutical Sciences College of Pharmacy University of Illinois, Chicago.	Chairman: Dr. P. D. Chaudhari Co- Chairman: Dr. Satish Polshettiwar	ONLINE	Engineered microenvironments for in vitro disease models and regenerative medicine
10.15 AM – 11.00 AM	Dr. Kamal Dua	Associate Professor, Discipline of Pharmacy, Graduate School of Health University of Technology Sydney, Australia		ONLINE	Emerging therapeutic interventions in the treatment of lung diseases: Discovery & roadmap through interdisciplinary research of biological advances to advance delivery systems
11.00 AM – 11.15 AM	TEA BREAK				
11.15 AM – 12.00 NOON	Dr. Gauri Godbole	Specialist Pharmacist, Aged & Pallaitive Care, Gosford Hospital, Research Pharmacist, University of Sydney, Teaching Associate-Monash University, Australia.	Chairman: Dr. Ramesh Katedeshmukh Co- Chairman: Dr. Madhur Kulkarni	ONLINE	"Deprescribing: The Systematic Review Your Patients Deserve"
12.00 NOON -12.45 PM	Dr. Abhay Harsulkar	Dean Research, INSPIRE, MIT-ADTU, Vishwarajbaug, Pune		OFFLINE	Omics: A Platform for Generating Hypotheses to Unravel the Pathology of Disease
12.45 PM – 1.30 PM	POSTER PRESENTATION				
1.30 PM – 2.15 PM	LUNCH BREAK				
2.15 PM – 3.00 PM	Dr. Mirza Baig	Professor and Associate Dean, Clinical Affairs- Pharmacy Practice, Women's college of Pharmacy, Dubai Medical University, UAE	Chairman: Dr. Vaishali Undale Co- Chairman: Dr. Suvarna Ingale	OFFLINE	Simulating Safety: Transforming Pharmaceutical Care Education for Improved Patient Outcomes
3.00 PM – 3.45 PM	Dr. Manish S. Lavhale	Managing Director ,Pharmazz India Pvt Ltd. Delhi		ONLINE	Pharmacological Innovation in Shock Management: Centhaquine (Lyfaquin®) as a Next-Generation Resuscitative Agent.
3.45 PM – 4.15 PM	VALEDICTORY FUNCTION				
4.15 PM - 5.00 PM	HIGH TEA				

EDITORIAL TEAM

Chief editor

Dean

School of Pharmacy, Indira University, Pune

Associate Editors

		
Dr. Suvarna Ingale Professor and Head Dept. of Pharmacology & Pharm D SCES's Indira College of Pharmacy, Pune	Dr Madhur Kulkarni Professor and Head Dept. of Pharmaceutics SCES's Indira College of Pharmacy, Pune	Dr Manasi Wagdarikar Associate Professor and Head Dept. of Pharm. Chemistry School of Pharmacy, Indira University, Pune
		
Dr. Digambar Ambikar Associate Professor Dept. of Pharmacology School of Pharmacy, Indira University, Pune	Ms. Amruta Walvekar Assistant Professor Dept. of Pharm. Chemistry School of Pharmacy, Indira University, Pune	Ms. Falguni Mistry Assistant Professor Dept. of Pharmacognosy SCES's Indira College of Pharmacy, Pune

PRATIBHA PILGAONKAR

Co-founder, Managing Director, Board of Directors

Chief Guest

Biosketch

Pratibha Pilgaonkar is the guiding light that has steered Rubicon Research from the beginning. Rubicon Research was established as a R & D services company in 1999. Under her leadership the company has grown from being India's first independent product development company to a specialty generic company with a focus on regulated and emerging markets. Today Rubicon is amongst the fastest growing US-focused company in India; Rubicon Research has three manufacturing units in India, Two R& D centers, one in India and one in Canada, Offices in Thane and in New Jersey.

Prior to starting Rubicon Research, she led R&D teams at Burroughs Wellcome (now GSK), Ciba Geigy (now Novartis), and Sun Pharma. She has over 45 years of experience in the pharmaceutical industry, conceptualizing, establishing and spearheading research groups of qualified scientists in leading Indian and multinational organizations. She has numerous patents and publications to her credit and has developed platform technologies for various applications in the pharmaceutical Industry.

She graduated in Chemical Technology from the Institute of Chemical Technology (ICT) in 1976 and in Chemistry from the University of Mumbai in 1973.

Resource Person

MATTHIAS G. WACKER

Professor of Biopharmaceutics in the Drug Delivery and Disposition Lab, Department of Pharmaceutical and Pharmacological Sciences at KU Leuven

Biomolecular Transformation of Complex Injectables under Dynamic Physiological Conditions

Biopharmaceutical performance of modern drug delivery systems is commonly rationalized through static descriptors such as composition, size, and surface chemistry. However, mounting evidence indicates that these descriptors fail to capture the dynamic nature of carrier behavior in vivo. Upon administration, delivery systems are exposed to complex and continuously varying biochemical and biomechanical boundary conditions that induce biomolecular transformation, the adaptive and often irreversible reorganization of carrier components through interactions with proteins, lipids, cells, and tissues under physiological stress.

This transformation alters key functional attributes including stability, drug retention, targeting efficiency, and biodistribution, thereby decoupling in vitro performance from clinical outcome. Importantly, biomolecular transformation is not solely driven by molecular affinity but is governed by the interplay of thermodynamic equilibria, transport processes, and mechanical forces such as shear and compression. These factors collectively define a transformation landscape that is rarely probed during preclinical development and marks a critical component in understanding drug delivery processes

Biosketch

Matthias G. Wacker is Professor of Biopharmaceutics in the Drug Delivery and Disposition Lab within the Department of Pharmaceutical and Pharmacological Sciences at KU Leuven, where he contributes to research and education in pharmaceutical sciences with a focus on advanced drug delivery and biopredictive testing. He received his Ph.D. in Pharmaceutical Technology from Goethe University Frankfurt (Germany) and completed his habilitation at the Institute of Pharmaceutical Technology under the guidance of Prof. Jennifer Dressman and Prof. Jörg Kreuter.

Prior to joining KU Leuven, Prof. Wacker held senior academic and research leadership positions in both academia and applied research. He led the Department of Pharmaceutical Technology and Nanosciences at the Fraunhofer Institute for Molecular Biology and Applied Ecology (IME), where his work focused on translational formulation research at the interface of academia, industry, and regulation. From 2019 to 2026, he served as Associate Professor at the National University of Singapore (NUS), where he established an internationally visible research program in biopharmaceutics and complex drug delivery systems.

His research centers on in vitro testing and mechanistic characterization of complex dispersed dosage forms, including liposomes, lipid nanoparticles, and long-acting injectable systems. A particular emphasis lies on biopredictive release methods, in vitro–in vivo correlations (IVIVC), and the disassembly and transformation of drug carriers in physiological environments under realistic mechanical and biochemical conditions. Prof. Wacker integrates quality-by-design principles, advanced in vitro methodologies, and computational modeling to improve formulation design, regulatory relevance, and translational success.

DR. CHIRAG TRIVEDI
Global Head, Clinical Study Units (CSU) Early Operational Strategy
Sanofi, Mumbai, Maharashtra, India

Resource Person

Current Clinical Trial Scenario: Collaborative approach from Academia and Industries

India currently contributes only <2% of global clinical trials despite its vast population and medical infrastructure. The regulatory landscape has evolved considerably over the past decade, creating substantial opportunities for academia-industry collaboration to address large unmet medical needs of our patients. Academic institutions bring quality research facilities, expert professionals, and rich clinical data, while industry provides cutting-edge technologies, funding, and product development capabilities. The future of clinical trials lies in digital transformation through AI/ML, IoT-enabled devices, mobile technologies, and decentralized trial models that enable patient participation from home with eConsent, home healthcare services, and direct-to-patient product shipment. Success requires strengthening all stakeholders across the country and embracing patient-centric approaches that leverage combined academic-industry strengths to make meaningful differences in patients' lives while positioning India as a more significant contributor to global clinical research.

Biosketch

Currently working in Sanofi as Global Head, Clinical Study Units (CSU) Early Operational Strategy within the Clinical Sciences & Operations department in the Research & Development. Key aspects of this role:

-Accountable for a robust early CSU strategy across Therapeutic Areas.

-Managing the CSU early planning group (including feasibility, competitive intelligence, patient recruitment and retention) to optimize the early planning strategy at the program level.

- In collaboration with stakeholders, the early operational strategy group delivers the CSU readiness to meet the development portfolio of the future, helping CSUs accelerate program execution.

Was previously the Director and Head of Clinical Study Unit, India and South East Asia Cluster. Been with Sanofi since 2006 and has handled various roles and responsibilities in these years. Prior to Sanofi, worked in a CRO and prior to that, in a Central Lab.

From April 2017 to March 2021, was the President of Indian Society for Clinical Research (ISCR) for a total of two terms. As a Society, ISCR brings together all those who are engaged in clinical research activities in India and provides a forum for exchange of information and learning. ISCR aims to build awareness of clinical research as a specialty in India and to facilitate its growth in the country while helping to evolve the highest standards of quality and ethics. Is a Ph.D. in Pharmacology and is experienced in the fields of Clinical Research, Clinical Quality Assurance, Medical Excellence, Pharmacovigilance, Bioavailability & Bioequivalence Studies, and Business Development.

SHILPA SANT, PHD

Professor and Director of Graduate Studies, Department of Pharmaceutical Sciences,
Retzky College of Pharmacy, University of Illinois Chicago

Resource Person

Engineered microenvironments for in vitro disease models and regenerative medicine

The central research theme in the Sant Laboratory is to engineer three-dimensional disease and regenerative microenvironments and organoids by developing novel biomaterials- and micro /nanotechnology-based approaches. The major goal is to elucidate how microenvironmental factors drive cellular behaviors in health and disease. Our work in breast cancer focuses on recapitulating the early-stage tumor microenvironmental factors. For example, we have engineered size-controlled microtumor models that recapitulate tumor-intrinsic hypoxia and hypoxia-initiated changes such as cell cycle alterations, partial/hybrid epithelial mesenchymal transition (pEMT) and collective migration. We are investigating mechanisms underlying hypoxia-induced pEMT and collective migration. In another project, we have designed extracellular matrix-mimetic scaffolds that reproduce mineralized environments relevant to both bone regeneration and breast cancer to bone metastasis. More recently, we have been using brain organoids to model the role of extracellular matrix in brain development and neuropathogenesis. This talk will highlight some of our work in these areas.

Biosketch

Shilpa Sant, PhD is a Professor and Director of Graduate studies of the Pharmaceutical Sciences Graduate Program at the Retzky College of Pharmacy, University of Illinois Chicago and a member of Translational Oncology at the University of Illinois Cancer Center. She is elected Fellow of American Institute for Molecular and Biological Engineering (AIMBE). Before her recent move to UIC, she started her independent faculty career at the University of Pittsburgh School of Pharmacy and was promoted to Associate Professor with tenure. She holds membership at the McGowan Institute for Regenerative Medicine at the University of

Pittsburgh. Dr. Sant is a pharmaceutical scientist with a strong background in biomaterials, bioengineering, micro/nanoscale technologies, and cancer biology. Dr. Sant has contributed over 78 research/review articles including edited book on nanomaterials, edited journal issue and 5 awarded US patents. Her research is supported by multiple NIH awards, including NIBIB R03, NINDS R56 and NCI R37 MERIT Award, and have resulted in widely cited publications, patents, and recognition such as the CMBE Rising Star Award and CMBE Young Innovator Award. She has served on many NIH, NSF, DoD as well as international grant review panels. She serves as a review editor for Frontiers Bioengineering and Biotechnology/Biomaterials and review editor for Frontiers Cell and Developmental biology/signaling. Dr. Sant is a member of TERMIS, Society for Biomaterials, American Association of Cancer Research, American Association of Colleges of Pharmacy and the Indian Pharmaceutical Association.

Resource Person

PROF. MIRZA R. BAIG

Program Director-Post Graduate studies, College of Pharmacy

Dubai Medical University, Dubai, UAE

Simulating Safety: Transforming Pharmaceutical Care Education for Improved Patient Outcomes

Ensuring patient safety is a core responsibility of pharmaceutical care, yet traditional lecture-centric educational models often fail to adequately prepare pharmacy graduates for the complexities of modern, technology-driven healthcare systems. Simulating Safety: Transforming Pharmaceutical Care Education for Improved Patient Outcomes explores the transformative role of smart simulation and innovative teaching modules in reshaping pharmacy education to meet evolving workforce demands.

The rapid changes in healthcare delivery, coupled with increasing expectations for pharmacists to demonstrate clinical competence, critical thinking, interprofessional collaboration, and technological proficiency, necessitate a paradigm shift in teaching and assessment strategies. Conventional methods, characterized by passive learning, standardized testing, and delayed feedback, are limited in fostering deep understanding, clinical reasoning, and real-time decision-making skills essential for safe patient care.

Smart simulation-based education, including virtual reality, simulated patient interactions, mannequin-based training, model pharmacies, and digital platforms such as Pharmacy Simulator & My Dispense simulation, provides learners with immersive, risk-free environments to practice pharmaceutical care activities. These approaches enable students to apply theoretical knowledge, refine communication and counseling skills, manage medication-related problems, and respond to clinical scenarios without exposing patients to potential harm. Simulation-supported learning promotes active engagement, enhances knowledge retention, and strengthens critical thinking and decision-making abilities, all of which are directly linked to improved patient safety outcomes.

Furthermore, the integration of gamification, adaptive learning platforms, and interdisciplinary modules encourages personalized learning and mirrors real-world collaborative healthcare settings. By embedding simulation into both teaching and assessment, pharmacy education can better evaluate competency, provide immediate feedback, and ensure readiness for clinical practice.

In conclusion, smart simulation is not merely an educational enhancement but a strategic necessity for transforming pharmaceutical care education. Its adoption supports the development of competent, safety-focused pharmacists capable of delivering high-quality patient care, ultimately contributing to improved patient outcomes and a more resilient healthcare system.

Biosketch

Prof. Dr. Mirza R. Baig currently serves as the Program Director-Post Graduate studies at College of Pharmacy, Dubai Medical University. He earned his Ph.D. in Clinical Pharmacy from the esteemed Universiti Sains Malaysia (USM) and brings over 22 years of international experience in academia and research, having worked extensively in Malaysia, India, and the United Arab Emirates.

Prof. Baig has been recognized among the top scientists globally in the 2024, 2025 in Scientific Index. His innovative research has led to the awarding of one German patent in 2022 and two U.S. patents in 2024, in collaboration with King Abdulaziz University, Saudi Arabia. He has co-authored seven books on Clinical Pharmacy, including a recent editorial contribution to a Springer publication titled Drug Development, released in April 2024. His scholarly work comprises more than 120 peer-reviewed research articles published in reputable international journals, with his latest paper appearing in Oct 2025. Prof. Dr. Baig is frequently invited to serve as a chairperson, speaker, and moderator at high- profile international conferences and seminars. He holds editorial board memberships in several prestigious journals and is a peer reviewer for multiple Elsevier publications. He has mentored numerous master's and Ph.D. candidates and served as an external examiner for postgraduate theses at both Indian and international universities.

Throughout his distinguished career, Prof. Dr. Baig has been honored with numerous accolades, including the Distinguished Alumnus Award (2024) from KLE University, India; Best Research Project Awards at conferences hosted by Al Ain University (2023) and the University of Sharjah (2019); and the Best Professor in Clinical Pharmacy Award at the Middle East Educational Awards (2018). His presentations have earned top honors at major forums such as DUPHAT Dubai and the Indian Pharmaceutical Congress (IPC), and he was recognized as an Outstanding Scientist by a prominent research foundation in India (2016).

His research interests lie in pharmacoepidemiology, pharmacovigilance, drug safety and efficacy, drug utilization studies, and public health.

DR. KAMAL DUA

Associate Professor Discipline of

Pharmacy,

University of Technology Sydney (UTS).

Resource Person

Emerging therapeutic interventions in the treatment of lung diseases: Discovery & roadmap through interdisciplinary research of biological advances to advance delivery systems

Chronic respiratory diseases, including asthma, chronic obstructive pulmonary disease (COPD), and cystic fibrosis (CF), are the leading cause of morbidity and mortality worldwide. This is primarily because of the aging population and increasing prevalence of cigarette smoking globally. Thus, it is very crucial to have an effective therapeutic moiety delivered to the target site at the right time and in an appropriate amount, especially with various chronic respiratory diseases, such as asthma where an immediate therapeutic action is needed. Globally, the viral respiratory infections are also one of the major health problems. The investigations in this area are becoming more challenging because of the complexity of relationship between the host's defences and microbial virulence. Though, there are number of translational and clinical studies performed worldwide to investigate molecular mechanisms interlinking various infections and allergic airway diseases along with the ongoing search for potential therapeutic interventions, there are still many questions that remain unaddressed. Some of these impediments include patterns of inflammation involved due to various respiratory viruses and multiple genes and their products, which underpin the regulatory mechanisms driving the disease pathology. In my talk I will be covering some of the novel phytoceuticals-based therapeutic interventions discovered through biological advances. In order to have a clinically relevant and meaningful data, it is essential to validate and standardise the various biological techniques to warrant greater reproducibility and minimum variability for future applications in respiratory research. Such approaches will be of interest for both the biological and

formulation scientists to understand and explore the new vistas in the area of pulmonary inflammatory diseases.

Biosketch

Kamal Dua is an Associate Professor in the Discipline of Pharmacy at the University of Technology Sydney (UTS). Dr Dua has been recognised and named as one of Australia's Top 250 researchers in 2026, 2025 and 2024 in Research Magazine by "The Australian" in the research discipline of Health and Medical sciences, and #1/research leader in the area of Pharmacology and Pharmacy (2026, 2025) and Toxicology (2024) respectively. With over 17 years of research experience, he has specialised in drug delivery targeting inflammatory diseases. Additionally, Dr Dua also leads drug delivery research at the Woolcock Institute of Medical Research. In this role, he focuses on advancing targets identified in research projects to develop innovative formulations, taking the first steps toward clinical translation. Dr Dua's research encompasses two complementary areas: drug delivery and immunology. His work explores how these disciplines can mutually benefit, contributing to the goal of promoting longer and healthier lives for the community. His commitment to synergy is reflected in his extensive publication record in reputable journals. Dr Dua's research interests are centered on harnessing the pharmaceutical potential of modulating critical regulators, such as interleukins and microRNAs. He also specialises in developing new and effective drug delivery formulations for managing inflammation in chronic airway diseases and cancer.

ABHAY M. HARSULKAR

Dean Research, INSPIRE, MIT-ADTU, Vishwarajbaug,
Loni- Kalbhor, Pune

Resource Person

Omics: A Platform for Generating Hypotheses to Unravel the Pathology of Disease

"Omics" collectively refers to high-throughput disciplines such as genomics, proteomics, metabolomics, and transcriptomics, which enable the comprehensive exploration of biological systems at multiple molecular levels. By integrating these approaches, researchers can generate robust, data-driven hypotheses that elucidate the complex regulatory mechanisms underlying disease development and progression. I am here to give a context of recent advances in omics technologies and their applications in disease pathology, with a particular focus on their ability to generate hypothesis.

Disease Models and Hypothesis Generation

Multi-omics data aided with computational models serve as powerful instruments for hypothesis generation, which is instrumental primarily to understand the disease pathology and further precision medicine and targeted therapeutic design. Dissecting the underlined molecular mechanisms behind biological responses is crucial for understanding pathophysiology of complex diseases like Osteoarthritis (OA).

In our studies in OA, the integration of transcriptomic and proteomic datasets has provided valuable insights into the immune cell dynamics within the synovial fluid microenvironment. Utilizing these multi-omics approaches, we investigated the molecular mechanisms underlying the pathological differentiation of monocytes into M1 and M2 macrophages in response to synovial fluid derived from OA patients across progressive Kellgren–Lawrence (KL) grades. Furthermore, our analyses revealed a previously unrecognized role of mast cells in promoting pathological bone outgrowth i.e. osteophyte formation. This finding enabled us to conceptualize and design novel therapeutic interventions targeting this mechanism, offering directions that were previously unexplored in OA pathology.

Conclusion

Omics technologies represent a paradigm shift in biomedical research, enabling comprehensive, data-rich exploration of disease mechanisms. Through the integration of different omics techniques, we have developed a deeper understanding of biological

complexity, of complex disease lime OA. This work has potential to develop personalized and precision-based medical interventions in disease, which is too complex to develop any pharmacological intervention.

Biosketch

Prof. Abhay M. Harsulkar is a distinguished academician, researcher, and scientific leader with over three decades of experience spanning biochemistry, molecular biology, pharmaceutical biotechnology, and translational health research. He currently serves as **Dean (Research)** at MIT-ADT University, Pune, where he leads institutional research strategy, promotes high-impact interdisciplinary research, and mentors faculty in developing competitive, fundable proposals.

Prof. Harsulkar has previously served as **Professor and Head, Department of Pharmaceutical Biotechnology**, Poona College of Pharmacy, Bharati Vidyapeeth University, Pune, where he taught undergraduate, postgraduate, and Pharm.D. courses and designed curricula in molecular biology, recombinant DNA technology, and immunology. His research interests encompass non-communicable diseases, nutraceuticals, traditional and Ayurvedic medicine, and phytochemical-based therapeutics.

A major focus of his scientific career has been the study of **osteoarthritis and nutrient–gene interactions**, particularly the role of omega-3 fatty acids. As Group Leader and Adjunct Professor at the Interactive Research School for Health Affairs (IRSHA), Pune, he led multiple nationally and internationally funded projects, established unique OA patient biobanks, and contributed seminal findings on the role of mast cells and the synovium–synovial axis in osteoarthritis pathology.

Prof. Harsulkar has held international positions including **Visiting Professor at the University of Tartu, Estonia**, and **Visiting Scientist at Washington State University, USA**, demonstrating strong global research collaborations. His scholarly output includes **112 publications**, over **3,800 citations**, an **h-index of 34**, one book, multiple book chapters, patents, and over 100 DNA sequences deposited in public databases. He has supervised numerous PhD, postdoctoral, medical, and pharmacy theses and serves on several national scientific panels and ethics committees, reflecting his continued contribution to research, policy, and academic leadership.

DR. MANISH S. LAVHALE, PH.D.
Managing Director,

Pharmazz India Private Limited,
Greater Noida, India.

Resource Person

Pharmacological Innovation in Shock Management: Centhaquine (Lyfaquin®) as a Next-Generation Resuscitative Agent

Shock remains a leading cause of mortality in critical care, characterized by inadequate tissue perfusion and cellular hypoxia despite advances in fluid resuscitation and vasopressor therapy. Conventional agents primarily target macrocirculatory parameters and are often associated with adverse effects such as arrhythmias, increased myocardial oxygen demand, and impaired microcirculatory flow. Centhaquine (Lyfaquin®) has emerged as a novel, first-in-class resuscitative agent offering a differentiated pharmacological approach to shock management.

Centhaquine is a centrally and peripherally acting α-adrenergic modulator that enhances venous return through selective α_2B-adrenergic receptor–mediated venoconstriction while concurrently reducing systemic vascular resistance via central α_2A receptor activation. This dual mechanism improves cardiac preload and cardiac output without increasing heart rate or myocardial oxygen demand. Preclinical studies demonstrated significant improvements in mean arterial pressure, lactate clearance, tissue perfusion, and survival across multiple experimental shock models.

These findings were subsequently validated in clinical studies conducted in India, including randomized controlled trials in hypovolemic shock patients, where Centhaquine, as an adjunct to standard of care, resulted in significant improvements in hemodynamic parameters, metabolic markers, and a statistically significant reduction in 28-day all-cause mortality. Based on this robust Indian clinical dataset, Centhaquine received regulatory approval in India and has been available in the market since 2020. Furthermore, the strength of the Indian clinical evidence supported the

USFDA approval of an Investigational New Drug application for a Phase III clinical trial in hypovolemic shock patients..

Centhaquine has demonstrated a favorable safety profile with no incidence of tachyarrhythmias or ischemic adverse effects, addressing key limitations of conventional vasopressors. This abstract highlights Centhaquine (Lyfaquin®) as a next-generation pharmacological innovation in shock management, with established real-world clinical use in India and advancing global clinical development, underscoring its potential to redefine resuscitative strategies in critical care medicine

Biosketch

Dr. Manish S. Lavhale is the Managing Director of Pharmazz India Private Limited and a seasoned expert in non-clinical and clinical drug development with over 25 years of experience, particularly in critical care therapeutics. A postdoctoral fellow from Midwestern University, USA, he has led Pharmazz's R&D strategy since its inception in 2011, overseeing multiple IND submissions in the U.S. and India. Dr. Lavhale played a pivotal role in the preclinical and clinical development of two first-in-class drugs—**Lyfaquin** for hypovolemic shock and **Tyvalzi** for cerebral ischemic stroke—both approved in India. He holds several patents, has authored over 40 peer-reviewed publications, and has received research funding from UGC (India) and NIH (USA). His leadership in translational research and regulatory affairs continues to drive innovation in critical care therapeutics.

DR. MOHAMED HISHAM

Lead Clinical Pharmacist,

Cleveland Clinic Abu Dhabi, UAE.

Resource Person

Transforming Clinical Pharmacy Services: Value-based Model and Measuring Impact

Transforming clinical pharmacy services toward a value-based model emphasizes patient- centered outcomes, quality of care, and cost-effectiveness. Value-based clinical pharmacy services prioritize proactive medication management, interdisciplinary collaboration, and accountability for achieving measurable health outcomes. Measuring the impact of these services requires robust performance indicators, such as reductions in medication-related adverse events, improvements in disease control, hospital readmission rates, patient satisfaction, and overall healthcare costs. Standardized outcome measures and continuous quality improvement frameworks are crucial for accurately assessing and communicating the value of pharmacist-led interventions. This transformation not only strengthens the role of clinical pharmacists within healthcare teams but also supports sustainable healthcare delivery by demonstrating their contribution to high-quality, efficient care

Biosketch

Mohamed Hisham is a Lead Clinical Pharmacist at Cleveland Clinic Abu Dhabi, UAE. Hisham earned his PharmD degree from India. He is Board Certified in Critical Care and Infectious Diseases. He has 14 years of experience in clinical pharmacy, spanning both India and the UAE. He has 40 peer-reviewed publications in journals and books, and delivered over 100 invited talks at various conferences, including the ASHP Mid-Year 2019, Las Vegas, USA, and the ID Week 2025, Atlanta, USA. Hisham has also received several awards for his research and contributions in the field of clinical pharmacy. Hisham serves as a review editor for prestigious medical journals and reviews chapters for the infectious diseases self-assessment program for the American College of Clinical Pharmacy. Hisham is an Ambassador for the Board of Pharmacy Specialties (BPS), USA. His area of interest includes quality and process improvement for antimicrobial stewardship, clinical pharmacy, and medication safety.

DR. PRALHAD WANGIKAR MVSc, PhD, DABT, UKRT, MRSB

Founder Director of PRADO- Preclinical Research and Development Organization, Pvt. Ltd., Pune. India

Resource Person

Advances and Opportunities in Preclinical Safety Evaluation

Till date pharmaceutical industry has delivered multiple life-saving medicines contributing to new treatment options for several medical needs and proved that discovery of new medications has led to improvement in health, quality of life and increased life expectancy. Inherent in the development of these technologies is the role of preclinical testing as they gather data needed for regulatory approval to protect humans from potentially harmful effects. However, systematic analyses of drug attrition and post-marketing safety failures have revealed that there are gaps between animal toxicology and human outcomes, which laid the conceptual foundation of New Approach Methodologies (NAM). NAM, enables improved chemical safety assessment through use of *in vitro*, *in chemico* or *in silico* models as an alternative method to animal use such as Human-relevant in vitro systems, 3-D tissues, organoids, and organ-on-chip, high-throughput screening methods, Omics technologies, Computational toxicology, including QSAR, read-across, and machine-learning models.

Regulatory agencies adopted and issued roadmaps emphasizing NAM adoption. The U.S. FDA Modernization Act 2.0 (2022), removed the statutory requirement for animal testing prior to first-in-human trials. Although NAMs are established for local toxicity endpoints (e.g., skin sensitization, genotoxicity screening) they are less established for complex systemic outcomes such as chronic toxicity, cardiotoxicity, developmental neurotoxicity, and carcinogenicity and it is demonstrated that no single NAM can substitute for a whole organism study, hence regulatory bodies promoted a scientific approach where multiple NAMs will be combined through Integrated Approaches to Testing and Assessment (IATA) and Defined Approaches (DAs). The talk presents, the key challenges to implement and adopt this strategy and its alignent with Next-Generation Risk Assessment (NGRA) and precision toxicology.

Biosketch

Dr. Pralhad Wangikar has completed his Bachelor and Masters (BVSc & AH and MVSc) in Veterinary Pathology from College of Veterinary and Animal Sciences, Parbhani, INDIA. Completed Doctorate (PhD) in 'Veterinary Pathology' from Indian Veterinary Research Institute (IVRI) Izatnagar, India. He is Diplomat of American Board of Toxicology (DABT) Since 2009, UK registered Toxicologist (UKRT) and member of Royal Society of Biology (MRSB) Since 2023.

In 1997 he started his career as Veterinary Pathologist from Intox, Institute for Toxicological studies, Pune India. In 1998 moved to College of Veterinary and Animal Sciences Parbhani as Assistant Professor, taught Pathology courses to Undergraduate students. After completion of PhD, during Jan 2003, he joined as a Research Scientist at Ranbaxy Research Laboratories, Gurgaon India from this position he moved to Dhirubhai Ambani Reliance Life Sciences Centre, Navi Mumbai, India in Aug 2005. There he established pathology laboratory and standardized toxicity studies. Since Oct 2008 to May 2013 worked as Associate Director Toxicology at Sai Advantium Pharma Ltd in Pune, India. He established Animal Facility and Standardized Toxicology, was Instrumental in Receiving AAALAC and OLAW certification. Founded PRADO– a Preclinical CRO. Received GLP certification in 2018, 2021, 2024. GLP and Animal Facility consultant- Recognized nationally & internationally.

Received various awards including 'Preclinical Research Excellence Award' in First Global Pharma Summit 2K19' in November 2019. 'Indian Leadership Award for Industrial Development' from All India Achievers Foundation in 2017. Best Ph. D. Thesis Award from Uttar Pradesh Council of Agricultural Research (UPCAR) during 2006. Young Scientist Award by Indian Association of Veterinary Pathologists in 2002. Merit Scholarship during UG and P.G. studies. He has many publications (23) in reputed national and international journals, patents (1) and book chapter (7) to his credit

GAURI GODBOLE

A specialist aged-care and palliative-care pharmacist

NSW Health and the University of Sydney

Resource Person

Deprescribing: The Systematic Review Your Patients Deserve

Polypharmacy is now a defining feature of ageing, yet much of it grows from inertia rather than intention. This session explores the evidence, the pitfalls, and the practical realities of managing complex medication regimens in older adults. We'll examine common drivers of overprescribing, the risks hidden in long medication lists, and the role of pharmacists in leading safe, person-centred deprescribing. Using real-world cases and emerging research, this talk highlights how thoughtful medication reduction can improve function, reduce harm, and restore clarity to care. Ultimately, deprescribing isn't about *stopping medicines — it's about starting better conversations".*

Biosketch

Gauri Godbole is a specialist aged-care and palliative-care pharmacist who has spent countless hours untangling polypharmacy puzzles that seem to multiply overnight. She works with NSW Health and the University of Sydney, where she researches medication safety, deprescribing, and the enduring mystery of "Why is this patient on three PPIs?" She has contributed to national training programs, shaped certification standards, and led research showing that older adults do not need medication lists longer than their discharge summaries. When she's not deprescribing, she's teaching others how to do it—or gently asking her signature question: **"Do we really need that?"**

Track: Pharmaceutics

Track: Pharmaceutical Chemistry

Track: Pharmacology

Track: Pharmacognosy

PH001

When Saliva becomes the trigger: A smart swelling-activated mucoadhesive oral patch for targeted periodontal delivery of Metronidazole

Khushi Patel[1]

Chronic periodontal infections require ongoing antimicrobial presence at the affected area; nonetheless, traditional gels and rinses are swiftly washed away by saliva, leading to inadequate retention and the need for frequent reapplication. To address this unmet clinical requirement, we present a smart, swelling-activated mucoadhesive oral patch designed for accurate and patient- focused local administration of metronidazole.

The patch was created using a synergistic combination of chitosan, hydroxypropyl methylcellulose (HPMC), and Carbopol 934P, chosen for their swelling response, biocompatibility and excellent mucoadhesive characteristics. When it comes into contact with saliva, the patch quickly absorbs moisture and expands, causing polymer chains to relax and deeply intertwine with the oral mucosa. This activation driven by swelling firmly secures the patch at the application site, allowing for prolonged, localized drug delivery. Metronidazole was uniformly integrated into the polymer matrix to enhance antimicrobial effectiveness against anaerobic periodontal pathogens while reducing systemic exposure.

The enhanced formulation exhibited quick swelling, nearly neutral surface pH, outstanding mucoadhesive properties, and consistent drug distribution. In vitro release experiments validated sustained metronidazole delivery over long durations and antimicrobial assessment demonstrated effective localized suppression of anaerobic bacteria.

This mucoadhesive oral patch, activated by swelling, reimagines local periodontal treatment by turning saliva-induced swelling from a constraint into a therapeutic catalyst. The platform provides a comfortable, non-invasive, and compliant alternative to traditional treatments, emphasizing the promise of advanced polymeric systems for future oral drug delivery.

PH002

Formulation of Kewra-enriched herbal face wash

Vaishnavi Tanpure, Samruddhi Tanpure, Aparna Harkal, Supriya Suryavanshi , Gangasagar Gutte

Facial skin is highly sensitive and is frequently affected by environmental pollution and strong cleansing agents, which may damage the natural skin barrier and lead to irritation or dryness. The present study aims to formulate and evaluate a herbal face wash enriched with Kewra (Pandanus odoratissimus) oil and menthol, intended to function as a mild cleanser with antimicrobial, soothing, and refreshing effects. The antimicrobial and anti-inflammatory properties of Kewra oil are traditionally recognized, while menthol is widely used to provide a cooling sensation and improve user comfort.

The herbal face wash was prepared using a gel-based technique to ensure gentle cleansing without compromising skin hydration. The formulation showed smooth texture, pleasant odor, good spreadability, and excellent washability, making it suitable for daily facial care. The pH of the formulation was found to be compatible with skin pH, ranging from 5.5 to 5.7, thereby ensuring user safety. Antimicrobial efficacy was evaluated by the cup plate method using Staphylococcus aureus as test organisms, and the formulation showed a noticeable zone of inhibition of ~9 to 12mm. Foaming ability and foam stability were assessed by the cylinder shake method, producing sufficient and stable foam with a foaming index of 30 ml, ensuring effective cleansing without excessive harsh surfactants. Stability studies conducted under different temperature conditions showed no significant changes in color, odor, consistency, pH, or performance parameters throughout the study period, confirming formulation stability.

Overall, the formulated Kewra-enriched herbal face wash proved safe effective.

PH003

Development and optimization of Capmatinib-loaded SNEDDS for enhanced oral bioavailability and anticancer potential for treatment of lung cancer"

Ms. Nilam S. Devkar*, Dr. Harshal A. Pawar*
*Mansarovar Global University, Sehore, Bhopal, Madhya Pradesh

The present study aimed to develop a SNEDDS loaded with Capmatinib (CMB) to enhance its oral solubility, bioavailability, and therapeutic efficacy in the treatment of lung cancer. A 3^2 full factorial design was employed to evaluate the influence of lipid and surfactant mixture concentrations on key formulation parameters, including transmittance (% T), cumulative drug release (% CDR), and self-emulsification time (SET). The optimized solid SNEDDS was further characterized by TEM for morphology, XRD for crystallinity, and DSC for thermal behavior. Among 13 liquid formulations (SNE-1 to SNE-13), SNE-13, comprising 5 % PEG- 200, 27.5 % Labrafac, and Labrasol at Km 3, exhibited optimal characteristics, including rapid self-emulsification (30 ± 0.37 seconds) and high transmittance (99.12 ± 0.95 %). Solid SNEDDS was prepared by adsorbing the optimized formulation onto Neusilin®US2, yielding free-flowing granules. FTIR spectra confirmed drug-excipient compatibility, and DSC and XRD data indicated the amorphization and molecular dispersion of CMB in the formulation. The CMBNE formulation exhibited superior drug release (99.76 ± 0.75% within 30 min in 0.1N HCl) compared to pure CMB (27.85 ± 1.84 %), with slightly enhanced release at pH 6.8. CMBNE significantly inhibited A549 lung cancer cell proliferation ($P < 0.001$) and induced apoptosis as evidenced by Annexin-V/PI staining. Cell cycle study of CMBNE resulted in almost 1.5-fold increase in G2/M phase arrest compared to CMB. Pharmacokinetic studies demonstrated a 2.8-fold improvement in oral bioavailability of CMBNE over plain CMB. Collectively, these findings establish CMBNE as a promising oral delivery platform for improving the therapeutic potential of CMB in lung cancer treatment.

Keywords: Capmatinib, Nanoemulsion, Cancer, Bioavailability, Apoptosis, and Cell cycle etc.

PH004

"Formulation and in-vitro evaluation of Senna uniflora phytosomal gel against candidiasis."

[1]Anjali Gaddapwar, [2]Vaishnavi Bhadalkar, [3]Vaishnavi Solanke Department of Pharmaceutical Quality Assurance, S. R. T. M. University Nanded.

Candidiasis is a common opportunistic fungal infection primarily caused by Candida albicans, affecting cutaneous and mucosal tissues. The increasing incidence of antifungal resistance and adverse effects associated with conventional therapies necessitates the development of safer and effective alternative treatment strategies. Senna uniflora, a medicinal plant possessing antifungal activity, has limited clinical application due to poor solubility and bioavailability. Hence, the present study aimed to formulate and evaluate a phytosomal gel of Senna uniflora leaves extract for the management of candidiasis. The leaves of Senna uniflora were extracted and subjected to preliminary phytochemical characterization. Phytosomes were prepared using phosphatidylcholine by solvent evaporation technique to enhance lipid compatibility and skin penetration of the extract. The prepared phytosomes were evaluated for percentage yield, drug content, entrapment efficiency, particle size, zeta potential, and in-vitro drug release. The optimized phytosomal formulation was incorporated into a topical gel using suitable gelling agents. The developed phytosomal gel was evaluated for physicochemical parameters including pH, viscosity, spreadability, extrudability, homogeneity, drug content, and in-vitro diffusion studies. Antifungal activity was assessed using the agar well diffusion method against Candida albicans. The experimental results demonstrated promising entrapment efficiency, nanosized phytosomal particles, enhanced drug release, and good physicochemical stability of the formulation. The optimized phytosomal gel exhibited a significant zone of inhibition against Candida albicans, indicating improved antifungal efficacy compared to the plain extract.

Keywords: Candidiasis, Senna Uniflora, Phytosomes, Topical antifungal formulation, Phosphatidylcholine, Candida albicans.

PH005

Formulation and evaluation of liquisolid orally disintegrating tablets of Lansoprazole using central composite design

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The present research aimed to develop and evaluate liquisolid compact tablets to address the challenges associated with the poor solubility and low bioavailability of lansoprazole. Orally disintegrating tablets (ODTs) of lansoprazole were formulated using liquisolid technology, where different concentrations of the drug were incorporated into liquid medications. The carrier-to-coating material ratio of Avicel PH 102 to Aerosil 200 was maintained at 10, 15, and 20 across different formulations. These formulations underwent comprehensive evaluation of both pre-compression and post-compression parameters in accordance with pharmacopeial standards. The formulation was further optimized using Central Composite Design (CCD), with the drug concentration in liquid, carrier-to-coating ratio, and angle of repose as independent variables, and disintegration time and cumulative drug release as dependent variables.

Compatibility between drug and excipients was confirmed through FTIR and DSC studies, indicating no significant interactions. The liquisolid systems displayed acceptable flow characteristics, and pre-compression results confirmed good flow properties. Post-compression evaluations including thickness, hardness, weight variation, drug content, and in-vitro drug release also demonstrated satisfactory outcomes. Stability studies indicated no significant physicochemical changes in the optimized formulation over time. Additionally, XRD and SEM analyses confirmed the presence of lansoprazole in a solid solution form within the compact matrix, supporting the successful incorporation and dispersion of the drug using liquisolid technology.

Keywords: Lansoprazole, BCS Class II, Liquisolid Technology, Solubility Enhancement.

PH006

Development of supramolecular complex of anticancer Drug for enhancement of solubility

Vivek Baburao Kachate Sneha Sanjay Rajankar

Etoposide, a semi-synthetic podophyllotoxin derivative, shows potent topoisomerase 2 inhibitory activity but faces limited clinical use due to poor water solubility. This underscores the need for solubility enhancement. The low aqueous solubility of etoposide restricts its clinical applications despite its strong anticancer potential. The existing crystalline form limits dissolution, creating a gap for amorphous conversion through polymer interactions. The purpose of the study was to develop supramolecular complexes of etoposide with hydroxypropyl methylcellulose phthalate (HPMCP) and hydroxypropyl methylcellulose acetate succinate (HPMCAS) via noncovalent interactions to boost aqueous solubility and dissolution behavior. Supramolecular complexes were prepared by solvent evaporation and spray drying to obtain amorphized etoposide. The characterization involved FTIR for interactions, DSC for miscibility and glass transition, PXRD for crystallinity, and SEM for morphology. The optimized formulations underwent in vitro dissolution testing. FTIR confirmed noncovalent interactions; DSC showed single glass transition for molecular dispersion; PXRD verified amorphous state without recrystallization; SEM revealed morphological changes absent of crystals. In vitro dissolution showed significantly faster drug release from complexes compared to pure etoposide. These complexes offer a promising strategy for improving the solubility of the etoposide. The approach demonstrates polymer- drug synergy for broader poorly soluble drug applications.

PH007

Development of Apixaban solid dispersion tablets using a novel solubilizer: insights from in-vivo and ex-vivo studies.

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Apixaban (APX) is a highly selective and potent direct factor Xa inhibitor with poor aqueous solubility (0.028 mg/ml at 24 °C) and relatively low oral bioavailability (approximately 50% following a single dose). To address these limitations, we developed an oral formulation of the anticoagulant apixaban (APX) by preparing solid dispersions with the novel polymeric excipient Soluplus. Phase Solubility Studies were done to optimise APX: soluplus ratio for solid dispersion development via melt method. Among the prepared formulations, the 1:3 (w/w) APX:Soluplus dispersion showed the highest saturation solubility and was selected for further solid-state characterization by SEM, DSC, XRPD, and FTIR. Further more the optimized solid dispersion was then compressed into an immediate-release tablet using grass Excipients. Further its *in-vitro* dissolution profile was compared with a marketed reference product and pure APX tablet. *Ex-vivo* permeation was assessed using the everted gut sac model. More than 5 folds increase in APX permeation from the optimized solid dispersion tablet indicated a marked enhancement in intestinal transport. *In-vivo* pharmacokinetic studies in male Wistar rats were performed, in which the optimized tablet produced more than 10-fold and 5-fold increase in C_{max} and AUC, respectively. *In vitro, ex-vivo* permeation and *in-vivo* study collaborated that solid dispersion can be considered as the promising approach for bioavailability enhancement of APX with soluplus.

PH008

Formulation and evaluation of extended release matrix tablet containing Famotidinie

Yashshri Katkar1, Sachin Jagdale*1, Babita Agarwal1, Saurabh Gaware1,

The purpose of this study was to develop an extended-release (ER) matrix tablet containing famotidine that shows dissolution properties able to account for the variability of pH and mechanical stress in the GI tract using a hydrophilic polymer.

Materials and Method: The aim of the study was to develop a longer lasting and slower releasing formulation of Famotidine ER tablets that could be administered just once daily. The hydrophilic matrices of hydroxypropyl methyl cellulose (HPMC) of different viscosity grades HPMC K4M, HPMC K100M and xanthan gum were selected as ER polymers for the ER matrix tablet. In this, nine formulation batches were prepared by direct compression method.

Results and Conclusion: Compatibility studies were performed and powder blend was subjected to precompression parameters evaluation followed by post compression evaluation of tablets including weight uniformity, hardness, drug, thickness, *in vitro* drug release. *In vitro* drug release of all formulation was carried out in phosphate buffer (pH 4.5) as dissolution media for12 hrs. Amongst the nine trias; formulation containing HPMC K4M 50.0 mg/Tablet i.e. F4 showed complete drug release (98%) in 12 hrs. Also, the physicochemical properties of F4 were found adequate. The dissolution profile of F4 followed zero order kinetics. After comparing all the data, statistical analysis and physicochemical study it was concluded that formulation "F4" is optimum and final formulation.

Key words - Extended-Release (ER) matrix tablet, Famotidine, HPMC K4M, HPMC K100M Xanthan gum

PH009

Design and evaluation of a polymeric nanoparticle-based targeted drug delivery system with improved pharmacokinetics in cancer therapy

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Globally, cancer accounts for approximately 16.8% of deaths, with female breast cancer being the second leading cause of cancer mortality, representing 2.3 million new cases and 11.6% of total cancer deaths annually. The study focused on designing and evaluating surface-modified chitosan-based nanoparticles (CNP) targeting against CD44 receptors to enhance the apoptotic potential and bioavailability of the loaded anticancer drug. CNP were formulated by ionic gelation method and optimized using a design of experiment to achieve optimal particle of approximately 150 nm with an encapsulation efficiency around 70%. The optimized CNP were surface-modified with a targeting moiety aimed at CD44 receptors overexpressed on cancer stem cells. Comprehensive characterization through particle size analysis, zeta potential, FTIR, DSC, and TEM confirmed successful coating and nanoparticle stability. *In-vitro* release studies demonstrated pH-sensitive drug release, with significantly greater release at acidic tumor-like pH (5.0) compared to physiological pH (7.4), suggesting enhanced tumor-specific drug availability and reduced systemic toxicity. The optimized nanoparticle formulation showed a significant enhancement in bioavailability, exhibiting more than 4-fold increase, indicating improved systemic exposure and therapeutic potential. Stability assessments over three months confirmed maintenance of particle size, drug loading, and encapsulation efficiency. The *in- vitro* cytotoxicity assessment demonstrated a significant reduction in cancer cell proliferation when treated with the surface-modified CNP compared to the free drug, confirming enhanced anticancer efficacy. These findings underscore surface-modified CNP as a promising targeted delivery platform for anticancer drugs in breast cancer, combining improved pharmacokinetics, tumor-specific targeting, and controlled release to overcome therapeutic challenges.

PH010

Formulation and optimization of nanocrystals fora poorly soluble BCS class-IV carcinogenic agent

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BCS Classification Class-IV drugs have low permeability and solubility, which significantly lowers their oral bioavailability and efficacy. This class includes some cancer drugs, and there is a need for improved formulation technology to boost their efficacy. Developing and characterizing nanocrystals of a selected cancer drug that falls under BCS Classification Class- IV is the main goal of this research project. An ideal size-reducing technique, such as high- pressure homogenization or antisolvent precipitation, using ideal stabilizers, could be used to create the nanocrystals. Critical parameters could also be changed to formulate the nanocrystals. The particle size, polydispersity, and zeta potential of the nanocrystals could then be examined. Then, surface morphology and crystallinity could be investigated using X-ray diffraction, differential scanning calorimetry, and scanning electron microscopy/transmission electron microscopy, respectively. To find an improvement in drug release over the pure drug, in-vitro dissolution tests could be performed. Particle size is significantly reduced, saturation solubility is increased, and the dissolution rate is significantly increased in the optimized nanocrystal formulation. The characterization tests demonstrate improved stability while maintaining crystallinity. The findings unmistakably show that nanocrystal technology is a useful and promising platform for improving the oral bioavailability of BCS Class-IV anti- cancer medications that are poorly soluble and poorly permeable.

Keywords: BCS Class-IV, Anticancer Drug, Nanocrystals, Solubility Enhancement, Dissolution

PH011

Development and optimization of PEGylated Darolutamide-loaded liposomes for treatment of Prostate Cancer: in vitro and in-vivo characterization

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The present study aimed to develop a Darolutamide (DRM) loaded PEGylated liposomal (DRML) to improve therapeutic efficacy in the treatment of prostate cancer. A 3^2 full factorial design was employed to evaluate the influence of Hydrogenated Soy Phosphatidylcholine (HSPC) and cholesterol concentrations on key formulation parameters, including particle size and entrapment efficiency (EE). The optimized PEGylated DRM liposomal formulation (DRML-9) was further characterized by transmission electron microscopy (TEM) for morphology, X-ray diffraction (XRD) for crystallinity, and differential scanning calorimetry (DSC) for thermal behavior. Among 13 liquid formulations (PDL–1 to PDL–13), PDL–9, comprising 15 mg HSPC, 35mg cholesterol, exhibited optimal characteristics, including particle size (87.8±3.25) and higher entrapment (95.57±1.67 %). FTIR spectra confirmed drug- excipient compatibility, and DSC as well as XRD data indicated the amorphization and molecular dispersion of DRM in the liposomal formulation. The DRML-9 formulation exhibited superior drug release (71.56±3.48 %) at tumor pH compared to blood pH (16.35±1.17 %). DRML-9 significantly inhibited LNCaP prostate cancer cell proliferation ($P < 0.001$) and induced apoptosis as evidenced by Annexin-V/PI staining. Cell cycle study in DRML resulted in almost 2-fold increase in S-phase arrest compared to DRM alone. Pharmacokinetic evaluation demonstrated a 3.6-fold improvement in intravenous bioavailability of PEGylated DRML over pure DRM. Collectively, these findings establish PEGylated DRML-9 as a promising intravenous delivery platform forimproving the therapeutic potential of darolutamide in treatment of prostate cancer.

PH012

Development and evaluation of Lutein loaded liposomal in-situ nasal gel for brain targeting in alzheimer's disease

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Alzheimer's disease is a progressive neurodegenerative disorder characterized by cognitive impairment and memory loss, where effective drug delivery to the brain is a major challenge due to the blood–brain barrier. Lutein, is potent antioxidant with neuroprotective properties, shows therapeutic effect in Alzheimer's disease; But its low aqueous solubility and low bioavailability reduces therapeutic efficacy. The present research aimed to develop and evaluate lutein-loaded liposomes incorporated into an in situ nasal gel for direct nose-to-brain delivery. Lutein liposomes were prepared using the ethanol injection method followed by high-pressure homogenization and optimized using a 3^2 full factorial design. Particle size, zeta potential, entrapment efficiency, and drug loading were selected as critical evaluation parameters. The optimized liposomal formulation exhibited a nanosized particle diameter of approximately 70 to 100 nm with high entrapment efficiency and drug loading. The optimized liposomes were incorporated into a gellan gum and xanthan gum based in situ nasal gel, which demonstrated appropriate pH, viscosity, rapid gelation, and strong mucoadhesive properties suitable for nasal administration. In vitro and ex vivo permeation studies confirmed enhanced drug release. In vivo pharmacokinetic studies show significantly higher lutein concentration in the brain following intra-nasal administration of the optimized gel compared to oral and nasal drug suspensions indicating brain targeting via olfactory and trigeminal pathways. Histopathological studies confirmed the safety of the formulation. The developed liposome- based in situ nasal gel shows potential as a non-invasive strategy for targeted brain delivery of Lutein in the management of Alzheimer's disease.

PH013

A Box-Behnken-guided nanocrystal approach for superior oral delivery of Ezetimibe

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Ezetimibe (EZT), a BCS class II drug and a selective cholesterol absorption inhibitor used for treating high blood cholesterol, exhibits poor aqueous solubility and limited oral bioavailability, which together restrict its therapeutic effectiveness. To overcome these limitations and enhance the solubility, dissolution, and bioavailability of this hydrophobic drug, Ezetimibe nanocrystals (EZT-NCs) were formulated using an antisolvent precipitation ultrasonication method, and subsequently lyophilized to obtain a stable nanosized system. A Box-Behnken Design (BBD) was employed to optimize solvent-to-antisolvent ratio, stabilizer concentration, and ultrasonication amplitude, resulting in uniform nanosized crystals with good dispersibility. The reduced crystallinity and improved dispersibility of the optimized nanocrystals were validated through solid-state analyses (DSC and pXRD) and morphological characterization (SEM). In vitro dissolution studies showed that EZT-NCs achieved nearly 88% drug release within 1 hr, representing a 1.89-fold improvement over pure EZT. Ex vivo permeability evaluation using the everted gut sac model demonstrated a substantial enhancement, with EZT-NCs exhibiting approximately 5.32-fold increase in permeability, attributed to their nanoscale size and the P-gp inhibitory effect of Poloxamer 188 used as a stabilizer. Preliminary pharmacokinetic findings further indicated improved systemic exposure, evidenced by a 2.16-fold increase in AUC compared with pure EZT. Overall, the optimized EZT nanocrystals offer a promising strategy to enhance the solubility, permeability, and oral bioavailability of EZT, underscoring their potential to improve therapeutic performance.

PH014

Development and evaluation of supersaturated silica-lipid hybrids system for enhanced oral delivery of BCS Class II drug

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A BCS Class II drug is characterized by poor aqueous solubility and low oral bioavailability. The selected active pharmaceutical ingredient is a selective estrogen receptor modulator (SERM) used for breast cancer prevention and osteoporosis treatment; these properties are primarily due to extensive first-pass metabolism. This study developed supersaturated silica- lipid hybrid (super-SLH) formulations using Phosal 50 PG lipid and mesoporous silica to enhance drug solubility, dissolution, and bioavailability via a novel, scalable supersaturation method. A 3^2 full factorial design was employed to optimize the silica–lipid hybrid system for obtaining high solubility and effective drug release. In vitro dissolution in pH 6.8 phosphate buffer using the USP II apparatus showed more than 90% drug release in 1 h. More than 10 fold increase in solubility was observed and solid-state analyses (FTIR, DSC, XRPD, SEM) confirmed drug-lipid-silica interactions, drug amorphization, and pore entrapment without crystallization. In vivo pharmacokinetics in male Wistar rats demonstrated more than 2-fold C_{max} and AUC enhancement. Three-month room-temperature stability retained more than 90% drug content, enhanced solubility, and more than 90% at 1-h release. The Supersaturated silica- lipid hybrid system offers a promising, high-drug-loading lipid-based formulation platform for enhanced oral delivery and potential translation to clinical breast cancer chemoprevention therapy.

PH015

Dual-action pharmaceutical co-crystals for solubility and bioavailability enhancement of Dolutegravir

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Introduction: Co-crystallization is a useful pharmaceutical approach used to improve the physicochemical properties of poorly soluble drugs. Dolutegravir, an HIV integrase strand transfer inhibitor, shows low aqueous solubility and limited oral bioavailability mainly due to P-glycoprotein mediated efflux, which affects its absorption and therapeutic effectiveness.

Objective: The objective of the present work was to enhance the solubility, dissolution behaviour, and oral bioavailability of dolutegravir by developing pharmaceutical co-crystals with additional efflux inhibition potential.

Material and Method: Co-crystals of dolutegravir were prepared using p-aminobenzoic acid and oxalic acid as co-formers by the solvent evaporation method in a 1:1 molar ratio. The selection of co-formers was carried out using Hansen solubility parameters and molecular docking studies. The prepared co-crystals were characterized using DSC, FTIR, PXRD, and SEM. Further evaluation included solubility studies, in-vitro dissolution testing, ex-vivo intestinal permeation studies, and in-vivo pharmacokinetic studies in Wistar rats.

Results and Conclusion: The prepared co-crystals showed a significant improvement in aqueous solubility, with nearly an 18-fold increase compared to pure dolutegravir. Enhanced dissolution and intestinal permeation were observed, particularly with the dolutegravir–p- aminobenzoic acid co-crystal. In-vivo studies demonstrated a 2.16-fold increase in relative oral bioavailability. Overall, the study confirms that dual-action co-crystallization is an effective strategy to overcome solubility and efflux-related limitations of dolutegravir.

Keywords:

Dolutegravir, pharmaceutical co-crystals, solubility enhancement, P-glycoprotein inhibition, oral bioavailability

PH016

Formulation and optimization Zolmitriptan HCl mucoadhesive nanostructured lipid carrier (NLC) by using Box -Behnken design

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The objective of the present study was to develop mucoadhesive nanostructured lipid carrier of zolmitriptan hydrochloride for brain targeting by nasal route. Mucoadhesive nasal dosage forms are an attractive method for overcoming rapid mucociliary clearance transport in the nose and for delivering the drug directly to brain. Box–Behnken design (BBD) was used to optimize the mucoadhesive NLC. The independent variables were the total lipid ratio, surfactant: co-surfactant concentration and concentration of mucoadhesive agent and the dependent variables were particle size, zeta potential and entrapment efficiency. Response surface graphs were used to understand the effects of each variable, and the desirability function was then adjusted to optimize NLC formulation. The optimised batch showed particle size 166.7nm, zeta Potential -40.09 and entrapment efficiency of 75.54 %. The experimental values of optimized formulation were in close agreement with predicted values. The optimized NLC were characterized by in vitro dissolution mucin binding efficiency, TEM DSC, FTIR, XRD. In conclusion, the BBD demonstrated its effectiveness in optimizing the NLC formulation and in identifying the effects of formulation variables.

PH017

Formulation and evaluation of cold cream from natural ingredients

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Aim: The present study aimed to formulate and evaluate a cold cream using natural ingredients to provide effective moisturization, skin protection, and soothing effects with minimal side effects, ensuring safety for regular cosmetic application.

Objectives: The objectives of this research were to formulate a cold cream using natural ingredients such as beeswax, almond oil, coconut oil, neem oil, honey, aloe-vera, and rose water; to study the role and compatibility of these ingredients; and to evaluate the physicochemical properties, safety, and suitability of the formulation for topical use.

Methodology: The cold cream was prepared using the emulsion method. The oil phase containing almond oil, coconut oil, and beeswax was heated to 70–75°C, while the aqueous phase containing rose water and other water-soluble ingredients was heated separately to the same temperature. Both phases were mixed under continuous stirring, followed by the addition of borax as an emulsifying agent. The formulation was cooled gradually to obtain a smooth cream and packed in suitable containers. The prepared formulation was evaluated for pH, viscosity, stability, and microbial contamination. Stability studies were also conducted under different temperature conditions.

Conclusion: The formulated cold cream showed acceptable pH, smooth consistency, good stability, and minimal microbial load. The formulation was found to be safe, stable, and suitable as a herbal cosmetic product for skin care.

Keywords: Cold cream, Natural ingredients, Herbal cosmetics, Emulsion method, Skin care.

PH018

Transdermal nanostructured lipid carrier gel containing p-coumaric acid for rheumatoid arthritis

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Rheumatoid arthritis(RA), an autoimmune disease is characterized by chronic synovial inflammation, leading to pannus formation, cartilage degradation, and bone erosion. Limitations of non-steroidal anti-inflammatory and disease-modifying antirheumatic drugs, include systemic toxicity, poor compliance and delayed therapeutic onset. Present studies investigated nanostructured lipid carrier (NLC) based gel for transdermal delivery of p- Coumaric acid, a phenolic phytocompound with established anti-inflammatory and antioxidant properties, to enhance therapeutic outcomes in RA management. NLCs were formulated by high-pressure homogenization and optimized using Box–Behnken design, with concentration of lipids and surfactants and homogenization cycles as independent variables. Gelucire®50/13, Captex®355), Tween®80 and Transcutol®P were selected as lipids and surfactants. Optimized formulation exhibited mean particle size of 90.74 nm, polydispersity index of 0.35, zeta potential of −23.2 mV, and high entrapment efficiency (95.54%). *In silico* docking showed strong interaction with Gelucire 50/13 (glide −4.533) and moderate interaction with Captex 355 (−3.530), supporting formulation stability. Carbopol 940 (2% w/v) was identified as gelling agent based on its textural properties. *In vitro* release studies demonstrated significantly enhanced and sustained release from NLC and NLC gels. *Ex vivo* permeation through porcine skin revealed better permeation (51.3ug/cm 2) and permeability coefficient (0.000327 cm/h) forNLC gel. Skin irritation studies confirmed non-irritant nature of formulation. *In vivo* pharmacodynamic assessment in CFA-induced arthritis model in Wistar rats demonstrated marked reduction in paw edema and also in levels of pro-inflammatory cytokines (TNF-α, IL- 1β). In conclusion, NLC-based gel offers an effective, biocompatible, and non-invasive delivery platform for enhancing therapeutic efficacy of p-CA for treatment of RA.

PH019

Development and evaluation of a kojic acid loaded cross linked hyaluronic acid dermal filler for melasma treatment.

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Melasma is a chronic hyperpigmentation disorder that is difficult to manage due to poor patient compliance and frequent relapse associated with conventional therapies like topical creams, laser treatments and Kojic acid IV/IM injectables . Dermal fillers help overcome the drawbacks of conventional melasma therapies by providing localized, sustained delivery of depigmenting agents with a single or minimal application, improving patient compliance and reducing the chances of relapse. The present study aimed to formulate and evaluate a novel dermal filler containing kojic acid incorporated into novel cross-linked hyaluronic acid foreffective and sustained treatment of melasma with a single-time application. Hyaluronic acid was cross-linked using polyethylene glycol (PEG-200) to enhance stability, biocompatibility, and residence time, while kojic acid was selected as a tyrosinase inhibitor. The cross-linked hyaluronic acid was characterized using FTIR and mass spectroscopy, followed by formulation of a kojic acid dermal filler injection. The formulation was evaluated for particle size, viscosity, syringeability, drug content, sterility, in-vitro drug release, ex-vivo permeation, skin irritation, anti-tyrosinase activity, and stability. The final formulation was clear and pale yellow, with pH 7 and a particle size of 206 nm. It was syringeable through a 25-gauge needle, suitable for subcutaneous administration, and passed sterility testing. Molecular docking confirmed anti-tyrosinase activity. In-vitro and ex-vivo studies demonstrated sustained and controlled drug release, while skin irritation studies confirmed biocompatibility. The study concludes that the developed formulation is a promising, minimally invasive, and sustained therapeutic approach for melasma management.

PH020

Green solvent-assisted bioanalytical method development under QbD framework for plasma drug estimation and pharmacokinetic study

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The development of reliable bioanalytical methods for drug quantification in plasma is essential for accurate pharmacokinetic (PK) evaluation. The present study aims to develop and validate a green solvent–assisted bioanalytical method based on Quality by Design (QbD) principles for the estimation of a drug in plasma and its subsequent application to pharmacokinetic studies. An Analytical Target Profile (ATP) was established to ensure adequate sensitivity, selectivity, accuracy, and precision.

Critical Quality Attributes (CQAs) and Critical Method Parameters (CMPs) were systematically identified using risk assessment tools to achieve enhanced method understanding and control. Design of Experiments (DoE) was employed to optimize the method by investigating the combined effects of green solvent composition, buffer pH, and chromatographic conditions on analytical performance. The optimized method was validated in human plasma in accordance with ICH M10 and USFDA bioanalytical method validation guidelines.

Following successful validation, the method was applied to rat plasma samples for the determination of plasma concentration–time profiles and the estimation of key pharmacokinetic parameters. The proposed approach is expected to deliver a robust, reproducible, and environmentally sustainable bioanalytical method suitable for routine bioanalysis. This study highlights the significance of integrating QbD concepts with green analytical chemistry to enhance method reliability, regulatory compliance, and sustainability in bioanalytical and pharmacokinetic investigations.

PH021

Preparation and evaluation of raft forming antacid capsules for the management of GERD

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The current research study's major goal is to develop a gastro retentive raft-forming device to treat GERD and increase bioavailability using a mix of flotation and controlled release mechanisms. Raft-forming systems are becoming increasingly popular for the treatment of gastrointestinal (GI) diseases. These formulations often contain sodium alginate as a major polymer, along with carbonate or bicarbonate as effervescent agents. When in touch with gastric fluid, the change in pH causes gelation, allowing the material to swell and form a thick, cohesive gel; also, the entrapment of carbon dioxide bubbles reduces the system's density, enhancing its buoyancy in gastric fluid.

Hydrophilic polymers such as sodium alginate and HPMC were chosen and combined with gas-generating agents like sodium bicarbonate and calcium carbonate. The raft preparation was evaluated for physical and chemical parameters such as pH, floating lag time, floating duration, drug content, acid neutralization capacity, raft density, raft resilience, and in vitro release experiments. The in vitro pharmacokinetic analysis reveals that the raft formulation was effective in controlling drug release. This study will definitely help us to get the improved GERD treatment with the enhanced drug bioavailability and advancement in gastro retentive drug delivery system.

Keywords – GERD, Raft, buoyancy, raft resilience

PH022

Dissolving microneedles of polyvinyl alcohol loaded with Etoricoxib, using beeswax a natural base mould, for targeted delivery -a novel anti-inflammatory approach.

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Conventional oral and injectable therapies used in the management of inflammatory joint disorders are often associated with systemic side effects and poor patient compliance. Microneedle (MN) technology offers a minimally invasive, painless, and patient-friendly alternative to overcome these limitations. In the present research work, dissolving microneedles loaded with the anti-inflammatory drug etoricoxib were developed for targeted transdermal delivery in joint disorders. The microneedles were fabricated using a polyvinyl alcohol (PVA)– polyethylene glycol 400 (PEG 400) polymeric system, while beeswax, a natural and biocompatible material, was employed to prepare the moulds using a dermal roller technique. Microneedle arrays were formed through vacuum-assisted mould filling followed by application of a PVA backing layer. The optimized formulation containing 12.5% PVA produced well-defined conical microneedles with adequate tensile strength (17.5 MPa) and mechanical strength (0.68 N/needle), ensuring effective skin penetration. The drug content was found to be 88.73%, indicating uniform drug distribution within the microneedles. Sustained drug release was observed, with approximately 95% in vitro and 92–93% ex vivo release over 8 hours. In vivo anti-inflammatory evaluation using a carrageenan-induced paw edema model demonstrated significant therapeutic efficacy, achieving 99.98% inhibition at 24 hours, which was superior to the marketed formulation (97.11%). Skin irritation studies confirmed good biocompatibility, and stability studies indicated satisfactory physical and chemical stability under storage conditions. Overall, the developed beeswax-based dissolving microneedle system represents a safe, effective, and promising transdermal delivery platform for localized and sustained anti-inflammatory therapy.

PH023

Microfluidic Vein Shield: A novel thin film solution for varicose vein treatment and prevention

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Background: Varicose veins are a prevalent vascular disorder characterized by dilated and tortuous veins, commonly in the lower extremities, due to elevated venous pressure and impaired blood flow. Current treatment strategies often involve invasive procedures or systemic medications, which can result in limited efficacy and unwanted side effects.

Objectives: The study aimed to develop and evaluate a novel microfluidic thin film system for the treatment and prevention of varicose veins. The primary goal was to enable controlled drug delivery to affected veins, while the secondary aim was to improve blood circulation and reduce venous obstruction.

Methods: A microfluidic membrane was engineered using soft lithography, involving microchannel design, mold fabrication, PDMS(polydimethylsiloxane) casting, and bonding to a flexible biocompatible substrate. The channels were loaded with Heparin and EDTA—agents selected for their anticoagulant and calcium-chelating effects. The design allowed for sustained and localized drug release.

Results: Experimental evaluations demonstrated that the microfluidic thin film effectively reduced clot formation and minimized venous calcification. Test models exhibited significantly improved vascular flow and decreased obstruction when compared to untreated controls, confirming the film's therapeutic potential **Conclusions:**The microfluidic vein shield offers a promising, non-invasive approach for managing and preventing varicose veins. Its ability to deliver localized therapy with minimal systemic exposure presents a significant advancement in microvascular regulation, with potential applications in both treatment and prophylaxis of venous disorders.

Keywords: Varicose veins, microfluidic thin film, Heparin, venous obstruction, anticoagulant, chelation therapy, PDMS, localized drug delivery.

PH024

"Development & evaluation of Bilosome containing antimigraine drug via nasal delivery"

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One of the leading causes of disability in the world is migraine, a crippling neurological condition. In order to improve the transport of Rizatriptan benzoate, a hydrophilic BCS Class III medication with a 45% oral bioavailability, directly to the brain through the non-invasive olfactory pathway, this work focusses on creating an in situ nasal gel loaded with bilosomes. Using the ethanol injection approach, bilosomes were created by adding sodium taurocholate as a penetration enhancer, cholesterol for vesicle stability, and Span 60 as a surfactant. An ion- activated gellan gum in situ gel matrix was included with the optimised bilosomal dispersion. With a polydispersity index of 0.4512, a zeta potential of -12.8 mV, and a particle size of 162.1 nm, the optimised formulation (Batch F8) showed favourable stability for brain targeting. In vitro diffusion experiments showed that the formulation had an entrapment effectiveness of 98.64%, a drug content of 95.36%, and a sustained drug release of 89.92% over eight hours. Prolonged mucosal residence was made possible by the in situ gel's physiological pH of 6.6 and notable viscosity rise from 120 cp to 719 cp upon contact with simulated nasal fluid. Fora month, stability testing verified that the formulation stayed below permissible ICH limits. This study effectively demonstrates that bilosome-loaded in situ gels are a viable means of effective nose-to-brain transfer, which may enhance migraine treatment.

PH025

Rapid water content determination in pharmaceutical products using near-infrared spectroscopy

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Moisture content plays a critical role in the stability, efficacy, and shelf life of pharmaceutical products. Conventional methods such as Karl Fischer titration and gravimetric analysis, though widely used, are time-consuming, destructive, and often involve hazardous reagents. Near-infrared (NIR) spectroscopy has emerged as a rapid, non-destructive, and environmentally friendly alternative for moisture determination across diverse dosage forms including tablets, granules, powders, semi-solids, and gelatin capsules. This poster highlights the feasibility and advantages of NIR spectroscopy for routine pharmaceutical analysis.

NIR operates in the spectral range of 12,500–4000 cm^{-1} (750–2500 nm), with water exhibiting strong absorption bands at 1450 nm (first overtone of O–H stretching) and 1940 nm (combination of O–H stretching and bending). Using instruments such as the Buchi NIRFlex-N 500 and ProxiMate™, calibration models were developed through partial least squares regression (PLSR) with preprocessing techniques like SNV (Standard Normal Variate) and mean centering. Case studies demonstrated excellent correlation between predicted and reference moisture values, with R^2 values exceeding 0.99 and low prediction errors, confirming the robustness of the models.

Applications extend beyond moisture analysis to polymorph detection, raw material identification, and process analytical technology (PAT) for real-time monitoring, supporting Quality by Design (QbD) principles. Additionally, NIR enables in-line control during processes such as freeze-drying, ensuring precise drying and product consistency. Overall, NIR spectroscopy offers a fast, reliable, and sustainable approach to pharmaceutical quality control, minimizing environmental impact while enabling advanced method development for hygroscopic materials and formulations.

PH026

Design, development, and evaluation of mucoadhesive tablets containing Hesperidin nanocrystals for gastric ulcer treatment

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Hesperidin is a natural flavonoid found in the peels of citrus fruits like *Citrus sinensis, Citrus limon, and Citrus reticulata* . It shows promise for protecting the stomach but has poor water solubility and low oral absorption. These issues may limit its effectiveness as a treatment. The proposed research seeks to design, develop and evaluate mucoadhesive tablets that contain hesperidin nanocrystals for treating gastric ulcers. To address these limitations, we propose preparing hesperidin nanocrystals using an appropriate top-down technique. This will improve solubility and dissolution properties.

The developed nanocrystals are expected to have a smaller particle size, a narrow size range, and good physical stability. These nanocrystals will be included in mucoadhesive tablet formulations made with polymers like chitosan and HPMC. The goal is to extend gastric residence time and increase local drug availability at the ulcer site. The prepared tablets are expected to show good physicochemical properties. These include uniform drug content, adequate hardness, low friability and appropriate swelling and mucoadhesive characteristics. In vitro drug release studies are expected to show better and lasting release of hesperidin from the nanocrystal-loaded mucoadhesive tablets compared to regular formulations. Ex vivo mucoadhesion studies are expected to help with longer adhesion to gastric mucosa. In addition, in vivo evaluation using a suitable gastric ulcer model is suggested to test the gastroprotective potential of the formulation. Overall, the study is expected to offer a useful formulation strategy to improve the therapeutic effectiveness of hesperidin in managing gastric ulcers.

PH027

"Formulation and evaluation of Naproxen pickering Emulsion"

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Naproxen is an effective NSAID, but its oral use is limited by gastrointestinal and systemic side effects. This study developed a surfactant-free Pickering emulsion for topical delivery of naproxen using natural octenyl succinic anhydride (OSA)– modified starch nanoparticles as solid stabilizers. The nanoparticles were synthesized from corn starch and used to prepare oil- in-water emulsions, with lemongrass oil selected as the oil phase due to its high naproxen solubilization capacity. The formulated emulsions were evaluated for physicochemical properties including pH, viscosity, droplet size, zeta potential, stability, and drug content. FTIR analysis confirmed drug– excipient compatibility, while transmission electron microscopy showed uniform and well-stabilized droplets. The optimized formulation exhibited good physical stability, narrow droplet size distribution, and high drug content. In vitro drug release studies using a Franz diffusion cell demonstrated sustained and enhanced naproxen release from the Pickering emulsion compared to the pure drug. Overall, the results indicate that OSA- modified starch nanoparticle stabilized Pickering emulsions are a safe, stable, and effective carrier for topical naproxen delivery, offering a promising alternative to conventional surfactant-based formulations.

PH028

Intranasal delivery of Sildenafil-loaded nanostructured lipid carriers embedded in thermosensitive in-situ gel for alzheimer's therapy.

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The blood–brain barrier (BBB) significantly limits the effective delivery of therapeutic agents to the brain, necessitating alternative strategies for the treatment of neurodegenerative disorders such as Alzheimer's disease (AD). Intranasal administration has gained considerable attention as a non-invasive route for direct nose-to-brain drug delivery. Sildenafil (SD), a selective phosphodiesterase-5 (PDE-5) inhibitor, exhibits vasodilatory and neuroprotective properties; however, its clinical utility is restricted by poor aqueous solubility, limited oral bioavailability, and inadequate brain penetration.

In the present study, sildenafil-loaded nanostructured lipid carriers (SDNLCs) were developed to enhance brain targeting via the intranasal route. SDNLCs were prepared using the hot homogenization–ultrasonication technique with Peceol and Gelucire® 44/14 as lipid components and Tyloxapol as a surfactant. A Quality by Design (QbD) approach employing a Box–Behnken design was utilized to optimize formulation variables affecting particle size, entrapment efficiency, and drug loading. The optimized formulation exhibited nanosized particles with low polydispersity, high entrapment efficiency, and satisfactory colloidal stability.

The optimized SDNLCs were incorporated into a thermosensitive in situ gel using poloxamer 407 and carbopol to improve nasal residence time and mucoadhesion. The *in situ* gel demonstrated suitable gelation temperature, viscosity, and sustained drug release behavior. In vitro and ex vivo studies confirmed controlled drug release and enhanced nasal permeation compared to plain drug suspension.

In vivo pharmacodynamic evaluation in an intracerebroventricular streptozotocin-induced AD rat model showed significant improvement in cognitive performance, reduced amyloid-β and inflammatory markers, and preserved neuronal architecture. The developed SDNLC-based *in situ* gel demonstrates promising potential for effective nose-to-brain delivery of sildenafil in the treatment of Alzheimer's disease.

PH029

"Fenticonazole nitrate loaded lipid-based drug delivery for treatment of mixed vaginitis: Fabrication, optimization, *in vitro, Ex vivo* characterization"

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Vaginal infections, including bacterial vaginosis, vulvovaginal candidiasis, and trichomoniasis, affect over 70% of women worldwide, often leading to mixed vaginitis with overlapping symptoms such as erythema, pruritus, and discharge. Current therapies face limitations such as poor bioavailability, short residence time and systemic side effects. This study aims to develop and evaluate Fenticonazole nitrate (FNZ)-loaded nanostructured lipid carriers (NLCs) for enhanced treatment of mixed vaginitis. NLCs were formulated using hot melt emulsification and ultrasonication, optimized through a Box-Behnken design to achieve ideal particle size (137.61 nm), entrapment efficiency (98.01%), and drug loading (17.41%). *In vitro* drug release studies demonstrated sustained release with 62.31% release from NLCs. The mucoadhesive gel formulation further improved vaginal retention and drug localization. *Ex vivo* permeation and antimicrobial studies confirmed enhanced penetration and activity against *Candida albicans* and *Staphylococcus aureus.* HET-CAM testing confirmed minimal irritation. The outcomes suggest that FNZ-NLCs offer a promising, patient-friendly, and effective treatment for mixed vaginitis by improving drug stability, solubility and retention while reducing the frequency of application and systemic side effects.

PH030

Formulation and evaluation of self-nanoemulsifying drug delivery system (SNEDDS) of Amlodipine for enhanced oral bioavailability.

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Amlodipine a widely prescribed antihypertensive agent, exhibits low aqueous solubility and variable oral bioavailability, which may limit its therapeutic efficiency. The present study aimed to develop and evaluate a Self-Nanoemulsifying Drug Delivery System (SNEDDS) of amlodipine to enhance its solubility, dissolution rate, and oral bioavailability. SNEDDS formulations were prepared using peppermint oil as the lipid phase, Tween 80 as the surfactant, and polyethylene glycol 400 as the co-surfactant, selected based on solubility studies. Pseudo- ternary phase diagrams were constructed to identify the nanoemulsion region. The optimized formulation was evaluated for droplet size, polydispersity index, zeta potential, self- emulsification time, drug content, and in vitro dissolution studies. The optimized SNEDDS showed rapid self-emulsification with nano-sized droplets (<100 nm), low polydispersity, and satisfactory drug content uniformity. In vitro dissolution studies demonstrated significantly higher and faster drug release compared to pure amlodipine, indicating improved dissolution behaviour. Stability studies revealed no significant changes in physical appearance or drug content. The study concludes that SNEDDS is a promising and effective approach for improving the oral delivery and bioavailability of amlodipine in the management of hypertension.

PH031

Development and evaluation of 5-Fluorouracil nanosuspension using nose-to-brain delivery for enhanced anticancer activity

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5-Fluorouracil (5-FU) is a potent antimetabolite chemotherapeutic agent used in the treatment of various cancers. However, its clinical efficacy in brain-related malignancies is limited due to poor aqueous solubility, rapid systemic clearance, and restricted penetration across the blood–brain barrier (BBB). Nose-to-brain delivery has emerged as a non-invasive approach to bypass the BBB and directly target the central nervous system.

Materials and Methods: The 5-FU nanosuspension was prepared using a precipitation technique followed by high- pressure homogenization, employing suitable stabilizers to achieve nanoscale particles. The optimized formulation was characterized for particle size, polydispersity index, zeta potential, drug content, and morphology. In vitro drug release studies were performed to assess release behaviour. Nasal permeation studies were conducted using excised nasal mucosa. The anticancer potential was evaluated using in vitro cytotoxicity assays on selected cancer cell lines.

Results: The optimized nanosuspension exhibited a mean particle size in the nanometer range with a narrow size distribution and adequate zeta potential, indicating good stability Optimized batch showed the least particle size, i.e., 110.4 ± 0.15, optimum zeta potential, i.e., -48.2 ±0.24mV, Polydispersibility index was 0.312 ± 0.03, and better entrapment efficiency, i.e. 98.94±0.23, Drug loading was calculated 12.00±0.52, Drug content 98.99±0.33. The SEM studies indicated the formation of spherical nanoparticles. Sustained drug release and enhanced nasal permeation were observed compared to pure 5-FU.

Conclusion: The developed 5-Fluorouracil nanosuspension using nose-to-brain delivery represents a promising strategy for targeted brain cancer therapy, offering enhanced anticancer efficacy and reduced systemic toxicity. Further in vivo studies are warranted.

Keywords: 5-Fluorouracil, Nanosuspension, Nose-to-brain delivery, Anticancer activity, Intranasal drug delivery

PH032

Formulation and characterization of liposomal delivery system for an antifungal drug

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The present study aims to develop and evaluate a novel liposomal formulation containing the antifungal agent Eberconazole nitrate (EBZ) for effective topical delivery. Fungal infections such as dermatomycosis and candidiasis require localized treatment with minimal systemic effects. Liposomes serve as promising carriers due to their ability to enhance drug penetration, stability, and sustained release.

Liposomes were prepared using the thin-film hydration method with phospholipid and cholesterol as lipid components. The prepared formulations were characterized for particle size, zeta potential, morphology, and entrapment efficiency using UV-spectroscopy, zeta sizer, and transmission electron microscopy (TEM). The optimized batch exhibited an average particle size of 0.468 µm and satisfactory zeta potential, indicating uniform and stable vesicles with good entrapment efficiency.

The optimized formulation was incorporated into a gel base for improved topical application and evaluated for physical appearance, drug content, spreadability, and stability. The liposomal gel showed enhanced drug retention, sustained release, and better antifungal activity compared to conventional formulations. Stability studies revealed no significant changes in physicochemical properties during storage.

Overall, the developed liposomal gel of Eberconazole nitrate offers a safe and effective alternative for topical antifungal therapy, providing improved skin penetration, prolonged drug action, and better patient compliance.

PH033

Architecting mesoporous Alumina via Sol–Gel chemistry for next-generation drug delivery

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The present research focuses on the synthesis, characterization, and biomedical potential of high-quality mesoporous alumina prepared via a cost-effective sol–gel method using aluminum chloride as the precursor and hexadecyltrimethylammonium bromide (HTAB) as a structure- directing agent. Mesoporous alumina has gained considerable attention as a drug delivery carrier owing to its high surface area, tunable pore architecture, thermal stability, and favorable biocompatibility. In this study, controlled synthesis parameters were employed to achieve alumina with well-defined mesoporosity suitable for efficient drug loading and controlled release applications.

The synthesized material was calcined at optimized temperatures, with the sample treated at 600 °C exhibiting a high BET surface area of approximately **239 m²/g**, indicating effective template removal and pore development. Structural and morphological characterization using X-ray diffraction (XRD) and FESEM confirmed the formation of mesoporous alumina with uniform pore distribution. Thermal stability and decomposition behavior were evaluated using TG–DTA analysis, demonstrating complete removal of organic components and enhanced thermal stability of the final material.

Furthermore, the synthesized mesoporous alumina exhibited promising adsorption efficiency in dye removal studies, reflecting its high surface activity and porosity. These characteristics indicate strong potential for drug loading and sustained drug release in biomedical applications. Overall, this study establishes sol–gel-derived mesoporous alumina as a versatile and scalable platform for drug delivery systems, with future scope for surface functionalization, biocompatibility evaluation, and therapeutic performance studies.

PH034

Development of a Copper nanoparticle-based foot pad for the management of burning feet sensation

Prajakta Vyankat Dharmsale, Vijayalaxmi Shivaji Dharmsale

Burning feet sensation is a frequently reported condition that causes discomfort and reduced quality of life, particularly in individuals with neuropathic and metabolic disorders. The present study aimed to develop a copper nanoparticle (CuNP)-loaded foot pad as a simple and convenient topical approach for localised management of burning feet sensation. Copper nanoparticles were synthesised by a chemical reduction method, indicated by a visible colour change from pale blue to reddish-brown. The synthesised CuNPs showed a smooth texture with uniform dispersion. The foot pad was fabricated by incorporating CuNPs into a suitable polymeric matrix to obtain a flexible and comfortable formulation. The prepared foot pads were evaluated for physicochemical and mechanical properties. The CuNP-loaded foot pad exhibited uniform thickness (2.1 ± 0.2 mm), adequate folding endurance (>120 folds), and good flexibility without cracking. Surface pH was found to be 6.5 ± 0.3, indicating skin compatibility. Visual inspection confirmed uniform distribution of nanoparticles without visible aggregation. The formulation showed satisfactory stability under room temperature conditions for30 days, with no significant change in appearance or texture. The developed foot pad demonstrated acceptable physical characteristics suitable for prolonged contact with the plantar surface. The study concludes that copper nanoparticle-based foot pads can be successfully fabricated using a simple and cost-effective method and may offer a promising topical system for managing burning feet sensation. Further in vivo and clinical evaluation is required to confirm therapeutic efficacy.

PH035

A sustainable incense preparation using *Anethum Sowa* and biodegradable waste

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Nowadays, individuals sanitize their indoor environments with disinfectants and room fresheners. They frequently have insect repellent properties and pleasant fragrances to produce a clean, mosquito-bite-proof, and comfortable environment. It is really admirable to make herbal dhoop with pieces of plants that shows the analgesic and anti-inflammatory.The aim of research work is to produce a sustainable Incense Preparation (dhoop) formulation from biodegradable waste material and incorporate an ancient herb *Anethum sowa* in an as analgesic and anti-inflammatory agent. It fits well with the rising demand for natural and sustainable substitutes. The Ayurvedic texts mentioned some form of herbal fume inhalation for therapeutics such as, for disease treatment, for health prevention, for mental illness, for fever, for child growth, for diseases of ears, eyes, etc. The current work focuses on preparation and evaluation of natural and herbal dhoop formulation for anti- inflammatory analgesic effect along with that the air microbial count was induces when fumes are introduced into particular area or room. Furthermore in the research *in vitro* anti-inflammatory action of *Anethum sowa* extract, *E. ribes* extract and formulation was estimated compared with ibuprofen as standard. Considering the future prospective of study the detail evaluation of specific microbial control can be possible along with that using several aromatherapy model the analgesic and anti- inflammatory action can be confirmed and stability study of dhoop can be possible.

Keywords: Anethum sowa; Herbal dhoop; Biodegradable waste; Anti-inflammatory activity; Analgesic activity; Sustainable formulation

PH036

Innovative drug delivery for Hematological Malignancies: Ibrutinib polymeric micelles in CLL and SLL treatment

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Background: Ibrutinib is a first-in-class Bruton's tyrosine kinase inhibitor. It works well against chronic lymphocytic leukemia (CLL) and small lymphocytic lymphoma (SLL). However, it has poor water solubility and low oral bioavailability, which limits its use in treatment.

Objective: The aim is to develop and optimize ibrutinib-loaded polymeric micelles to enhance solubility, bioavailability, and sustained drug release.

Methods: Ibrutinib-loaded polymeric micelles were made using thin film hydration with Pluronic F127 and acetone. They were characterized for particle size, entrapment efficiency, morphology, and stability. The micelles were also tested for in vitro drug release and the effects of lyophilization.

Results: The optimized micelles (PM21) had a particle size of 241.6 ± 8.3 nm, a polydispersity index of 0.016, and an entrapment efficiency of 95.35%. The in vitro release showed steady kinetics, with 58.78% release at 6 hours compared to 91.43% for the free drug at pH 6.8. Lyophilization with 2% mannitol maintained micelle integrity and drug content (92.7%). PXRD and DSC analyses amorphization of ibrutinib, potentially enhancing dissolution. Stability studies showed excellent physical and chemical stability over 30 days.

Conclusion: The developed ibrutinib-loaded polymeric micelles significantly increase drug solubility, stability, and sustained release. This offers a promising oral delivery platform for better treatment of CLL and SLL.

PH037

Solid lipid nanoparticles as a promising carrier for topical anti-melanogenic therapy

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Hyperpigmentation disorders happen due to too much melanin production, and they are a significant skin issue. This requires safe and effective topical treatments to reduce melanin. However, many of these treatments do not work well because they have trouble penetrating the skin, are not very stable, and can cause irritation. Solid lipid nanoparticles (SLNs) have come up as a promising delivery system that can help tackle these problems and improve how drugs are delivered to the skin. SLNs are submicron sized colloid carriers made of biologically compatible solid lipids that are stabilised by surfactants. This particular property of SLNs allows them to entrap large amounts of drugs, control the release of drugs, occlude, and interact well with the stratum corneum. The use of SLNs in topical anti-melanogenic treatment helps to improve the penetration and retention of drugs in the target site. This work aims to showcase the potential of SLNs as a new delivery platform for topical anti-melanogenic agents. The formulation method typically uses solvent injection or similar techniques to incorporate lipophilic and amphiphilic molecules into a stable lipid matrix. Key evaluation parameters include particle size, polydispersity index, zeta potential, drug entrapment efficiency, in vitro drug release, skin permeation studies, and testing of anti-melanogenic activity through melanin inhibition and tyrosinase suppression assays. SLN-based topical formulations are promising for managing hyperpigmentation disorders. They improve drug stability, bioavailability, and localized action. This makes SLNs an attractive carrier system for new skin treatments that target melanogenesis. Please provide citations for references.

Keywords: Solid Lipid Nanoparticles, Anti-Melanogenic Agents, Hyperpigmentation, Topical Delivery System, Melanogenesis.

PH038

"Surface-functionalized Phenolic acid loaded ZnO Nanoparticles: An approach to overcome antimicrobial resistance in wound infection"

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Rise of antimicrobial resistance in wound infections, pose a serious risk to human health. Zinc oxide nanoparticles (ZnONPs) have gained significant interest due to their antimicrobial properties. To address this issue, the present research focuses on the development of functionalized ZnONPs conjugated with phenolic acid (PA-ZnO NPs) to enhance antimicrobial activity against microbes resistant in wound healing. The co-precipitation method was used to develop ZnONPs and conjugated with phenolic acid to develope PA-ZnO NPs with surface modification using PEG. The surface plasma resonance spectra at 360-380nm showed formation of ZnONPs. Fourier transform infrared spectroscopy showed the presence of characteristic groups indicating successful conjugation of drug on surface functionalized ZnONPs. Field emission scanning electron microscopy and Dynamic light scattering demonstrated spherical nanosize particles, and PDI of 0.3-0.5 indicating a uniform distribution of particles. Nanoparticles showed *in vitro* antimicrobial activity against *C.albicans*, *E. coli*, *P. aeruginosa*, *S. aureus* and *MRSA* which involves in wound infections. PA-ZnONPs further incorporated in hydrogel showed better skin compatibility and *ex vivo* skin permeation. The wound healing potential of PA-ZnO NPs hydrogel was monitored in excision wound model, and formulation showed improved wound contraction and re-epithelization. The results of histopathological analysis and decrease level of TNF-α, IL-6 showed reduced inflammation, increase level of hydroxyproline indicates regulated remodeling phase. Our findings indicate that surface functionalized PA-ZnONPs show better antimicrobial efficacy against wound infection microbes and wound healing potential act as a promising platform to provide a potentially cost-effective and eco-friendly alternative therapy for infectious disorder and wound healing. **Keywords**: Antimicrobial resistance, Zinc oxide nanoparticles, Phenolic acid, Surface functionalized, Wound.

PH039

Formulation, development and in vivo evaluation of Nanofiber based diabetic wound healing systems

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Wound healing in diabetic patients remains a major therapeutic challenge due to chronic inflammation, impaired angiogenesis, oxidative stress, and susceptibility to infection. This study focuses on the formulation, development, and in vivo evaluation of nanofiber-based wound healing systems for diabetic wounds. Electrospun nanofibers were fabricated using polyvinyl pyrrolidone and Kollidon VA 64, loaded with bromelain and cerium oxide nanoparticles (CeNPs) to enhance antimicrobial, antioxidant, and anti-inflammatory activity. The prepared nanofibers were evaluated for morphology, physicochemical characteristics, swelling index, tensile strength, degradation rate, porosity, and drug release behaviour. Scanning electron microscopy confirmed uniform fiber formation, while XRD analysis verified structural integrity. In vitro cytotoxicity studies using HaCaT cells demonstrated good biocompatibility. The optimized formulation exhibited sustained drug release along with significant antioxidant and antibacterial activity against E. coli and S. aureus. In vivo wound healing efficacy was assessed using excision wound model of streptozotocin-induced diabetic Wistar rats. The optimized nanofiber formulation significantly enhanced wound contraction, increased hydroxyproline and hexosamine content, reduced TNF-α levels, and promoted angiogenesis as shown by histopathological studies. The study concludes that bromelain and cerium oxide nanoparticle-loaded electrospun nanofibers provide an effective and multifunctional wound dressing system for diabetic wound management, offering improved healing outcomes through synergistic biological activity.

PH040

Formulation and evaluation of transdermal drug delivery system based nanoemulgel of Mometasone Furoate

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Mometasone furoate (MOF), BCS class II corticosteroid known for its efficacy in treating asthma, rhinitis & various skin conditions, presents formulation challenges due to its poor water solubility. This research explores the development of a nanoemulgel (NEG) formulation to enhance the drug's penetration into skin and hence its therapeutic efficacy. Compatibility studies were perform ed using FT-IR spectroscopy by overlaying physical mixture of drug & additives. Utilizing 3^2 full factorial design, 9-NEG formulations were designed with varying concentrations of Capryol®90, fixed amount of Tween80 and PEG400, alongside different concentrations of Carbopol-934P. The optimized formulation, F9, demonstrated the Viscosity of 10992.92 Cp.s, yielding the spreadability of 14.63 ± 0.66 g.cm/sec. %IVRT comparative studies and Ex-vivo studies revealed enhanced drug permeation in rat skin layers indicated that the MOF-NEG high drug permeation when compared with 0.1% Elocon Ointment at the end of 8h, while Ex-Vivo drug retention in skin layers showed increased drug retention after 24h than marketed formulation which attributed to a reservoir effect from the formulation's components. TEM analysis confirmed spherical shape of the NEG globules. Overall, MOF- NEG formulation offers a promising approach to improve drug delivery and skin retention in that could enhance therapeutic outcome of MOF

Globule size & PDI		% drug content	% In-Vitro drug release (8h)		% Ex-Vivo drug Permeation (8h)		% Ex-Vivo drug Retention (24h)	
Globule size (nm)	PDI	MOF-NEG	MOF-NEG	0.1% Elocon Ointment	MOF-NEG	0.1% Elocon Ointment	MOF-NEG	0.1% Elocon Ointment
170.13± 0.118	0.365	83.96±0.22	83.96 ± 0.22	89.12±0.5 1	50.80±0. 23	67.48±0.64	51.77± 0.11	34.64±0.38

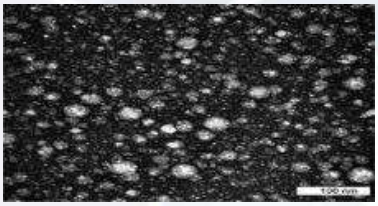

Figure 1 TEM image of prepared NEG showing spherical shape

PH041

Development of Ellagitannin-loaded silver nanoparticles: enhanced wound therapy approach

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Acute wounds typically heal in a predictable manner, while chronic wounds such as diabetic ulcers, pressure sores, and infected injuries often experience delayed healing. Factors like microbial invasion, oxidative stress, and impaired extracellular matrix formation delay the process of healing. This study aimed to develop an ellagitannin-conjugated silver nanoparticle- based topical gel for enhanced antimicrobial, antioxidant, and wound healing activity. Silver nanoparticles were synthesized using Creighton's chemical reduction method and stabilized with polyvinylpyrrolidone, followed by conjugation with bioactive ellagitannin. A 3^2 full factorial design was employed to optimize the concentration of PVP and drug for the development of metallic nanoparticles, and their effect was checked on particle size, entrapment efficiency, and surface plasmon resonance. The optimized ellagitannin-AgNPs exhibited nano-sized particles with spherical morphology and uniform distribution of particles. The developed Ellagitannin-AgNPs showed the surface plasmon resonance at 415 nm, confirming the formation of silver nanoparticles. EDX analysis confirms the presence of elemental silver in synthesised nanoparticles. The optimized ellagitannin-AgNPs were further incorporated into a Carbopol gel for topical application. In the *in vivo* animal study, Ellagitannin-AgNPs gel showed no skin irritation. Ellagitannin-AgNPs gel significantly accelerates wound repair, due to their synergistic action. The hydroxyproline level was significantly increased in the groups treated with Ellagitannin-AgNPs gel compared to other groups. This indicates collagen synthesis and more organised tissue. Matrix Metalloproteinase- 9 levels were significantly reduced in the Ellagitannin-AgNPs group, indicating a well- regulated remodelling phase and reduced extracellular matrix degradation. H&E and M&T staining further validated organized collagen deposition and complete tissue regeneration.

Keywords: Silver nanoparticle, Factorial design, Optimization, Wound Healing, Re-epithelialization.

PH042

Biodegradable Polymer: Preparation and evaluation to fulfill need of SDG

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Elephant root starch was isolated and characterised in this work in preparation for its use in formulations of biodegradable polymers which was derived from the tubers of the elephant foot yam (*Amorphophallus paeoniifolius*). Elephant root starch provides a special, renewable supply of starch with unique characteristics. To acquire high-purity starch, the isolation procedure requires extracting from elephant root tubers and then purifying the product. Spectroscopy, microscopy, and chromatography are some of the characterization methods used to examine the chemical and structural characteristics of isolated elephant root starch. Additionally, using blending procedures, the study explores the compatibility of elephant root starch with different biodegradable polymers.

Elephant root starch was incorporated into biodegradable polymer matrices in order to improve its mechanical strength, thermal stability, and biodegradability. This helps to create s ustainable products that have a less environmental effect.

Keywords: Elephant foot yam starch, biodegradable polymer, isolation and extraction.

PH043

Development of flavonoid-loaded ZnO nanoparticles for Wound Healing.

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Wound management remains a major healthcare concern due to its significant social and clinical impact. Zinc Oxide (ZnONPs) nanoparticles have potential for wound healing applications due to their smaller size. This study aimed to develop flavonoid-loaded zinc oxide nanoparticles to enhance wound healing. ZnONPs were synthesized by the precipitation method followed by conjugation with flavonoids. The synthesized nanoparticles were evaluated for their size, entrapment efficiency and zeta potential. The optimized nanoparticles exhibited nano-sized particles and high entrapment. FE-SEM analysis showed spherical morphology of nanoparticles. EDX confirmed uniform distribution and presence of Zinc in synthesised nanoparticles. Flavonoid-loaded ZnONPs showed sustained *in vitro* drug release for over 24 hours. In Vitro Antibacterial activity was checked against the *Pseudomonas aeruginosa*, confirming antibacterial effect. The synthesised flavonoid-loaded ZnONPs were incorporated into a gel for topical application. *In vivo* animal study showed that Flavonoid- loaded ZnONPs have accelerated wound healing compared to other groups. A marked reduction in pro-inflammatory cytokines (IL-6, TNF-α, and MMP-9) was observed, which indicates a reduction in inflammation. Increased levels of superoxide dismutase (SOD) and hydroxyproline were observed, indicating enhanced antioxidant activity and collagen synthesis. Histopathological evaluation using hematoxylin and eosin staining revealed improved re-epithelialization and reduced inflammation. Further, Masson's trichrome staining confirmed enhanced collagen deposition.

Keywords- Zinc nanoparticles, Wound Healing, Antibacterial activity, Re-epithelialization.

PH044

Nanostructured lipid carrier-integrated thermoresponsive nasal gel for dual-drug brain delivery in Alzheimer's disease

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Alzheimer's disease (AD), a multifactorial neurodegenerative disorder characterized by amyloid-β aggregation, tau hyperphosphorylation, oxidative stress, and neuroinflammation, remains inadequately treated due to poor brain penetration of existing therapeutics. To address this, dual- targeted intranasal nanotherapeutic system was developed by co-encapsulating curcumin (CUR) and quercetin (QUR) into nanostructured lipid carriers (CQ–NLCs). NLCs were prepared by hot emulsification–high-pressure homogenization and optimized using Box–Behnken Design, where total lipid concentration, surfactant concentration and homogenization pressure were independent variables, while particle size, zeta potential, and entrapment efficiency were dependent variables. Optimized CQ–NLCs displayed particle size (125.8 nm), zeta potential (−28 mV) and >94% entrapment efficiency, ensuring stability and high drug loading. Formulation exhibited strong antioxidant activity with 79.42% DPPH radical scavenging (IC_{50} comparable to ascorbic acid), confirming CUR–QUR synergism. To improve nasal retention and sustained release, CQ–NLCs were incorporated into thermoresponsive in situ gel (TR–NIS) containing Poloxamer 407 and Carbopol 934, optimized using Central Composite Design. Optimized TR–NIS gel exhibited gelation temperature (32°C), viscosity (32,000 cPs), and mucoadhesive strength (4618 dyne/cm²), enabling prolonged nasal residence. *In vitro* and *ex vivo* studies confirmed controlled release and enhanced permeability, while *in vivo* evaluations in scopolamine-induced AD rats demonstrated improved cognition, reduced oxidative stress, and neuronal protection. This dual-phytoconstituent nanocarrier-based thermoresponsive gel provides promising non-invasive nose-to-brain delivery strategy for effective management of AD.

PH045

Targeted gastrointestinal delivery of Synbiotics using multilayer natural polymer beads

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Modification of intestinal microbiota and improvement of gastrointestinal activity with the help of synbiotics introduce major health rewards. However, the efficacious nature of the probiotic strains is limited by their weak stability during production processes, storage, and exposure to severe gastrointestinal factors including bile salts and gastrointestinal acidity. These constraints reduce the probiotic fermentation and hinder their effective colonization of the bowel. The current study will focus on creating multilayered polymer beads that can be used to deliver the synbiotic formulations in the gastrointestinal tract with controlled delivery and targeted delivery in order to draw on the available limitations. Probiotic cultures and prebiotic monomers were capped inside a sodium alginate core and then it was subjected to ionotropic gelation. Then sequential layer-by-layer deposition process of chitosan and pectin was done. This multi-layer composite architecture does not only protect the probiotics against gastric acidity but also pH-controllable release in intestinal milieu.The non-toxic and biocompatible biodegradable natural polymers were favored due to their ability to detect pH changes in the gastrointestinal tract, biodegradation mechanisms. The bead architecture system extends the viability and activity of probiotics by reducing the premature discharge of probiotics to the gastrointestinal milieu and facilitating the controlled discharge in the intestinal milieu. Therefore, the use of multilayer natural polymer beads is a potential, long-term solution to improve the delivery of synbiotics in pharmaceutical, nutraceutical and functional foods regimes.

Key words: synbiotics, Probiotics, Prebiotics, Multilayer beads, Natural polymers,Sodium alginate,Chitosan, Pectin.

PH046

Development of phenolic Monoterpenoid-loaded cubosomal gel For wound healing

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Wound healing is a multifaceted biological process influenced by several factors such as infection, oxidative stress and inflammation. To address the limitations of conventional treatments, this study focuses on the development of Phenolic Monoterpenoid-loaded cubosomes to improve wound healing. Cubosomes were formulated using Glyceryl monooleate (GMO) and Poloxamer 407 by emulsification technique followed by probe sonication, applying 3^2 factorial design and the effect of concentrations of these was checked on Particle size and %Entrapment efficiency. Optimized batch was evaluated for particle size, zeta potential, drug entrapment efficiency, release profiles, XRD, DSC and morphology. The optimised batch showed nano size particles (less than 100nm) and high entrapment efficiency (more than 75%). The Optimized batch was further loaded into carbopol gel and analysed. Ex vivo skin permeation studies demonstrated superior dermal penetration compared with conventional gel. In vivo wound healing studies in rats showed significantly reduction in the inflammatory marker (IL-6 and TNF-α) and increased hydroxyproline level, indicating enhanced collagen synthesis. MMP-9 showed a reduction in level indicating tissue regeneration. Reduction in SOD levels indicates a decrease in oxidative stress. Histopathological analyses confirmed improved re-epithelialization, granulation tissue formation and overall tissue regeneration in the treated group. These results underscore the potential of Phenolic Monoterpenoid-loaded cubosomes as a promising therapeutic nanoplatform for effective wound care. This system offers sustained drug release, enhanced skin penetration and deposition of Phenolic Monoterpenoid-loaded cubosomes in skin and improved therapeutic efficacy, making it particularly suitable for wound management.

Keywords: Phenolic monoterpenoids, Skin irritancy, Wound healing.

PH047

Accelerated wound healing and biofilm inhibition by a synergistic Sodium Fusidate- Aloe-Emodin silver-nanoparticle hydrogel.

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Chronic wounds pose a significant global health challenge, primarily due to prolonged inflammation and persistent microbial infections often encapsulated within difficult-to-treat biofilms. This study aimed to evaluate the synergistic wound healing, antimicrobial, and anti- biofilm properties of a novel nanosystem composed of the antibiotic Sodium fusidate, the natural anti-inflammatory agent aloe-emodin, and Silver Nanoparticles. Sodium fusidate and aloe- emodin were successfully co-loaded onto silver nanoparticles through the carbonyl bond. The loaded nanoparticles were amorphous having particle size of 89.2 nm and zeta potential of -28.3 mV. A topical hydrogel was prepared and evaluated. In vitro antimicrobial studies demonstrated that the nanoparticle gel formulation produced a synergistic antimicrobial effect against two common wound pathogens, Staphylococcus aureus and Pseudomonas aeruginosa, evidenced by an enhanced zone of inhibition. Furthermore, the formulation effectively inhibited the formation of bacterial biofilms, as confirmed by the crystal violet assay. In - vivo evaluation utilizing an excision wound model in wistar rats showed that the gel significantly accelerated the wound healing cascade, exhibiting faster wound contraction and a superior therapeutic effect compared to control and marketed formulations. Biochemical assays supported these observations, revealing elevated levels of hydroxyproline alongside reduced levels of superoxide dismutase (SOD) and the inflammatory marker TNF alpha. Histopathological studies confirmed excellent tissue repair, demonstrating complete re-epithelialization and robust collagen deposition in the treated group. In conclusion, the novel Sodium fusidate - aloe-emodin loaded nanoparticle gel formulation presents a promising and effective nanosystem that simultaneously combats drug- resistant biofilms and stimulates tissue regeneration, offering an advanced solution forchronic wound management.

Keywords: Sodium Fusidate, Aloe emodin, Wound healing, Silver nanoparticle, Hydrogel

PH048

A comparative study of the SLN-developed probe sonicator, microwave method and microemulsion method

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The present study focuses on the comparative formulation and evaluation of Cefdinir Monohydrate-loaded Solid Lipid Nanoparticles (SLNs) developed using three distinct techniques- Probe Sonication, Microwave-assisted, and Microemulsion methods. SLNs were formulated with Glyceryl Monostearate, Stearic acid, and Soya lecithin as lipids, using Tween 20 and Tween 80 as surfactants. The prepared SLNs were characterized for particle size, Polydispersity Index (PDI), Zeta potential, Entrapment Efficiency (EE), and in-vitro drug release. Among all formulations, the Probe Sonicator-based SLN exhibited the smallest particle size (189.4 nm), PDI of 0.231, and Zeta potential of −32.8 mV, indicating excellent colloidal stability. The Entrapment Efficiency achieved was 92.6%, significantly higher than the Microwave (81.3%) and Microemulsion (77.5%) methods. Saturation solubility of the probe- sonicated formulation increased threefold compared to the pure drug, enhancing dissolution and bioavailability. The in-vitro release profile demonstrated a sustained release of 96.8% over 24 hours with an initial burst release of 15% within the first 2 hours. The optimized SLN gel (Carbopol 934-based) exhibited ideal viscosity (4280 cps), pH (6.8), and spreadability (6.2 gcm/sec), ensuring effective topical application. Antibacterial testing via the Kirby–Bauer method revealed a zone of inhibition of 25.6 mm, confirming enhanced antimicrobial activity of the SLN formulation against Gram-positive and Gram-negative bacteria. The study concludes that the Probe Sonicator method is superior in producing stable, efficient, and bioavailable SLNs for improved delivery of Cefdinir Monohydrate.

KEYWORDS: Solid Lipid Nanoparticles (SLNs), Cefdinir Monohydrate, Probe Sonication Technique, Microwave-Assisted Synthesis, Nanocarrier Drug Delivery System, Glyceryl Monostearate (GMS), Topical SLN Gel,

PH049

From poor absorption to enhanced uptake Efavirenz solid lipid nanoparticle and the lymphatic advantages.

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This study aimed to develop and optimize efavirenz-loaded solid lipid nanoparticles (EFA-SLNs) to enhance oral bioavailability by promoting lymphatic uptake and circumventing extensive first-pass metabolism. Efavirenz, a BCS class II antiretroviral with poor aqueous solubility and variable oral bioavailability, was selected as a model drug. Lipid screening identified Gelucire 43/01, in combination with glyceryl monostearate, as suitable carriers based on solubility and prevention of gelation. A Box–Behnken design (3 factors: lipid concentration, Tween 80 concentration, homogenization pressure) was employed to study their effects on particle size and drug content using high-pressure homogenization for SLN preparation. Optimized EFA-SLN showed a mean particle size of about 100 nm, drug content around 10%, smooth spherical morphology, and a slightly negative zeta potential favorable for lymphatic uptake. Ex vivo studies in presence of chlorpromazin in everted rat gut sac demonstrated higher permeability of EFA-SLN than bulk drug and confirmed an endocytic uptake mechanism. In vivo pharmacokinetic studies in rats revealed a marked increase in Cmax(8.53 ug/ml) and AUC(41.4915 ug.h/ml.) for EFA-SLN compared with pure efavirenz Cmax(4.50 ug/ml) and AUC(18.8561ug.h/ml),indicating improved systemic exposure. Co-administration with lymphatic uptake blocker significantly reduced plasma and lymphatic levels, supporting the role of clathrin-mediated, lymphatic transport in SLN uptake. Overall, EFA-SLNs prepared by high-pressure homogenization appear as a promising strategy to enhance oral bioavailability of efavirenz.

PH050

Transferosome-integrated film-forming spray: development and evaluation for wound healing

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The present research focuses on the development of a curcumin-loaded transferosome-based film-forming spray for effective wound healing. Curcumin, a natural compound with antioxidant, anti-inflammatory, and antimicrobial activities, was selected as the model drug. Transferosomes were prepared by the thin-film hydration method using phospholipids, cholesterol, and an edge activator, and optimized for vesicle size, zeta potential, entrapment efficiency, and deformability. The optimized formulation (TRF5) exhibited a vesicle size of
~200 nm, PDI 0.36, zeta potential −31 mV, and high entrapment efficiency, confirming good stability and homogeneity. FTIR and DSC analyses demonstrated compatibility. In vitro release
studies showed sustained drug release, while permeation through diffusion membrane confirmed enhanced penetration compared to plain curcumin solution.

The optimized transferosomes were incorporated into a hydroxypropyl methylcellulose (HPMC)-based polymeric solution to prepare film-forming sprays. These formulations were evaluated for physicochemical properties, spray pattern, viscosity, drying time, and stickiness. The optimized spray produced uniform, transparent, and quick-drying films with non-sticky surfaces, ensuring ease of application and patient acceptability. Antimicrobial studies demonstrated significant zones of inhibition against Staphylococcus aureus and Pseudomonas aeruginosa, supporting the therapeutic relevance of the formulation. Stability testing under ICH conditions for one month indicated no major changes in physicochemical parameters or vesicle properties.

Overall, the curcumin-loaded transferosome film-forming spray exhibited promising potential as a patient-friendly, stable, and effective wound-healing delivery system.

PH051

Formulation development and optimization of Caffeine effervescent tablets using fluidized bed granulation

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Caffeine a BCS class I drug, a central nervous system stimulant. In a present work caffeine was formulated into effervescent granule using fluidized bed granulation (FBG) technology and further as effervscent tablets. Process parameters were optimized in order to obtain desired flow properties and effervescent time. The present study aimed to develop and optimize caffeine effervescent tablets using fluidized bed granulation (FBG) technology. Granules were optimized employing a 3^2 factorial design, where atomization air pressure X_1 (0.4,0.5,0.6 bar) and spray speed rate X_2 (3,5,7 rpm) were selected as independent variables at three levels. Effervescence time, process time, and angle of repose were evaluated as dependent response variables. As per Design expert software 16 trails were suggested and 13 trial batches were evaluated and Response surface methodology and ANOVA were applied to analyze the effects of the formulation variables and their interactions. The results demonstrated that atomization air pressure of 0.4 bar and spray speed rate of 7rpm significantly influenced effervescence time of 182 sec and process time of 34min, while angle of repose showed a non-significant effect. Higher atomization air pressure 0.4bar resulted in reduced effervescence time 182sec and processing time to 34 min. Optimized formulation batches complied with pharmacopoeial limits for effervescence time 182 sec , assay of 97.52±0.21%, and in-vitro dissolution at 15 min of 91.10±0.69%. The study concludes that fluidized bed granulation is a robust and efficient technique for the development of caffeine effervescent tablets, and optimization of critical process parameters is essential to achieve consistent product quality and performance.

PH052

Exploitation of natural resources for therapeutic application: spray dried Neera Powder

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Urolithiasis is one of the most common urinary tract disorders, characterized by stone formation that leads to pain, hematuria, and recurrent infections. Neera, a natural non-alcoholic sap obtained from the unopened inflorescence of the coconut palm, is rich in essential nutrients such as iron, phosphorus, ascorbic acid, and amino acids. The major drawback of neera is its tendency to ferment quickly under ambient conditions, thereby limiting its shelf stability.

The present study aimed to enhance the shelf life of neera using the spray drying technique and to assess the anti-urolithiatic potential of spray-dried neera powder. Fresh neera was spray dried to obtain a stable powder form. The prepared powder was subjected to physical characterization, including appearance, flowability, and solubility. The anti-urolithiatic activity was evaluated using an egg membrane model, where decalcified egg membranes were used to assess the inhibition of stone formation.

The spray-dried neera powder showed acceptable physical properties and good reconstitution ability. The reconstituted neera solution demonstrated a significant ability to inhibit stone formation, indicating notable anti-urolithiatic activity.

The study demonstrates that spray drying effectively improves neera stability and shelf life without compromising its medicinal value. Spray-dried neera powder exhibits promising anti- urolithiatic potential and may serve as a natural, nutraceutical alternative for the management and prevention of urolithiasis.

PH053

Respiratory and pulmonary applications of *Suvarna Sindoora* (A-Hgs): stoichiometric analysis, powder engineering, and formulation of a scientifically-based inhalable herbo-mineral dpi for respiratory diseases

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With mounting air pollution levels and climate change, the incidence of respiratory diseases has also increased globally. This has created a need for effective pulmonary drug delivery systems. Although Suvarnasindoor (α-HgS), an herbomineral compound, has substantial anti-inflammatory properties, its use has been limited due to poor aerosol ability and a requirement for high doses. This study developed a dry powder inhaler using Suvarnasindoor along with curcumin and Piperine to improve its potency in treating respiratory conditions. Additionally, it enhanced dispersibility. This study involved particle processing using a "bottom-up" spray-drying method referred to as F10. Spray-drying processes were also analysed using traditional ball milling processes called F6. The obtained results of XRD, XPS, LC- MS, and ICP-AES analyses identified improved compatibility of α-HgS. The outcomes also indicated effective combination of bio-excipient particulates. Test assessment using an ACI indicated a 50% improvement in emittance in F10 compared to the unprocessed formulation. Additionally, FPF values of 38.86% indicated deeper tissue deposition. During in vivo studies on six test animals using a saline formulation of 0.3 ml, it indicated a safe dose. At a concentration of 6.3 mg, epithelial rat toxicity and mild irritation in bronchial tissue irritation was observed. Therefore, further safety tests determined safety at a dose of 50% (3.16 mg) of ¼ doses. This study thus highlights an effective approach to transform herbomineral compounds for application in superior DPI-formulated respiratory drugs.

PH054

"Formulation and evaluation of Leflunomide containing microneedle patch for rheumatoid arthritis treatment"

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Transdermal drug delivery offers a promising alternative for rheumatoid arthritis(RA) management by bypassing the limitations of oral therapy. In this study, Leflunomide (LFN) was successfully integrated into a microneedle-based transdermal patch designed to enhance controlled drug release while minimising systemic side effects. The microneedle patches were fabricated using a micromolding technique with an optimised polymeric composition. A comprehensive evaluation of the patches revealed favourable physicochemical and mechanical properties.

Morphological analysis by Scanning Electron Microscopy revealed uniformly formed, sharp microneedles capable of efficient skin penetration. Drug content determination showed excellent entrapment efficiency (> 95%), ensuring consistent therapeutic dosing. Mechanical strength testing confirmed that the patches maintained structural integrity with force resistance exceeding 0.5 N, indicating suitability for reliable application. Folding endurance testing produced values above 300 cycles, reflecting superior flexibility and resilience. Moisture uptake studies conducted over 72 hours revealed minimal moisture absorption (< 5%), indicating stability under variable humidity.

In vitro permeation studies using Franz diffusion cells demonstrated sustained and controlled drug release, with approximately 85% of Leflunomide released over 48 hours. The calculated permeation flux was 1.65 µg/cm²/h, indicating effective transdermal transport. Release kinetics aligned with diffusion-controlled models, underscoring the potential for extended therapeutic action. These findings suggest that the developed Leflunomide microneedle patches exhibit robust mechanical, physicochemical, and drug delivery performance, supporting their potential application in RA management. Further in vivo studies will be essential to confirm clinical efficacy and safety.

Keywords: Leflunomide, Transdermal Microneedle Patch, Rheumatoid Arthritis, In Vitro Permeation, Mechanical Evaluation, Controlled Release.

PH 055

"Development and evaluation of liquid bandage incorporating Curcumin loaded calcium phosphate nanoparticle for wound healing"

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Chronic wounds, particularly those associated with diabetes and infection, remain a major clinical challenge due to delayed healing and rising antibiotic resistance. This research aimed to develop and evaluate a liquid bandage incorporating curcumin-loaded calcium phosphate Nanoparticles (CaPNPs) to enhance wound healing efficacy. Curcumin was selected for its broad pharmacological properties; however, its low water solubility and bioavailability restrict clinical utility. To address these limitations, CaPNPs were synthesized by a co-precipitation method using chitosan as a stabilizer. The optimized batch (F1) exhibited desirable characteristics including a particle size of 236.9 nm, zeta potential of 19 mV, entrapment efficiency of 78.6 %, and PDI of 0.740. The liquid bandage formulation demonstrated a pH of 5.28, drying time of 3-4 minutes, and favorable viscosity and film-forming properties. In-vitro release studies confirmed sustained drug release, with 94.99±0.8 % from nanoparticles and 92.12±0.4% from the final formulation over 300 - 420 minutes. Antimicrobial assays revealed strong inhibition against Staphylococcus aureus (16±0.5 mm) and Pseudomonas aeruginosa (14.1±0.3mm), indicating effective antibacterial activity. This study concludes that curcumin- loaded CaPNPs in a liquid bandage base offer a promising and patient-compliant system for topical wound care. The formulation provides sustained drug delivery, antimicrobial protection, and enhanced wound healing potential, making it a viable alternative to conventional topical therapies.

PH056

Development of cubosomal gel engrossed with a polyphenolic phytoactive for accelerated wound repair

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Challenges in wound healing are commonly associated with delayed tissue repair, elevated oxidative stress, and microbial infections at the wound site. In this research, cubosomal gel engrossed with a polyphenolic phytoactive was developed to promote accelerated wound repair. Process parameters were statistically optimized to achieve stable and uniform nanosized cubic structured particles with effective encapsulation of the phytoactive in the liquid crystals. The developed delivery system exhibited nanosized particles with uniform distribution and favourable zeta potential indicating the formation of a stable nanostructured system. Significant entrapment efficiency and loading capacity confirmed effective incorporation of the polyphenolic phytoactive within the liquid crystals. *In vitro* release exhibited sustained release of the phytoactive at the wound site. Antimicrobial activity of the cubosomes against wound- associated microbes supported the prevention of infections at the site of the wounds. For topical application, the cubic nanoparticulate system was incorporated into the Carbopol gel base and was evaluated for pH, viscosity, and spreadability. *Ex vivo* skin permeation and deposition studies revealed enhanced skin retention, while occlusion studies confirmed the ability of the formulation to provide hydration to the skin. Antioxidant activity of the formulation showed low oxidative stress at the wound site. *In vivo* studies on animal models demonstrated faster wounds healing and tissue regeneration. Skin irritancy studies proved the dermatological safety of the formulation. This work overall shows that the developed phytoactive cubogel is safe and effective for wound healing.

Keywords: Cubosomes, wound healing, permeation, polyphenolic phytoactive, liquid crystals.

PH057

Formulation and evaluation of Telmisartan Co-amorphous Dispersion

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Telmisartan, a widely prescribed angiotensin II receptor blocker, belongs to Biopharmaceutical Classification System (BCS) Class II and exhibits poor aqueous solubility, resulting in low and variable oral bioavailability. The present study aimed to formulate and evaluate a co-amorphous dispersion of Telmisartan to enhance its solubility, dissolution rate, and bioavailability using D-biotin as a low-molecular-weight co-former.

Co-amorphous dispersions of Telmisartan and D-biotin were prepared in different molar ratios using the solvent evaporation method. The prepared systems were characterized forsolid-state properties using Fourier Transform Infrared Spectroscopy (FTIR), Powder X-ray Diffraction (PXRD), and Differential Scanning Calorimetry (DSC) to confirm intermolecular interactions, loss of crystallinity, and formation of a single-phase amorphous system. Solubility and in-vitro dissolution studies were performed to assess performance enhancement.

The optimized co-amorphous dispersion demonstrated a significant improvement in solubility and dissolution rate compared to crystalline Telmisartan. The optimized system was further formulated into tablets by direct compression and evaluated for pre-compression and post- compression parameters. In-vitro dissolution, pharmacokinetic evaluation, and accelerated stability studies confirmed improved drug release, enhanced bioavailability, and acceptable physical stability.

The study concludes that co-amorphous dispersion using D-biotin is an effective and stable strategy to enhance the solubility and oral performance of Telmisartan, offering a promising alternative to conventional solubility enhancement techniques.

PH058

Berberine hydrochloride loaded transethosomal gel for management of Psoriasis

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Berberine HCl is designed to improve oral absorption, stability and water solubility in comparison to the plain berberine for the treatment of Psoriasis. Strong hydrophilicity of berberine HCL restricts it's topical administration. That's why Berberine hydrochloride was effectively loaded into a transethosomes and incorporated into hydrogel system to treat Psoriasis. A zeta potential of −21.6 ± 1.1 mV, polydispersity index (PDI) of 0.269 ± 0.01, entrapment efficiency of 93.8 ± 1.33%, and a particle size of 132.3 ± 16.6 nm were all displayed by the optimized transethosomal formulation. Analysis using Transmission Electron Microscopy (TEM) verified the spherical shape of vesicle. The effective encapsulation of the drug within the vesicular matrix and no physicochemical interactions between the drug and excipients was confirmed by solid-state characterization techniques (FTIR, DSC and XRD). When compared to the pure drug dispersion, in vitro drug release experiments showed a noticeably improved release profile from the transethosomal formulation. Additionally, biological tests such as ELISA-based cytokine analysis, antioxidant assay, and anti- proliferative assay demonstrated a significant increase in biological activity of the transethosomal formulation as compared to the pure drug and the blank carrier. The developed transethosomal gel demonstrated enhanced drug deposition and epidermal penetration, achieving the primary goal of study. Experiments on skin irritation verified the gel's biocompatibility and showed that it was suitable for topical application. Furthermore, the formulation's chemical and physical stability during the evaluation period was confirmed by expedited short-term stability testing. These results suggests that the drug-loaded transethosomal gel is a successful therapeutic strategy for the management of psoriasis.

Keywords: Berberine Hydrochloride, Psoriasis, Ultradeformable carrier, Transethosmes, Gel

PH059

Formulation and evaluation of Fenugreek oil and Cinnamon extract emulgel for hair growth

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The study aimed to develop and evaluate an emulgel as a novel topical drug delivery system and to assess its efficacy in promoting hair growth. Fenugreek oil and cinnmon extract–based emulgels were formulated and optimized by varying the concentrations of the gelling agent (Carbopol 980) and surfactant (Span 20 and Tween 80). The emulgels were characterized for globule diameter, spreadability, and viscosity. The effect of formulation on hair growth was assessed using the rat hair growth model. The optimized formulation, containing 2.25 g of gelling agent and 6 mL of surfactant, had a globule diameter of 717 nm, spreadability of 32.2 g, and viscosity of 25,000 cP. In-vitro release studies showed that drug release was inversely proportional to gelling agent concentration and directly proportional to surfactant concentration. In-vivo studies showed, the hair growth initiation time for the test formulation to be **6 days**, which was comparable to the standard (2% Minoxidil solution) group (**7 days**) and faster than the control group (**8 days**). Complete hair growth was observed within **21 days** for both the test and standard groups, whereas the control group required **28 days**. Stability studies indicated that the optimized emulgel remained physically stable, with acceptable globule size, viscosity, and spreadability. Thus, it can be concluded that formulated fenugreek oil emulgel was stable and effectiveness is as per with marketed standard.

PH060

Solubility enhancement and development of sublingual wafers containing polymeric matrix of antihypertensive drug

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Telmisartan, an angiotensin II receptor blocker used to treat hypertension, has low oral bioavailability and poor water solubility. The goal of the current study was to improve telmisartan solubility and create immediate-release sublingual wafers utilising a polymeric matrix made by the freeze-drying (lyophilization) method. Polymers such as sodium alginate, PVP K-30, gelatine, and glycine were used to create telmisartan-loaded wafers. Mannitol was used as a filler, and sodium starch glycolate served as a superdisintegrant. Sodium hydroxide was chosen as a pH modifier. It demonstrated the greatest solubility enhancement of telmisartan (91.15 mg/mL) in comparison to sodium bicarbonate (14.65 mg/mL) and sodium carbonate (36.68 mg/mL). Preformulation investigations verified the drug's purity and excipient compatibility. Drugs and polymers were dissolved to create wafers, which were then frozen and lyophilized. The optimised formulation (F3: sodium alginate:PVP K-30, 1:1 ratio with 8% SSG) demonstrated good stability with a low moisture content (3.12%), consistent drug content (99%), quick disintegration (30 seconds), and short wetting time (9 seconds). Telmisartan's solubility dramatically improved to 0.307 mg/mL in comparison to the pure drug's 0.00619 mg/mL. In vitro drug release tests in phosphate buffer pH 6.8 showed a cumulative drug release of 96.56% in 30 minutes. first-order kinetics governed drug release, and SEM verified the wafers' porous structure, which facilitated quick disintegration. Studies using DSC and XRD revealed that the medication had changed from a crystalline to an amorphous state. Therefore, lyophilized sublingual wafers of telmisartan present a viable strategy for improved bioavailability in the treatment of hypertension.

PH061

"Development and evaluation of polymeric mixed micelles for anticancer therapy"

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Cancer therapy is often limited by poor solubility, low bioavailability, and systemic toxicity of anticancer drugs. Sorafenib tosylate, a widely used anticancer agent, exhibits low aqueous solubility, reducing its therapeutic effectiveness. This study focuses on the development and evaluation of polymeric mixed micelles to enhance drug solubility, stability, and controlled release. Mixed micelles were formulated using Soluplus® and TPGS 1000, and optimized polymer ratios were selected based on particle size, zeta potential, and entrapment efficiency. A dual-drug micellar system co-loaded with Sorafenib tosylate and Albendazole was also explored to improve anticancer potential.

The optimized formulations were characterized using FTIR, DSC, SEM, and TEM, confirming compatibility and stability. In-vitro drug release studies demonstrated sustained and controlled release behavior. Overall, the developed polymeric mixed micelle system showed enhanced solubility and promising characteristics for improved anticancer therapy, providing a potential nano-delivery platform for future biological and in-vivo evaluations.

KEYWORDS: Polymeric mixed micelles; Sorafenib tosylate; Albendazole; Soluplus®; TPGS 1000; Nano drug delivery; Anticancer therapy; Sustained drug release

PH062

Development and evaluation of Metformin HCl sustained release tablets by top spray and tangential spray hot melt granulation

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Sustained-release drug delivery systems prolonged therapeutic drug levels and improved patient compliance by reducing dosing frequency and plasma concentration fluctuations. This study aimed to formulate sustained-release metformin hydrochloride tablets using Compritol® 888 ATO and to evaluate the effects of top-spray versus tangential-spray hot-melt granulation on tablet properties and in vitro drug release. Metformin hydrochloride sustained-release formulations were prepared using Compritol® 888 ATO as a lipophilic matrix former and Klucel LF as a polymeric binder by top spray and tangential spray hot-melt granulation in a fluid bed processor. The granules were evaluated for flow, compressibility, particle size, and morphology, while the compressed tablets were assessed for physical parameters and in vitro drug release. Drug–excipient compatibility was confirmed by FTIR, and dissolution studies were performed in pH 6.8 phosphate buffer using a USP type II apparatus. Hot-melt granulation by top-spray (F3) and tangential spray (F7) techniques produced granules with acceptable flow and compressibility. F3 exhibited a bulk density of 0.55 g/mL and Carr's index of 16.47%, while F7 showed 0.57 g/mL and 19%, respectively. SEM analysis indicated irregular granules forF3, whereas F7 yielded spherical, compact granules with superior morphology. Tablets from both batches met pharmacopeial specifications. In vitro dissolution studies confirmed sustained drug release, with F3 showing slightly faster release (89.46% at 10 h) than F7 (86.59% at 10 h), and both complied with USP requirements. Tangential spray improved granule uniformity, while top-spray provided slightly higher drug release; both formulations met USP requirements.

PH063

Alkalization-assisted Telmisartan solid dispersion using sodium hydroxide–Meglumine system for enhanced dissolution using fluid bed processor technology

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Telmisartan, an angiotensin II type-1 receptor blocker used to treat hypertension and reduce cardiovascular risk, has very low pH-dependent solubility across gastrointestinal pH conditions, leading to poor dissolution and limited oral bioavailability. Therefore, improving its solubility is essential to enhance dissolution rate, ensure consistent absorption, minimize variability in therapeutic response, and ultimately achieve better clinical efficacy. Telmisartan is primarily absorbed from the small intestine, with better absorption occurring in the distal small intestine (jejunum–ileum) where the pH is higher, because its solubility improves in alkaline conditions. Absorption from the stomach is negligible due to its poor solubility at acidic pH. In the current research, Sodium Hydroxide (NaOH)–Meglumine-Polyvinyl Pyrrolidone K25 (PVP-K25) aqueous system and mannitol as carrier were used to develop stable Telmisartan solid dispersion (Telmi-SD) with improved solubility in alkaline pH using Fluid Bed Processor (FBP) Technology.

Excipients were selected based on API-excipient compatibility study using HPLC method for detection of impurities. Effect of various concentrations of Sodium Hydroxide, Meglumine and PVP K25 were studied on solubility. A 148-fold higher solubility was achieved using 3.36mg NaOH, 12mg Meglumine and 2.5mg PVP-K25 and more than 90% release was obtained at the end of 60min. Telmi-SD Tablets dissolution profile was similar to dissolution profile of reference product, Micardis Tablets. Formation of amorphous solid dispersion of Telmisartan was confirmed using absence of sharp endothermic melting peak in differential scanning calorimetry and X-ray diffraction analysis. FBP-based NaOH–Meglumine–PVP solid dispersion markedly improved Telmisartan solubility, dissolution, and achieved reference product-like performance in-vitro.

PH064

Formulation and development of Luliconazole topical spray for the treatment of Athlete's Foot (Tinea Pedis)

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Athlete's foot (tinea pedis) is a common superficial fungal infection that requires effective topical therapy with improved patient compliance and localized drug delivery. Luliconazole, a potent imidazole antifungal agent, exhibits broad-spectrum activity against dermatophytes but requires an optimized formulation to enhance skin retention and therapeutic performance. The present study aimed to formulate and evaluate a luliconazole topical spray using a film forming polymeric system for the effective treatment of tinea pedis. The formulation was developed using suitable film-forming polymers, plasticizers, and volatile solvents to obtain a clear and uniform topical spray. Preformulation studies confirmed drug purity and compatibility with selected excipients. The prepared formulations exhibited acceptable physicochemical properties with pH values suitable for skin application (5.5–6.8), uniform drug content (98– 101%), and appropriate viscosity for sprayability. In vitro diffusion studies demonstrated sustained drug release from the polymeric film, showing more than 85% drug release within 8 hours. The optimized formulation exhibited enhanced drug permeation compared to conventional topical preparations, indicating improved skin retention. Antifungal activity studies revealed a significant zone of inhibition against dermatophyte strains (≥40 mm), confirming preserved antifungal efficacy after formulation. Stability studies conducted under accelerated conditions showed no significant changes in appearance, pH, drug content, or diffusion profile over the study period, indicating good formulation stability. Overall, the developed luliconazole topical spray provided uniform drug distribution, sustained release, improved antifungal activity, and better patient convenience. Thus, film-forming luliconazole topical spray formulations represent a promising and effective approach for the management of tinea pedis.

PH065

Evaluation of Carboxymethyl Ethyl Cellulose as an enteric coating polymer

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The study aimed to evaluate enteric coating potential of carboxymethyl ethyl cellulose (CMEC) using diclofenac sodium tablets as a model formulation. Diclofenac sodium tablets (50 mg) were prepared and coated using 7.5%, 5%, and 4% w/w CMEC solutions at varying weight gains (3 to 10%). The coated tablets were evaluated for hardness, thickness, acid uptake, disintegration behavior, assay, and drug release in 0.1 N HCl (2 h) followed by buffer (45 min). Further trials involved coating the tablets with 4% CMEC solution containing varying concentrations of triethyl citrate as plasticizer and even without plasticizer. The tablets coated up to 5% weight gain with solution containing no plasticizer were subjected to accelerated stability studies. Tablets coated with 7.5% and 5% CMEC exhibited < 10% drug release in 0.1 N HCl but showed lower drug release in pH 6.8 buffer (61–76%). Optimization using 4% w/w CMEC coating solution without plasticizer and with a 5% weight gain, resulted in tablets with acceptable quality attributes and <5% drug release in acidic medium and 87.88 ± 1.46 % release in pH 6.8 buffer. Accelerated stability studies for three months showed no significant change in drug release profile, assay, or physical parameters. The diclofenac sodium tablets coated with optimized coating solution of CMEC demonstrated effective pH-dependent enteric release that complied with the pharmacopeial specifications. The findings confirm CMEC as a promising polymer that can form effective enteric coating films on the tablets without the need of a plasticizer.

PH066

Berberine HCl and Diclofenac sodium loaded dual delivery ethosomes : formulation and optimizationusing box-behnken design.

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This study focuses on developing and optimizing Ethosomes—a type of lipid-based vesicle for the topical delivery of berberine HCl and diclofenac sodium to manage rheumatoid arthritis. Berberine is a poorly soluble alkaloid with strong anti-inflammatory effects, capable of suppressing pro-inflammatory cytokines like TNF-α, IL-12, and IL-23. Diclofenac sodium, a nonsteroidal anti-inflammatory drug, reduces joint inflammation and pain by inhibiting cyclooxygenase (COX) enzymes. Ethosomes were prepared using a cold method and optimized through a Box-Behnken design, evaluating the effects of phosphatidylcholine quantity, cholesterol quantity, and rotation speed on particle size and entrapment efficiency. The optimized formulation exhibited a vesicle size of 132.59±2.8 nm and high entrapment efficiencies of 83.02±1.5% for berberine HCl and 86.12±1.8% for diclofenac sodium. The zeta potential was -34.7±0.6 mV, indicating good stability. Characterization included Fourier transform infrared spectroscopy (FTIR), transmission electron microscopy (TEM), in vitro drug release, and ex vivo skin permeation studies. The Ethosomal gel demonstrated sustained drug release over 12 hours—86.75±0.81% for diclofenac sodium and 81.46±3.81% for berberine HCl. Stability tests confirmed the formulation remained stable for three months at 4°C and 25±2°C with 60±5% relative humidity. These findings highlight the successful optimization of Ethosomes as an effective topical delivery system for berberine HCl and diclofenac sodium, offering promising therapeutic potential in the treatment of rheumatoid arthritis.

Keyword: Diclofenac Sodium, Ethosomes, Berberine Hydrochloride, Topical Drug Delivery, Box-Behnken Design.

PH067

In-vitro comparative investigation of antiasthmatic potential of different extracts of *Linum usitatissimum*

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Fora long time, Flaxseed, or *Linum usitatissimum*, has been well known for its abundance in α-linolenic acid (ALA/ omega-3 fatty acid), lignans, and dietary fiber. It is also used for its therapeutic properties, including anti-inflammatory, antioxidant, immunomodulatory, antidiabetic, anticancer, cardiovascular, autoimmune, and neuroprotective effects.

The present work aims to assess the antiasthmatic potential of different flaxseed extracts by evaluating their antihistaminic and anti-inflammatory activities. Defatted flaxseed powder was subjected to successive extraction using chloroform, ethyl acetate, ethanol, and water. Antihistaminic activity was performed on isolated goat tracheal tissue, while anti-inflammatory activity was evaluated by the human red blood cell (HRBC) membrane stabilization assay, which mimics lysosomal membrane stabilization. Among all extracts, the ethanol extract demonstrated a 76% reduction in histamine-induced tracheal tissue contraction at 800µg/ml. While in the membrane stabilization testing, water extract, at 1000ug/ml, showed better dose dependant inhibition of HRBC haemolysis, with 62% protection relative to the standard ibuprofen.

From the above study, it was concluded that *Linum usitatissimum* possesses significant antihistaminic and anti-inflammatory properties, supporting its potential role as a promising therapeutic candidate for the management of asthma. A thorough analysis is required to determine the phytoconstituents responsible for the prior outcomes and their therapeutic efficacy in the management of asthma.

Keywords: *Linum usitatissimum*, Antiasthmatic activity, Antihistaminic activity, Anti-inflammatory activity, goat trachea bioassay, HRBC membrane stabilization.

PH068

"Development and evaluation of novel caromin film spray (Cfs) for the treatment of Androgenetic Alopecia"

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Androgenetic alopecia (AGA) is a progressive hair loss disorder characterised by follicular miniaturisation and reduction of the anagen phase due to androgen-mediated activity, particularly dihydrotestosterone (DHT). Conventional treatments such as topical minoxidil and oral finasteride are limited by local irritation, systemic side effects, and poor cosmetic acceptability, highlighting the need for safer and more patient-friendly topical delivery systems. The present study focuses on the development and evaluation of a novel film-forming spray (FFS) containing minoxidil in combination with Rosmarinus officinalis (rosemary) leaves extract, intended to produce synergistic therapeutic action with sustained drug delivery.

The formulation was prepared using HPMC E15 as the film-forming polymer, along with PEG- 400 and glycerin as plasticisers, and an ethanol–acetone solvent system to facilitate rapid drying. A 3^2 factorial design was employed to optimise polymer and plasticiser concentrations with respect to viscosity, drying time, film flexibility, spray characteristics, and drug release behaviour. Phytochemical evaluation confirmed the presence of phenolics, flavonoids, and tannins in rosemary extract, supporting its antioxidant and 5α-reductase inhibitory potential. The optimised formulation exhibited desirable physicochemical characteristics, uniform drug content, rapid film formation, and good flexibility. In vitro diffusion studies demonstrated sustained release of minoxidil and carnosic acid following Higuchi kinetics, while skin irritation studies indicated excellent dermal safety. In vivo studies in testosterone-induced AGA mouse models demonstrated a significant improvement in hair regrowth parameters compared to controls and minoxidil alone.

Overall, the developed FFS presents a promising, cosmetically acceptable, and safer alternative topical therapy for AGA with enhanced therapeutic efficacy and reduced minoxidil-associated toxicity. (Indian patent 202521075913 A published)

KEYWORDS: Androgenetic alopecia, Film-forming spray, Minoxidil, Rosemary extract, Carnosic acid, Hydroxypropyl methylcellulose (HPMC), Sustained drug release.

PH069

Dual-Drug Solid Lipid nanoparticle-based gel of Adapalene and Quercetin for enhanced topical therapy of acne vulgaris

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The gold standard for third-generation retinoids is adapalene, but "retinoid dermatitis" often restricts its use. This is complemented by Quercetin, which has direct antimicrobial activity and potent anti-inflammatory and antioxidant effects to reduce irritation and restore the skin barrier. By concurrently addressing follicular clogging, bacterial growth, and the inflammatory response, the combination of adapalene and Quercetin improves overall treatment efficacy and results in faster lesion clearance with noticeably improved skin tolerance. SLNs provide better bioavilability and reduced toxicity as compared to conventional topical formulations. Solvent injection was used to prepare SLNs, which were then optimised using a Box-Behnken design. The concentration of glyceryl monostearate, the combination of surfactants (Span 20 and Tween 80), and stirring speed were chosen as independent variables. Response parameters included particle size, entrapment efficiency, and in vitro drug release. The optimized SLN formulation exhibited a mean particle size of 176.4 ± 3.8 nm, polydispersibility index was found to be 0.235 and a zeta potential of −30.8 mV, indicating good colloidal stability. Entrapment efficiency was found to be 89.57 ± 2.3% for Adapalene and 80.3 ± 2.6% for Quercetin. In vitro release studies demonstrated sustained drug release, with cumulative release of 72.89 ± 3.4% for Adapalene and 68.01 ± 4.3% for Quercetin. The optimized SLN dispersion was incorporated into a carbopol 940 gel. The developed SLN-based gel showed promise as an effective topical delivery system for the treatment of acne vulgaris

Key words: Adapalene, Quercetin, solid lipid nanoparticles, solvent injection method, acne vulgaris, Topical delivery

PH070

Elucidating the multi-target therapeutic mechanisms of Chrysin in Epilepsy using network pharmacology

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Epilepsy is a neurological disorder that has many molecular targets and signaling pathways requiring multi-target therapeutic approaches. The naturally occurring flavonoid, Chrysin, has demonstrated encouraging neuroprotective, antioxidant, as well as anti-inflammatory effects but the underlying molecular mechanisms in epilepsy are not fully researched. Systematic explanation of the possible therapeutic targets and signaling pathways of chrysin in epilepsy was conducted in this research by use of a network pharmacology approach. Potential targets of chrysin were estimated by Swiss Target Prediction, whereas genes related to epilepsy were harvested out of Gene Cards and Drug Bank. Venny 2.1 was used to identify common targets and then to provide a protein-protein interaction (PPI) network over the STRING database. Key hub genes have been discovered through network analysis alongside the CytoHubba plug- in in Cytoscape., functional enrichment analysis with shinygogo 0.80 to Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analysis was performed. Network analysis revealed that EGFR, IGF1R, SRC, ESR1, GSK3B, PARP1, MET, PTGS2, MMP9 and KDR are significant hub genes related to neuronal signaling, inflammatory regulation, synaptic plasticity and apoptosis in relation to epilepsy. The results of GO and KEGG enrichment indicated that the PI3K-Akt, MAPK, Ras, ErbB, and Rap1 signaling events and processes involving protein kinase activity, oxidative stress response, and intracellular signal transduction were significantly modulated. Altogether, these results indicate that chrysin has antiepileptic potential via multiple targets and mechanisms, which justifies its applications as a multi-mechanistic drug in the treatment of epilepsy.

Keywords: Chrysin; Epilepsy; Network pharmacology; Multi-target mechanisms; KDR

PH071

Topical therapy for bacterial skin infections caused by *E.coli*: investigating efficacy of *Punica granatum* L. loaded formulation

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The study developed a novel topical drug delivery system of *Punica granatum L.* peel extract for the treatment of *Escherichia coli* skin infections using ethosomal nanocarriers and a synergistic combination with tetracycline hydrochloride. The peels of *Punica granatum* were authenticated, extracted by hydroalcoholic maceration, and phytochemical screening was conducted. Ethosomal formulations were prepared and optimized using Central Composite Design, and characterized for all formulations for particle size, zeta potential, entrapment efficiency, and drug release. The optimized ethosomes were incorporated into a cream base in both alone or in combination with tetracycline HCI, and the cream formulations were tested against E coli (ATCC 25922) utilizing an agar diffusion method. The extract had a yield of 45.96±1.51% with significant phenolic (GAE), flavonoid (QE), and tannin (TAE) content. The optimized ethosomal batch demonstrated a particle size of 148.1±2.3 nm, zeta potential of - 38.6±1.4 mV, and entrapment efficiency of 94.98±1.2% with stable release of phenols (89.2±2.1% and tannins (92.5±1.8%) over 5 hours. Antibacterial testing revealed that 2% ethosomal extract cream had moderate inhibition (ZOI : 2.9±0.3 mm). 1.5% tetracycline cream had minimal inhibition (0.6±0.1 mm) and the combined cream had a significantly larger ZOI (8.7±0.5 mm). confirming that this cream exploits synergistic action. Ethosomal encapsulation of the *Punica granatum* peel extract under study enhanced stability, penetration and antibacterial ability. The combined cream with tetracycline is a scalable, biocompatible, and effective means of treating *E. Coli* resistant skin infections.(Indian patent 202521076487 A published)

Keywords: Punica granatum; Ethosomes; Topical antibacterial cream; Escherichia coli; Synergistic therapy.

PH072

Nanosponges: a breakthrough approach to target neurodegenerative disease.

Sharif U. Karbhari, Kalyani P. Kayande.

The present research focuses on the development of a haloperidol-loaded nanosponge based in situ nasal gel for efficient nose-to-brain delivery. Haloperidol nanosponges were prepared using the emulsion solvent diffusion method and optimized based on particle size, polydispersity index, zeta potential, production yield, and entrapment efficiency. The optimized formulation exhibited a mean particle size of 95.78nm, PDI less than 0.092, zeta potential of -0.44 mV, production yield of 82.32%, and entrapment efficiency of 95.196%. Scanning electron microscopy confirmed spherical nanosponges with a porous structure. The optimized nanosponges were incorporated into a thermosensitive mucoadhesive in situ-gel suitable for nasal administration. In vitro drug release studies of haloperidol nanosponge- loaded in situ-gel demonstrated sustained release, about 40% of haloperidol released within 8 hrs, following diffusion-controlled kinetics. Ex vivo permeation studies across the nasal mucosa revealed enhancement in drug permeation compared to pure drug suspension. Also, the nasal ciliotoxicity study show results that the developed haloperidol nanosponge-loaded in situ-gel is safe for nasal administration. The developed formulation suggest that haloperidol nanosponge-loaded in situ-gel is a promising non-invasive strategy for direct brain targeting and potentially improve the management of Alzheimer's disease.

PH073

Central composite design-based development of Pomegranate seed oil emulgel formulation for cosmeceutical application

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This study aims to develop and optimize an emulgel formulation of pomegranate seed oil(PSO). The study further aims to evaluate its photoprotective and anti-acne activity.Various compositions of the emulsifiers (Span 20 and 80, Kolliphor 20and 80, Poloxamer 188) and stabilizers (guar gum, xanthan gum) were explored to obtain a stable emulsion of PSO. The composition comprising 10% PSO, 10% Capmul PG NF-8, 2.5% each of Span-80 and Kolliphor-80 along with 0.5% xanthum gum was subjected to optimization using centralcomposite design.Emulsion obtained in each trial run was incorporated into a 1%w/w Carbopol 974 gel to obtain emulgel. The resulting emulgels were evaluated forviscosity and in vitro drug release. The optimized formulation suggested by the Design Expert software was subjected to texture analysis, ex vivo skin permeation and retention studies. Photoprotective and antimicrobial activity were further determined for PSO and its emulgel respectively. The optimized emulgel possessing smooth, homogeneous, and cohesive texture, exhibited the viscosity of 3868 ±63.35cps and in vitro drug release of 315.22±13.87 µg/cm². The emulgel exhibited ex vivo skin permeation of 177.97 ± 12.73 µg/cm² and skin retention of 54.21 ± 6.34 µg/cm². The SPF value was calculated to be 43.15 for PSO. The formulation exhibited potent antimicrobial activity against *Propionibacterium acnes* (zone of inhibition 11±2mm). The optimized PSO emulgel was successfully developed and optimized. This herbal-based formulation can be considered as a promising cosmeceutical for sunscreen and anti- acne application.

PH074

"Formulation and evaluation of biodegradable polymeric nanoparticles for sustained release of an antihypertensive drug in bilayer tablet form"

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The present study aims to formulate and evaluate biodegradable polymeric nanoparticles for the sustained release of an antihypertensive drug and their incorporation into a bilayer tablet dosage form. Drug-loaded nanoparticles were prepared using biodegradable polymers such as poly(lactic-co-glycolic acid) (PLGA) or chitosan by suitable techniques, including solvent evaporation or ionic gelation. The prepared nanoparticles were evaluated for particle size, polydispersity index, zeta potential, drug entrapment efficiency, surface morphology, and in vitro drug release. Optimised formulations showed nanosized particles with good stability, high entrapment efficiency, and prolonged drug release. These nanoparticles were compressed into the sustained-release layer of a bilayer tablet, while the immediate-release layer was designed to provide a loading dose. The bilayer tablets were evaluated for physicochemical properties, mechanical strength, drug content uniformity, and dissolution behaviour. In vitro release studies demonstrated an initial rapid release followed by sustained drug release, indicating the potential of this system to improve therapeutic efficacy and patient compliance in hypertension management.

Keywords: Biodegradable polymers, Polymeric nanoparticles, Sustained release, Antihypertensive drug, Bilayer tablet, Controlled drug delivery.

PH075

"Plant Power in Cancer Care: Gallic Acid-based ethosomal topical gel"

Tushar R. Pukale , Natalin M.Veg

Gallic acid is a widely distributed natural polyphenol with significant pharmacological activities, including notable anticancer effects against various cancer types, particularly breast cancer. To enhance its localized delivery and therapeutic efficacy, a gallic acid–loaded ethosomal topical gel was developed for breast cancer treatment. Ethosomes were prepared using the cold method and optimized through a Box–Behnken design, resulting in nanosized vesicles (236.5 nm) with high stability (−42.1 mV zeta potential) and excellent entrapment efficiency (93.45%). The optimized ethosomes were incorporated into a Carbopol 934 gel, exhibiting suitable viscosity, spreadability, and swelling properties. In-vitro release studies demonstrated sustained and significantly higher drug release from the ethosomal gel compared to a conventional gel. Ex-vivo permeation studies confirmed superior skin penetration and higher flux of gallic acid from the ethosomal formulation. Cytotoxicity evaluation on MCF-7 breast cancer cell lines revealed enhanced anticancer activity of the ethosomal gel compared to free gallic acid and conventional formulations. The formulation remained stable for three months under refrigerated conditions. The study establishes gallic acid-loaded ethosomal gel as a promising, stable, and effective nanocarrier for localized breast cancer therapy, offering improved drug permeation, controlled release, and enhanced anticancer efficacy with reduced systemic side effects.

PH076

Formulation, development and characterization of nasal *In Situ* gel of Erlotinib For enhanced cancer treatment

Rutuja J. Devkar, Shreya D. Sangale , Vishwaja V. More

The goal of this investigation was to improve erlotinib's intranasal administration into the brain in order to treat chemotherapy more successfully. Cubosomes-loaded with ELB (ELB-CBS) were formulated using a melt dispersion emulsification method with stabilizer, copolymer, and surfactant. ELB-CBS were described by particle size analysis , zeta potential , and the % entrapment efficiency of ELB-CBS. The formulation was adjusted with the use of Box-Behnken design, and the final batch comprises GMO(Glyceryl monooleate), Polaxomer 407(P407), and Tween 80. This customized batch was then investigated for stability, *ex vivo* penetration through the nasal mucosa, *in vitro* drug release, and morphological analysis. Subsequently, to enhance the retention time as well as the absorption of the erlotinib drug, transform that cubosomal formulation to ELB-SOL. Optimized the concentration of P407, then characterized the optimized batch like gelation time, gelation temperature pH and viscosity all mentioned parameters exhibits superior outcomes. ELB-SOL is demonstrating superior cumulative drug release and a lower burst effect than plain ELB, suggesting potential for extended drug delivery. while ELB-SOL released more slowly and steadily, indicating that ELB-SOL better for long-term treatment. All tested ELB-SOL formulations revealed cytotoxicity against the U87 cell line at 48 hrs. ERL-SOL showed the highest profile, increasing uptake by 1.08 times compared to plain ERL, while ERL-CBS showed slightly greater uptake but showed variability.

PH077

Design, develop, and optimize nanostructured lipid carriers (NLCs) with desirable physicochemical characteristics for effective topical drug delivery.

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Rosacea is a chronic inflammatory skin illness characterised by persistent facial erythema repeated flare ups, commonly associated with inflammation, oxidative stress and microbial involvement. Conventional topical formulation frequently exhibits limitations such as poor skin penetration, limited drug retention and instability, leading to diminished therapeutic efficacy. Nanostructured lipid carrier provides sophisticated lipid-based delivery method capable of improving drug stability, promoting skin penetration and delivering controlled drug released. The present study intended to design, develop, and optimize a nanostructured lipid based drug delivery system fortopical administration employing X drug and Y drug as model medication.

Preformulation studies comprising appearance, melting point, solubility analysis, wavelength determination and linearity validated the suitability of X drug and Y drug forformulation development. Drug excipient compatibility and thermal stability were demonstrated using FTIR and DSC studies, demonstrating no major chemical interaction. NLC were generated utilizing a heated high pressure homogenisation process using a specified binary lipid blend. Optimisation was performed using responses surface methodology based on a Box-Behnken design to investigate the effect of lipid concentration, surfactant concentration and homogenization speed on particle size, polydispersity index and zeta potential.The improved NLC formulations had particles that were very small, a narrow size range, a lot of drug content, and an encapsulation efficiency of more than 80%. The enhanced formulation was effectively lyophilized using mannitol as a cryoprotectant, resulting in a stable and easily redispersible product. Overall, the proposed NLC system shows significant potential as a successful and patient friendly topical medication delivery platform for rosacea therapy.

PH078

Optimization and molecular modeling of Berberine–Resveratrol liposomal gel for acne vulgaris using box–behnken design

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Acne vulgaris is a chronic inflammatory disorder of the pilosebaceous unit associated with microbial colonization, excessive sebum production, and inflammation. Limitations of conventional topical therapies necessitate safer and more effective alternatives. Present study aimed to develop and optimize a liposomal gel co-loaded with berberine hydrochloride (BB- HCl) and resveratrol (RES) for targeted topical treatment of acne vulgaris. Liposomes were prepared by the thin-film hydration method and optimized using Box–Behnken design. Molecular docking studies confirmed favourable drug–lipid interactions, supporting stable encapsulation. Optimized liposomes exhibited vesicle size was 298.3± 9.64 nm, Zeta potential

-23.8 ±1.8 mv and high entrapment efficiency for BB-HCl at 86.26± 1.67% and RES at 84.48±2.10%. Transmission electron microscopy revealed spherical, well-defined vesicles. The optimized dispersion was incorporated into a Carbopol-based gel with suitable viscosity and skin-compatible pH. *In vitro* release studies showed rapid BB-HCl release (49.40 ± 0.8% at 0.5 h) and sustained RES release (49.32 ± 1.8% at 8 h). *Ex vivo* studies demonstrated enhanced permeation and high skin retention, particularly dermal RES retention (34.75 ± 1.7%). The formulation exhibited strong antibacterial activity against P. acnes and Carrageenan induced rat paw edema model showed 39.88% anti-inflammatory inhibition, indicating its potential as an effective phytotherapeutic approach for acne management.

PH079

"Formulation and evaluation of nanosponges based topical gel of selected local anasthetic drug"

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Nanosponges loaded gels are a unique approach to medication delivery that offers the benefits of less systemic adverse effects and optimal drug concentration at the site of action. The goal of this study was to create and assess a gel that included Lidocaine nanosponges for topical administration. With the help of ethyl cellulose as the polymer, polyvinyl alcohol as a cross-linking agent, and dichloromethane as the solvent, Lidocaine nanosponges were successfully prepared using the emulsion solvent diffusion method. They were then subjected to analyses for drug entrapment efficiency, surface morphology, particle size analysis, and zeta potential. With the lowest particle size of 207.0 nm, with ζ potential -22.6 ± 0.6 mV and 94 ± 0.9 % drug entrapment effectiveness. Among the six formulations, the F4 batch was deemed to be the best. The SEM investigation revealed that the nanosponges have a smooth surface, are distinct, and spherical shape. The optimal formulation of F4 nanosponges was put into a Carbopol 394 gel, and its viscosity, spreadability, pH, in *vitro* diffusion study, *Ex -vivo* permeation study, diffusion kinetics, *in-vivo* tail flick test and stability tests were all assessed. The prepared Lidocaine nanosponges topical gel exhibits local anaesthetic activity, good stability and the anticipated drug release, according to the study.

Keywords: Ethyl cellulose, Lidocaine, Nanosponges, Polyvinyl alcohol, Topical gel.

PH081

Polymeric micelle-based co-delivery of Inositol and Quercetin: a novel nano carrier strategy for enhanced anticancer efficacy"

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Polymeric micelles appeared as promising nanocarriers for improving the therapeutic efficacy of bioactive compounds to enhance solubility and bioavailability. Inositol and quercetin are naturally occurring phytochemicals known for their hepatoprotective, antioxidant, anti- inflammatory, and anticancer properties; however, their clinical applications are limited due to low aqueous solubility, rapid metabolism, and poor cellular uptake. Encapsulation of inositol and quercetin within polymeric micelles offers a novel strategy to overcome these limitations and enhance targeted drug delivery. Polymeric micelle–based inositol–quercetin formulations improve drug stability, increase bioavailability, and promote preferential accumulation in tumour tissues via the enhanced permeability and retention (EPR) effect. Preclinical studies demonstrate that polymeric micelle inositol–quercetin exhibits significant anticancer activity against various types of carcinoma by reducing oxidative stress, suppressing inflammatory mediators, inducing apoptosis, and inhibiting tumour cell proliferation. Additionally, the formulation shows improved safety and reduced systemic toxicity compared to free drugs. Overall, polymeric micelle–loaded inositol and quercetin represent a promising therapeutic approach for the management of various types of carcinoma and other liver-related disorders. This review highlighting therapeutic potential of Polymeric Micelle Inositol Quercetin.

Keywords: PMIQ, Quercetin, Inositol, Cancer, Antioxidant, Bioavailability.

PH082

An integrated network pharmacology and preformulation strategy to enhance Trospium chloride therapy in overactive bladder

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Overactive bladder (OAB) is a chronic urological disorder, which is typified by urgency, frequency, nocturia, and urge incontinence, which significantly influence the standard of living. The molecular pathway of the typical quaternary ammonium antimuscarinic trospium chloride has not been clearly described. The model of network pharmacology has been employed in the paper to explain its key molecular targets and pathways in OAB. It has recognized six overlapping targets, namely CHRM1, CHRM2, CHRM3, CHRM4, CHRM5, and PABPC1. The protein-protein interaction analysis of the STRING database revealed that muscarinic acetylcholine receptor subtypes were found to be well-functionally interacting. Networks were built and the hub genes were analyzed using Cytoscape and CytoHubba where CHRM1, CHRM2 and CHRM3 were significant hub targets with majority of them being localized in the synaptic and plasma membrane regions. The involvement of cholinergic synapse, calcium signaling, cAMP signaling, neuroactive ligand-receptor interaction and PI3K-Akt signaling pathways are also important in the contraction of detrusor muscle and bladder overactivity according to the enrichment of the KEGG pathway. The studies that were conducted during preformulation to facilitate the development of the formulation were organoleptic studies, solubility studies, pKa studies, partition coefficient, melting point, hygroscopicity, FTIR compatibility studies, and the development of UV spectrophotometric methods. Also, this work will be aimed at creating a new formulation of trospium chloride to enhance the effectiveness of this treatment in overactive bladder and eliminate problems with formulation. Network pharmacology, preformulation studies, novel formulation development, and animal studies can be used together to give a comprehensive approach to improving the therapeutic efficacy of trospium chloride in the overactive bladder. **Keywords:** Trospium chloride; Overactive bladder; Network pharmacology; Muscarinic acetylcholine receptors; Preformulation; Novel formulation development.

PH083

Development and evaluation of an intranasal nanostructured lipid carrier–based in situ gel for nose-to-brain delivery of TNG

Jayshri M. Burrewar, Kalyani P. Kayande

The present study aimed to develop and evaluate an intranasal nanostructured lipid carrier based in situ gel for effective nose to brain delivery of TNG for potential application in Alzheimer's disease. TNG loaded nanostructured lipid carriers were prepared using the hot melt emulsification technique combined with high-speed probe sonication, resulting in a simple, reproducible, and cost-effective formulation approach. The optimized TNG NLCs were incorporated into a thermosensitive in situ gel to facilitate intranasal administration and prolonged nasal residence. Intranasal delivery of the TNG NLC in situ gel was found to be convenient and non-invasive. In vitro and ex vivo studies demonstrated sustained drug release from the NLC system along with enhanced permeation of TNG across the nasal mucosa over an extended duration. The formulation exhibited improved permeability characteristics, indicating efficient mucosal transport and prolonged drug availability. The intranasally administered NLC based in situ gel enabled direct nose to brain delivery of TNG, bypassing the blood brain barrier, as supported by pharmacodynamic evaluations. Overall, the findings demonstrate that the developed intranasal NLC based in situ gel system offers sustained release, enhanced nasal permeation, and improved therapeutic performance. This study highlights the potential of intranasal NLC based in situ gel formulations as a promising, non invasive, and effective strategy for targeted brain delivery and supports the repurposing of TNG for the therapeutic management of Alzheimer's disease. These outcomes collectively emphasize formulation feasibility, translational relevance, and future clinical applicability in neurodegenerative disorder therapy through optimized intranasal nanocarrier drug delivery systems.

PH084

Formulation and evaluation of mucoadhesive vaginal films containing Posaconazole- loaded nanoparticles for localized treatment of vaginal candidiasis

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Vaginal candidiasis is a prevalent fungal infection requiring effective localized therapy. Posaconazole, a broad-spectrum triazole antifungal, exhibits poor aqueous solubility, limiting its vaginal application. This study aimed to develop mucoadhesive vaginal films incorporating Posaconazole-loaded PLGA nanoparticles for enhanced local antifungal delivery. Posaconazole-loaded nanoparticles were prepared by the nanoprecipitation method and optimized using a Box–Behnken design. The optimized formulation showed a particle size of

192.81 nm, entrapment efficiency of 85.26%, and cumulative drug release of 83.65%. These nanoparticles were incorporated into HPMC E15-based films using solvent casting with PEG 400 as a plasticizer. The prepared films (150 mg, 200 mg, and 250 mg) exhibited uniform thickness and weight, surface pH compatible with vaginal application, good mechanical strength, and strong mucoadhesive properties. In-vitro release studies demonstrated sustained drug release (~76.42% over 48 h). The films showed significant antifungal activity against Candida albicans. The developed nanoparticle-based mucoadhesive vaginal films offer a promising, patient-friendly approach for localized treatment of vaginal candidiasis.

Keywords: Posaconazole, PLGA nanoparticles, Mucoadhesive vaginal films, Vaginal candidiasis

PH085

Development of a topical eye gel containing Lutein and Zeaxanthin for protection against blue radiation

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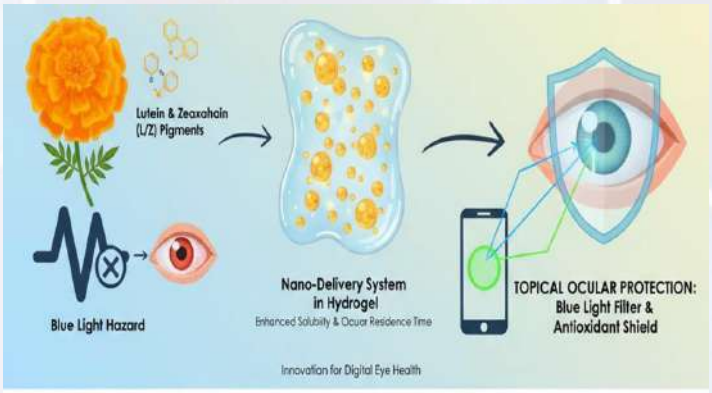
In recent years, increased use of digital devices such as smartphones, computers, and tablets has led to prolonged to blue light which can penetrate eye and induce oxidative stress, retinal damage, and digital eye strain. Chronic blue light exposure has been associated with visual discomfort, photochemical injury, and an increased risk of age-related macular degeneration. Lutein and zeaxanthin are naturally occurring xanthophyll carotenoids selectively concentrated in the macular region of the retina, where they function as endogenous blue light filters and potent antioxidants. These pigments absorb high-energy blue light and neutralize reactive oxygen species, thereby protecting retinal cells from oxidative damage. Topical ocular delivery in the form of an eye gel offers a promising alternative by providing localized action, prolonged ocular residence time, and improved patient compliance.



PH086

Development of gastro-retentive film combining unfolding and floating mechanisms for improved oral bioavailability

Ms. Sakshi Mangesh Rananaware

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Gastroretentive floating unfolding film of Tizanidine HCL aim to enhance gastric residence time and improve the oral bioavailability of this short half-life, low-bioavailability drug that is preferentially absorbed from the upper gastrointestinal tract. In this concept, tizanidine HCl is incorporated into a thin polymeric film designed to fold for encapsulation in a capsule and unfold, float, and retain in the stomach after contact with gastric fluid, combining principles of floating and expanding gastroretentive systems. Hydrophilic polymers such as hydroxypropyl methylcellulose and other film-formers are used to control drug release, while gas-generating or low-density components impart buoyancy. The prepared unfolding films would be characterized for thickness, folding endurance, tensile strength, drug content, in-vitro buoyancy (floating lag time and total floating time), unfolding behaviour, swelling, surface morphology, and in-vitro drug release in simulated gastric fluid. Release data are typically fitted to kinetic models to elucidate the mechanism of controlled release. The optimized formulation is expected to show rapid unfolding, short floating lag time, prolonged gastric retention (>8–12 h), and sustained release of tizanidine HCl while maintaining suitable mechanical properties. Such a gastroretentive unfolding film system could reduce dosing frequency, improve patient compliance, and potentially enhance therapeutic efficacy of tizanidine HCl in comparison with conventional or immediate-release oral films and tablets.

PH087

"Formulation and evaluation of in situ nasal gel of nanostructured lipid carriers (NLCs) of Cariprazine for the treatment of Schizophrenia"

Tejas Ghuge, Sarthak Yadav, Revati Kalne

Cariprazine, an atypical antipsychotic used in schizophrenia and bipolar disorder, suffers from low oral bioavailability (~50%) due to extensive first-pass metabolism and poor aqueous solubility. Conventional delivery methods also face challenges such as delayed onset of action, frequent dosing, and systemic side effects. To overcome these limitations, this study aimed to develop an in situ nasal gel loaded with nanostructured lipid carriers (NLCs) of Cariprazine for direct nose-to-brain delivery, thereby improving bioavailability and therapeutic efficacy.

Nanostructured lipid carriers (NLCs) were prepared using a Melt Emulsification and Ultrasonication method, optimized via Central Composite Design to assess the impact of lipid ratio, surfactant concentration, and homogenization parameters. The optimized NLCs exhibited a particle size of <200 nm, PDI <0.3, zeta potential >|±30 mV|, and high entrapment efficiency (>80%), ensuring stability and efficient drug loading. These NLCs were then incorporated into a thermosensitive in situ nasal gel composed of Poloxamer 188 and Carbopol 934, which undergoes sol-to-gel transition at nasal temperature (34–36°C), prolonging mucosal contact time.

The developed formulation was evaluated for gelation temperature, viscosity, pH, in vitro drug release and ex vivo permeation (using sheep nasal mucosa). Results indicated sustained drug release (>80% in 24 h), enhanced permeation (2–3 fold higher than plain drug suspension), and good mucoadhesion without irritation. Stability studies (ICH guidelines) confirmed the formulation's robustness under varying storage conditions.

The formulation also exhibited reduced systemic exposure, minimizing side effects. In conclusion, the cariprazine-loaded NLC in situ nasal gel presents a non-invasive, efficient, and patient-compliant approach for enhanced brain delivery, overcoming the limitations of conventional therapies. This novel strategy holds significant promise for improving the treatment of schizophrenia and bipolar disorder with rapid onset, reduced dosing frequency, and minimized adverse effects. **Keywords**- Cariprazine, Nanostructured lipid carriers, Melt Emulsification and Ultrasonication, In situ gel, Schizophrenia.

PH088

Polymeric micelle–based drug delivery for age-related macular degeneration: integrating network pharmacology and nanomedicine.

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Age-related macular degeneration (AMD) is a multifactorial and complex retinal disease and is provoked by oxidative stress, chronic inflammation, maladaptive angiogenesis, and failure of cells to respond to cell survival clues. The single-target therapies are found to be defined by a low level of long-term efficacy that serves to support the necessity to develop system-based therapies and supplementary technologies of medication delivery. We combine in our work the notion of network pharmacology with the concept of polymeric micelle-based nanomedicine to provide us with the overall treatment of the next-generation treatment of AMD. Protein- protein interaction (PPI) network analysis indicates that the central players of extracellular matrix remodelling, angiogenesis, apoptosis regulation, and intracellular signal transduction are such central hub genes as the products of the MMP2, MMP9, SRC, PPARG, ESR1, IGF1R, KDR (VEGFR2), and BCL2 family. As shown in the Gene Ontology enrichment, such molecular processes as kinase activity, transcription factor binding, nuclear receptor activity, and BH domain interactions may be very engaged and coordinated to regulate nuclear growth factors and programmed cell death. These are receptor complexes, membrane microdomains, mitochondrial, and endosomal compartment localized targets utilizing cellular component analysis and are targeted to the spatial organization of retinal signaling pathways. When enriching the biological process, vascular structure formation, and cell survival are considered. The analysis of KEGG pathways shows that the enrichment of PI3KAkt signaling, estrogen signaling, focal adhesion, endocrine resistance, and cancer pathways is high, which is explained by the large-scale pathway crosstalk, which is carried out in the case of AMD pathogenesis.

Keywords: Age-related macular degeneration; polymeric micelles; ocular drug delivery; retinal targeting; nanomedicine; VEGF inhibition; sustained drug release, Angiogenesis, Oxidative stress.

PH089

Radiance boosting Antiacne herbal face powder – Nutmeg

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This study aims to develop and assess the efficacy of an Antiacne Radiance Boosting Herbal Face Powder for cosmetic purpose and antiacne use. Ingredients such as Sandalwood Powder, Rose Petal Powder, Turmeric Powder, Talc, Glycerol, Zinc stearate, Kaolin, Water and Nutmeg are sourced from local store. Subsequently, Nutmeg extract is obtained through Cold Maceration, ensuring preservation of its herbal properties and safety. Since Nutmeg is a herbal drug, no adverse effects were observed. Now a days people are susceptible to acne problems and dark spot. The people especially women can use various beauty product daily basis. This product may damage the skin and start forming pimples and rashes on face. This study introduces "Radiant Skin" an innovative herbal face powder formulated to address acne concerns while promoting skin radiance. Antiacne Radiance Boosting Herbal Face Powder can comes in different shades to match varying skin tone and it is a good idea to choose the skin tone that most closely matches the natural skin. The formulation can choose by women to beautify the skin and good looking purpose but it may show their action of anti-acne and remove dark spot also. The another ingredient like talc can used as a adhesive agent to stick on face and kaolin as a covering agent, and zinc stearate lubricating agent, glycerol as a binder and water as a vehicle. The all ingredient are mixed by particular method and form a formulation to use. This can be used daily bases for glowing skin. The developed Antiacne Radiance Boosting Herbal face powder is physically stable, visually appealing, and gentle on skin and eyes, ensuring safety during use while effectively combating acne.

Keywords: Acne, Nutmeg, loose Powder, Cosmetic, Formulation, Evaluation

PH090

Brain targeting efficiency of L-Dopa from nasal mucoadhesive microemulsion.

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The aim of this investigation was to formulate and characterize a mucoadhesive microemulsion of levodopa (L-Dopa) to enhance nose-to-brain delivery and improve the bioavailability of the drug by avoiding its peripheral metabolism. Three levodopa-containing microemulsion formulations were developed by varying the concentrations of surfactant/co-surfactant and oil phase (LCP) using the titration method. The prepared systems were evaluated for globule size, zeta potential, pH, viscosity, mucoadhesion strength, drug content, and in-vitro drug release. All formulations were optically isotropic and exhibited a slightly acidic pH, desirable for nasal administration to reduce irritation, enhance drug absorption, inhibit microbial growth, and minimize oxidation of L-Dopa. The particle size of all formulations was in the nanometer range, facilitating rapid permeation across the nasal mucosa. Good mucoadhesive properties were observed, indicating prolonged nasal residence time. In-vitro release studies using a 0.45 µm cellulose acetate membrane demonstrated excellent drug release profiles for all formulations, with LPC-III exhibiting the fastest release rate. The optimized formulation, LPC- III, displayed an intranasal bioavailability of 85.96%, compared with only 1.816% following oral administration, and was nearly comparable to intravenous delivery. These findings indicate rapid and efficient transport of L-Dopa into the brain via the intranasal route. Overall, the developed mucoadhesive microemulsion presents a promising strategy for nose-to-brain delivery of L-Dopa and may offer significant therapeutic benefit in the management of Parkinsonism.

Keywords: Levodopa, mucoadhesive microemulsion, intranasal delivery, nose-to-brain transport, bioavailability, Parkinsonism, nanocarrier, LPC-III

PH091

Formulation and evaluation of a chitosan-based *Neolamarckia cadamba* (Kadamba) leaf extract gel for enhanced wound healing

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Wound healing is a complicated biological process that is essential for restoring skin integrity and preventing problems like infection and chronic wounds. Natural agents with antimicrobial and healing properties provide promising alternatives to standard wound care. This study focuses at the formulation and evaluation of a chitosan-based gel that includes Neolamarckia cadamba (Kadamba) leaf extract, known for its traditional medicinal uses and bioactive compounds. Kadamba leaves were collected, confirmed, and processed through ethanol extraction. The extract's phytochemical profile was verified with standard qualitative tests, showing the presence of alkaloids, glycosides, and flavonoids.

The wound healing gel was made by dissolving chitosan in 2% acetic acid, crosslinking it with citric acid, and adding 3% Kadamba leaf extract. The gel was assessed for its physical properties, including color, clarity, homogeneity, pH, spreadability, and viscosity. It was also tested for antimicrobial activity against Escherichia coli and Staphylococcus aureus using the agar diffusion method. Antimicrobial effectiveness was evaluated at concentrations of 0.1 to

0.2 µL, with Penicillin G serving as the standard control.

The chitosan-based Kadamba gel showed good physicochemical characteristics, such as a yellowish-green color, clear and uniform consistency, pH 6.5, and optimal spreadability and viscosity. Antimicrobial testing revealed significant zones of inhibition against S. aureus (25 mm) and E. coli (35 mm). This indicates strong antibacterial activity at the tested concentrations. The combined effects of chitosan and Kadamba extract encouraged tissue regeneration, lowered infection risk, and improved wound healing compared to commercial formulations.

PH092

Formulation, evaluation and optimization of self micro emulsifying drug delivery system of Chlorzoxazone.

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Chlorzoxazone is a commonly used muscle relaxant that helps relieve muscle stiffness and spasms. It comes under Biopharmaceutics Classification System (BCS) Class II which have low aqueous solubility and high permeability. This study aimed to formulate a self-micro emulsifying drug delivery system (SMEDDS) to enhance the solubility and bioavailability of chlorzoxazone using Cinnamon oil, Tween 20, and propylene glycol as the oil phase, surfactant, and cosurfactant respectively. Pseudo-ternary phase diagrams were created to identify the specific region where a stable microemulsion forms by mapping the proportions of oil, surfactant, and cosurfactant. Once the ideal microemulsion area was determined, the best formulation was tested for its ability to remain stable when diluted, as well as its particle size, uniformity, polydispersity index (PDI), zeta potential, drug content, clarity, and in vitro drug release by in lab tests. The F7 batch of this formulation exhibit excellent results with particle size of 129.9 nm, PDI of 0.2563, zeta potential of −20.04 mV, and drug content of 95.98%. It demonstrated rapid self-emulsification within 20 seconds, high optical clarity (99.48% transmittance), and significantly enhanced in vitro drug release (96.69% within 120 minutes) compared to pure chlorzoxazone. The formulation was further studied for its stability and found to be stable for more than 90 days. The results indicate that the formulated SMEDDS significantly enhances the solubility and dissolution of chlorzoxazone, presenting a viable approach to improve its oral bioavailability and therapeutic efficacy and present it as a more potent muscle relaxant.

KEYWORDS: Chlorzoxazone, BCS-II, Solubility enhancement, Oral bioavailability, Self-microemulsifying drug delivery system (SMEDDS), Pseudo-ternary phase diagrams, In vitro drug release.

PH093

Repurposing of Metformin for treatment of vaginal infection

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Background: Candidiasis Albicans is a common fungal infection affecting women worldwide, primarily caused by Candida species. Increasing resistance and recurrence associated with conventional antifungal therapies highlight the need for alternative and effective topical formulations. Metformin, known for its antidiabetic activity, has recently shown potential antifungal properties.

Objective:The present study aimed to formulate and evaluate a novel metformin-based vaginal antifungal gel with suitable physicochemical properties and enhanced antifungal activity.

Methods: The vaginal gel was prepared using carbopol 940 as a gelling agent, propylene glycol as a humectant, and Tween 80 as a solubilizing agent and nourishing oil to get superficial effect. The formulated gel was evaluated for pH, viscosity, spreadability, drug content uniformity, and in vitro drug release. Antifungal activity was assessed using in vitro cell culture/agar diffusion methods against Candida albicans.

Conclusion: The study concludes that metformin can be successfully formulated into a vaginal gel with promising antifungal efficacy. This formulation may serve as a potential alternative for the treatment of candidia albicans , subject to further in vivo and clinical evaluation.

Keywords: Metformin, Vaginal gel, Antifungal activity.

PH094

"Formulation, evaluation and optimization of lenalidomide loaded niosomes"

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Lenalidomide is an immunomodulatory drug widely used in the treatment of multiple myeloma; however, its short biological half-life and limited permeability necessitate frequent dosing, resulting in poor patient compliance. The present study aimed to formulate, evaluate, and optimize lenalidomide-loaded niosomes to enhance drug permeability and provide sustained drug release. Niosomes were prepared by the ether injection method using Span 80 as a surfactant and cholesterol as a membrane stabilizer. A 3^2 full factorial design was employed to optimize the formulation by varying the concentrations of Span 80 and cholesterol, with particle size and zeta potential selected as dependent variables.

Among the nine formulations developed, batch B4 was identified as the optimized formulation based on superior physicochemical properties. The optimized batch exhibited a particle size of

177.10 nm, zeta potential of −30.50 mV, polydispersity index of 0.2899, drug content of 86.36%, and entrapment efficiency of 83.20%. In-vitro drug release studies conducted in phosphate buffer (pH 6.8) demonstrated a sustained release pattern, with 79.42% cumulative drug release at 8 hours compared to 61.83% from plain lenalidomide. In-vitro permeation studies using a Franz diffusion cell showed significantly enhanced permeation from the niosomal formulation, achieving 66.83% cumulative permeation at 8 hours, whereas the plain drug exhibited only 42.36% permeation.

Stability studies performed according to ICH guidelines revealed a slight increase in particle size (177.10 nm to 256.04 nm), a decrease in drug content (86.36% to 79.69%), and a marginal reduction in entrapment efficiency (80.20% to 73.41%), indicating acceptable stability. Overall, the study concludes that lenalidomide-loaded niosomes represent a promising delivery system for improving permeability, sustaining drug release, and enhancing therapeutic efficacy.

PH095

"Teriflunomide-loaded nanosponges for transdermal delivery in rheumatoid arthritis: QbD-enabled formulation design and pharmacodynamic evaluation"

Roshan Gavit, Shweta Chavan, Supriya Nikam, Nitin Aher

This study focused on the development and optimization of a teriflunomide-loaded nanosponges (TFM-NS)–based transdermal gel for localized delivery in rheumatoid arthritis (RA), overcoming limitations associated with the drug's poor aqueous solubility and systemic exposure. TFM-NS were prepared by the emulsion solvent diffusion method and optimized using a Box–Behnken design within a Quality by Design framework. The optimized formulation exhibited a particle size of 246.03 nm with low polydispersity (PDI 0.093), high entrapment efficiency (89.95%), and satisfactory production yield (83.5%). A negative zeta potential (−21.53 mV) indicated good colloidal stability. Solid-state analysis (DSC and XRPD) confirmed partial amorphization of teriflunomide, while SEM revealed a characteristic porous nanosponges structure. The optimized TFM-NS were incorporated into a Carbopol 940 gel, yielding a formulation with acceptable physicochemical characteristics and favorable rheological behavior suitable for transdermal application. The TFM-NS gel demonstrated enhanced occlusive properties (62.35 ± 0.2%), reduced water vapor transmission rate (160 ± 0.09 g/m²/day), and improved skin hydration. In vitro release studies showed sustained drug release (82.52 ± 0.89% at pH 5) following zero-order kinetics (R^2 = 0.9907). Ex vivo permeation studies further confirmed significantly improved dermal permeation (78.3 ± 0.57% over 8 h). In vivo pharmacodynamic evaluation using CFA-induced arthritic rats demonstrated significant anti arthritic efficacy of the TFM-NS gel, evidenced by reduced paw edema (5 ± 0.32 mm), preservation of joint histoarchitecture, and minimal local toxicity. Stability studies confirmed the long-term integrity of the formulation. Overall, the QbD-optimized TFM-NS gel represents a stable, biocompatible, and effective transdermal delivery system for localized RA therapy.

PH096

3D printed local drug delivery Quercetin - Zinc oxide loaded patch for breast cancer treatment

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The increasing prevalence and mortality of breast cancer, particularly invasive ductal carcinoma, necessitated the development of advanced, localized, and personalized therapeutic strategies. This study presented the design, fabrication, and evaluation of a dual-layered, drug loaded Quercetin/Zinc Oxide 3D-printed implantable chip (DL-QCT/ZnO-3DP-IC) for localized breast cancer therapy. Drug-loaded filaments were fabricated via hot melt extrusion (HME) using Plasdone™ S-630 Ultra and Klucel™ Fusion X Hydroxypropylcellulose as thermoplastic carriers, and dual-layered chips were printed using fused deposition modeling (FDM). The inner layer of the chip incorporated Quercetin, a flavonoid with pro-apoptotic and anti-inflammatory properties, while the upper layer contained Zinc Oxide, known for its cytotoxic and antibacterial effects. Comprehensive physicochemical characterization using In vitro release study, FTIR, XRD, TGA, SEM, Stability testing study, MTT assay, Fluorescence and cytotoxicity study, The configuration with 40% infill density exhibited optimal mechanical integrity and sustained drug release. In vitro release studies demonstrated sustained release of Quercetin and controlled release of Zinc Oxide over 30 days. Biological evaluations using MTT assay and fluorescence microscopy on MCF-7 breast cancer cells revealed significant cytotoxicity and enhanced apoptotic response in cells treated with DL-QCT/ZnO-3DP-IC compared to pure drugs. The IC_{50} value for DL-QCT/ZnO-3DP IC was determined to be 4.301 µg/mL, confirming its potent anticancer activity. This study underscored the potential of FDM-based 3D printed implantable chip to fabricate personalized, implantable dual-drug delivery systems, offering a promising, site-specific strategy for effective breast cancer treatment with minimized systemic toxicity.

Keywords: 3D printing, Fused Deposition Modeling (FDM), Hot Melt Extrusion (HME), Breast Cancer, Implantable Drug Delivery, controlled release, Dual-layer implants.

PH097

Pharmaceutical co-crystal preparation of Pazopanib HCl and it's formulation and development

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The goal of this study was to enhance the solubility and dissolution rate of Pazopanib hydrochloride. It is a BCS class II anticancer medication, which limits its oral bioavailability. Pharmaceutical co-crystallization was chosen as a crystal engineering technique to improve physicochemical properties without modifying the drug's activity. Succinic acid, a co-former deemed acceptable for pharmaceutical use, was utilized to create Pazopanib HCl co-crystals through solid-assisted grinding and solvent evaporation methods. The resulting co-crystals were characterized using FTIR, DSC, P-XRD, and SEM, which confirmed the development of a new crystalline phase with modified thermal behavior and crystal morphology. The physicochemical assessment indicated enhanced flow properties, melting characteristics, and stability. Saturation solubility tests in water and various pH environments showed a notable increase in solubility compared to the unaltered drug. In-vitro dissolution experiments indicated improved drug release from the co-crystals. Capsules formulated with the co-crystals exhibited superior dissolution performance and favorable release kinetics when compared to the pure drug and existing marketed formulations. The co-crystallization of Pazopanib HCl with succinic acid represents an effective approach to enhance solubility, dissolution, and formulation performance, with the potential to improve oral bioavailability and therapeutic efficacy.

Keywords: Coformer, cocrystal, pazopanib hydrochloride, solubility, dissolution, crystal engineering.

PH099

Development of pH-sensitive nanogel for dual delivery of Catechin and Curcumin: a novel approach for targeted therapy

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A Melanoma is deadliest disease in world causing the burden on global health & economy, which treated by topical route is highly challenging due to low selectivity, poor efficacy & skin environment. In present study, we formulated the chitosan-based pH responsive nanogel encapsulated by catechin and curcumin, which shows the combined effect against skin cancer. The drug shows the promising synergistic effect against the cancer. The catechin - curcumin nanogel was synthesized by using ionic gelation technique which exhibit the nanosize particle distribution and sustained drug release. The optimized batch showed a promising particle size of 127.8nm, a Poly-dispersibility Index (PDI) of 0.469 & Zeta potential of +31.29 mV, indicating the good stability of formulation. The nanogels released approximately 98.6% of catechin and 89.5% of curcumin at pH 5 within 12 hours during In-vitro drug release. During Ex-Vivo drug permeation the nanogels showed a typical biphasic release profile an initial burst release followed by a sustained release phase. The nanogel exhibits swelling behaviors at a slightly acidic pH 4. The pH responsive behavior of nanogel resulted in triggered release of curcumin & catechin in slightly acidic microenvironment. Overall, the CCNGL shown the promising efficient and sustained delivery of curcumin & catechin for the topical chemotherapy that can be result in high efficacy, patient compliance and safety in further future study.

Keyword: pH responsive nanogel, Ex-vivo permeation, nano-size particle distribution, ionic gelation technique etc.

PH103

Avenues and opportunities in vaccine adjuvant research: insights from patent analytics, stakeholder perspectives, and policy pathways

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Vaccine adjuvants represent a critical and evolving avenue in pharmaceutical research, enabling improved immunogenicity, dose sparing, and broader population coverage. Understanding both innovation trends and practical development challenges is essential for identifying opportunities that can advance vaccine preparedness and equity. This study integrates patent analytics with stakeholder perspectives to identify key avenues, gaps, and policy-enabled opportunities in vaccine adjuvant research. Global patent data related to vaccine adjuvants were analyzed to assess technological focus areas, innovation trajectories, and research concentration. This analysis was complemented by outcomes from informal interviews with 52 stakeholders from academia, industry, and regulatory environments, aimed at identifying practical challenges and unmet needs to inform future structured surveys.Patent analytics revealed strong research emphasis on improving immunogenicity, stability, safety, and manufacturing efficiency, with increasing focus on cost reduction and scalable production. However, insights from stakeholder interactions highlighted persistent gaps, including limited access to approved adjuvants, high development costs, lack of standardized comparative testing platforms, dependence on proprietary and imported materials, and fragmented research ecosystems. The combined findings indicate that while technological avenues are actively explored, translation into accessible and equitable solutions remains constrained. Policy initiatives such as India's BioE3 framework offer an opportunity to bridge these gaps by supporting indigenous adjuvant research, shared infrastructure, and collaborative innovation platforms. The outcomes of this study provide a foundation for designing formal surveys and policy interventions to strengthen vaccine adjuvant ecosystems and pharmaceutical preparedness. **Keywords:** Vaccine adjuvants; patent analytics; stakeholder perspectives; pharmaceutical research; BioE3 policy.

PH104

GC-MS based phytochemical analysis and silver nanoparticle synthesis from Careya Arborea leaf extract: an investigation of in silico and in vitro anti-ulcer activity

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Careya arborea is a traditionally valued medicinal plant with recognized anti-ulcer potential, especially for gastrointestinal disorders. This study investigates the gastroprotective efficacy of Careya arborea leaf extract using an integrated approach that combines phytochemical profiling, green nanotechnology, and biological evaluation. Methanolic extraction of coarsely powdered leaves (Soxhlet, 9.56% yield) was standardized and subjected to preliminary phytochemical screening, revealing flavonoids, phenolics, glycosides, saponins, carbohydrates, amino acids, and related constituents. Detailed GC-MS analysis identified 30 bioactive compounds. Silver nanoparticles (AgNPs) were synthesized via a green method using the methanolic extract as both reducing and stabilizing agent and characterized by UV–Visible spectroscopy, FTIR, and SEM, confirming spherical particles of around 50 nm with an absorption maximum at 420 nm. In-silico studies using PubChem, PASS, Swiss ADME, and BIOVIA Discovery Studio evaluated the interaction of selected phytoconstituents with H^+/K^+-ATPase and Helicobacter pylori virulence protein (PDB ID: 1E9Y), highlighting several fatty acid derivatives with inhibitory potential comparable to omeprazole and tetracycline. Finally, both the standardized extract and synthesized AgNPs were assessed in vivo for anti-ulcer activity through proton pump and anti-H. pylori– targeted assays, demonstrating significant reductions in ulcer indices and inflammatory parameters. These findings support the gastroprotective promise of Careya arborea leaf extract and its green-synthesized AgNPs as potential candidates for anti-ulcer therapy.

PH105

Development and In-Vivo Therapeutic Evaluation of a Nano Emulsion-Based Intranasal Drug Delivery System for Alzheimer's Disease

Mr. Anirudha V. Munde, Dr. Vishakha Chauhan, Dr. Nidhi Bais

Nano emulsions are nanostructured colloidal systems that offer significant potential for enhancing drug delivery to the central nervous system. The treatment of Alzheimer's disease (AD) remains challenging due to limited drug permeability across the blood–brain barrier (BBB). This study reports the development and in vivo evaluation of a Rivastigmine (RSG)–loaded Nano emulsion designed to improve brain delivery and therapeutic efficacy in AD.

Nano emulsions were prepared using linseed oil as the lipid phase and pyridoxine as a neuroactive component via an emulsification method. Nine formulations were developed and evaluated for physicochemical properties, drug entrapment efficiency, and in vitro release behaviour. Among these, formulation RF6 demonstrated the highest entrapment efficiency (83.25%) and exhibited a sustained drug release profile in Franz diffusion cell studies. The optimized formulation showed a mean particle size of 203.4 nm, suitable for BBB permeation. Structural and thermal characterization using zeta potential analysis, ATR, DSC, and XRD confirmed formulation stability and successful drug incorporation.

In vivo efficacy was assessed using the Morris Water Maze (MWM) test in Long-Evans rats with AD-like pathology. Treatment with the RSG-loaded Nano emulsion resulted in significant improvement in spatial learning and memory, as evidenced by reduced escape latency and travel distance compared to control groups.

These findings demonstrate that the developed Nano emulsion system represents a promising Nano carrier for enhanced brain delivery of Rivastigmine and offers potential for improved management of Alzheimer's disease.

PC01

Computational design, synthesis, and evaluation of a novel anti-malarial derivative

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Malaria is disease caused by parasites of Plasmodium genus with female Anopheles mosquitoes acting as vector for these parasites. In recent years, treatment of malaria has become more challenging due to emergence of multi-drug resistant variant of parasites. Popular treatment use peptidomimetic for treatment of malaria. In food vacuole of parasite, hemoglobin is converted into amino acids in multiple steps. Enzyme plasmepsins and falcipains digest hemoglobin into oligopeptides. These enzymes were selected as target for developing new drug molecules. 16 molecules were selected as potential drug candidate and were checked for its targeting on enzymes via molecular docking. Out of 16 molecules, molecule 16 (M16) was selected for further development. M16 was synthesized by using flavonol as a starting material. After purifying M16, it's synthesis was validated using elemental and functional group tests like FTIR, NMR, Mass Spectrometry, DSC and for peak purity, HPLC was used. Following this, analytical method for M16 was developed and validated using HPLC. This molecule could be a crucial tool in addressing a global health crisis, offering hope for a more effective treatment of a disease that continues to pose a major threat, particularly in tropical regions.

Keywords: Malaria, Molecular Docking, HPLC

PC02

Design, synthesis and anticancer potency assessment of a tofacitinib thalidomide protac

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Breast and prostate cancers are major health concerns, often associated with dysregulation of the JAK–STAT signaling pathway, which contributes to tumor growth, survival, and therapeutic resistance. Although tofacitinib is an established JAK inhibitor, its effectiveness in cancer treatment is limited due to incomplete target inhibition and resistance development. Proteolysis Targeting Chimeras (PROTACs) offer a novel approach by inducing selective degradation of disease associated proteins through the ubiquitin proteasome system.In this study, a novel PROTAC was designed using tofacitinib as the target binding ligand and thalidomide as the E3 ligase recruiting moiety, linked via an appropriate linker. In silico molecular docking and molecular dynamics studies were performed against the JAK related protein (PDB ID: 4OTI) to evaluate binding affinity and stability. The synthesized PROTAC was characterized using physicochemical and spectroscopic techniques including melting point, TLC, FTIR, NMR, and mass spectrometry. The anticancer activity was evaluated in vitro using MTT assay against MCF-7 breast cancer and PC-3 prostate cancer cell lines.The results demonstrated improved anticancer activity of the synthesized PROTAC compared to the parent compound, suggesting effective targeting of JAK mediated signaling pathways. This work supports the potential of PROTAC based strategies as a promising approach for targeted cancer therapy.

PCO3

Microwave assisted synthesis, molecular docking of some novel benzimidazole derivatives as potential cyclooxygenase–2inhibitor'

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This study explores the microwave-assisted synthesis of benzimidazole, a compound well- antimicrobial, antiviral, anticancer, and anti-inflammatory effects. Benzimidazole was chosen because of its strong relevance in medicinal chemistry and its relatively simple synthesis process. Our objective was to develop a faster, more efficient, and eco-friendly method for preparing benzimidazole using microwave irradiation. After synthesis, the product is purified and characterized to confirm its identity. The results show that microwave-assisted synthesis is a practical and green approach, offering significant advantages in terms of reaction time and yield. This method demonstrates how modern techniques can improve traditional organic synthesis in a cleaner and more efficient way.

Due to the involvement of COX-2 overexpression in inflammatory, cancerous, and neurological diseases, targeting this enzyme has emerged as a valuable strategy in therapeutic research. In the present study, a series of novel and structurally simple benzimidazole derivatives were synthesized and identified as selective COX-2 inhibitors, demonstrating notable anti-inflammatory potential. Furthermore, the binding interactions of these compounds with the COX-2 enzyme were investigated through molecular docking studies using its crystal structure (PDB ID: 4COX), providing insights into their mechanism of action. These findings support the potential of these benzimidazole derivatives as promising leads for the development of new, highly selective COX-2 inhibitors.

Keywords: Microwave-assisted synthesis, Benzimidazole, Eco-friendly, Molecular docking, COX-2 enzyme, (PDB ID: 4COX

PC04

In-silico guided design and synthesis of 2-azetidinone derivatives targeting (NPC1L1) for anti-obesity activity

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Aim: Currently, researchers have developed a lot of new active substances as anti-obesity agents. One of the target proteins for anti-obesity agents is the Niemann-Pick C1-Like 1 (NPC1L1) protein. A key transporter on intestinal cells that brings dietary and biliary cholesterol into the body. By blocking NPC1L1, reduction of the cholesterol delivered to the liver, which triggers the liver to pull more LDL ("bad") cholesterol from the blood, ultimately lowering overall blood cholesterol levels. The potential activity of 2-Azetidinone derivatives may be increase due to the preparation of the Schiff base with aromatic aldehydes. Niemann- Pick C1-Like 1 (NPC1L1) inhibition was required to predict their anti-obesity activity so, the aim in the present study, molecular docking study of 2-Azetidinone derivatives used in the treatment of obesity.

Methodology: The molecular docking of 2-Azetidinone derivatives were carried out using AutoDock vina Ver.1.1.2. Twenty 2-Azetidinone derivatives were docked into the Niemann- Pick C1-Like 1 (NPC1L1) protein with Protein data bank code 7N4U. The interactions were evaluated based on the docking score. Ezetimibe was used as the reference standard for this study.

Results: Twenty 2-Azetidinone derivatives showed the approximate docking score – 4.9 to – 5.8 kcal/mol. Eighteen 2-Azetidinone derivatives have a greater docking score compared to Ezetimibe used as a standard compound.

Conclusion: All new 2-Azetidinone derivatives are feasible to synthesize and performed their in-vitro evaluation.

Keywords: 2-Azetidinone, Anti-Obesity, NPC1L1, Molecular docking, Lowering cholesterol level

PC05

Chemical synthesis and evaluation of copper oxide nanoparticles (CuONPs) and their application for hard water treatment.

Kalyani Mankar, Shubhangee Gaikwad, Amol Bansode, Snehal Jadhav

CuO Nanoparticles exhibit exceptional utility as an antioxidant, antimicrobial, and antitumor or anticancer agent. Chemical reduction method is used to prepare copper oxide nanoparticles, FTIR showed presence of a Cu-O bond at 557 cm -1 , the wavelength of CuONPs by UV- visible spectroscopy was determined at 266.3 nm, the particle size was found to be 37.89 nm and the Polydispersibility index was 0.09, and the resulting zeta potential was found to be - 5.59mV. Energy Dispersive Spectroscopy (EDS) showed signals for Cu (33.86%) and O (66.14%). Calcium and Magnesium are the two main metals found in hard water. AAS can be used for hard water analysis and the concentration of magnesium before and after addition of CuONPs was found to be 1.348 mg/L and 1.282 mg/L, respectively and for calcium it was 86 mg/L and 81 mg/L respectively. Heavy metal and impurities from water can be removed by using CuONPs.

PC06

In silico evaluation of novel DPP-4 inhibitors as potential antidiabetic agents Mrs. Pranita Santosh Shankaratti, Dr.(Mrs.) Babita A. Agarwal, Ms. Priyanka Shelke Marathwada Mitra Mandal's College of Pharmacy, Thergaon, Pune-411033

Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder marked by hyperglycemia due to insulin resistance and reduced insulin secretion. Dipeptidyl peptidase-4 (DPP-4) rapidly degrades incretin hormones such as (GLP-1), thereby reducing insulin release. Inhibition of DPP-4 prolongs incretin action and improves glycemic control.DPP-4 inhibitors represent an important class of oral antidiabetic agents with advantages such as weight neutrality and low risk of hypoglycaemia. However, existing inhibitors show limitations related to efficacy, selectivity, and long-term safety, highlighting the need for novel DPP-4 inhibitors.

Need & Objectives of the Study

The study was undertaken to design and evaluate novel DPP-4 inhibitor molecules with improved binding affinity and selectivity. The primary objective was to perform molecular docking studies to identify potential leads.

Methodology

Novel ligands were designed based on known DPP-4 inhibitor pharmacophores. The crystal structure of DPP-4 enzyme was obtained from the Protein Data Bank. Molecular docking was performed using docking software to evaluate ligand–protein interactions, binding energy, and hydrogen bonding patterns.

Docking Study & Results: Docking analysis revealed that selected novel compounds exhibited strong binding affinity and stable interactions with key active site residues of DPP-4. Docking scores of some compounds were comparable or superior to standard DPP-4 inhibitors.

Conclusion: The study successfully identified promising novel DPP-4 inhibitor candidates that may serve as potential antidiabetic agents.

PC07

Design, synthesis, computational analysis, characterization and bioevaluation of quinoxaline-based sulphonyl chloride derivatives

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Quinoxaline is an important heterocyclic scaffold known for its broad spectrum of biological activities, particularly antimicrobial potential. In the present work, a series of quinoxaline- based sulphonyl chloride derivatives were designed, synthesized, computationally analyzed, characterized, and evaluated for antimicrobial activity. The molecular design aimed to develop structurally novel derivatives with improved biological relevance.

Computational molecular docking studies were carried out against selected microbial target proteins to predict binding affinity and interaction profiles of the synthesized compounds. The docked complexes exhibited favorable binding energies and key interactions, suggesting effective target engagement. The compounds were synthesized via a systematic multi-step synthetic route and purified using standard laboratory procedures. Structural characterization was performed using FT-IR, Nuclear Magnetic Resonance spectroscopy which confirmed the formation of the quinoxaline nucleus and sulphonyl chloride functionality. The antimicrobial activity was evaluated in vitro against selected Gram-positive and Gram-negative bacterial strains using standard assay methods. Several derivatives demonstrated significant antimicrobial activity when compared with standard drugs, while others showed moderate to low activity. A good correlation was observed between docking results and experimental antimicrobial findings, supporting the predictive value of computational analysis.

Overall, the study identifies quinoxaline-based sulphonyl chloride derivatives as promising antimicrobial agents and provides a scientific basis for further structural optimization and pharmacological investigation.

Keywords: Quinoxaline derivatives; Sulphonyl chloride; Antimicrobial activity; Molecular docking; Novel heterocycles.

PC08

In silico molecular docking study of arborside a with HSP90: a potential natural inhibitor in cancer therapy

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A Molsoft/ICM molecular docking study was carried out to predict the binding of Arborside A with heat shock protein 90 (HSP90), a key anticancer drug target, and to identify major binding- site interactions supporting complex stability. The docking protocol was validated by re- docking a co-crystallized/reference ligand into the HSP90 binding pocket, producing an RMSD of 3.00 and a Molsoft score of −32.3, which was used as an internal benchmark for pose reproduction and scoring performance.

Using the validated setup, Arborside A was docked into the same binding site and yielded a consistent docking score of −15.57 (reported in both 2D and 3D pose outputs), indicating a favorable predicted binding orientation within the pocket. Interaction analysis showed that Arborside A formed three hydrogen bonds with N51 (3.1618 Å), F138 (3.0197 Å), and N106 (2.842 Å).

In addition, the ligand exhibited multiple hydrophobic contacts with residues D54, A55, D57, K58, I96, M98, D102, K112, G137, H154, and T184 (approximately 3.27–4.47 Å), suggesting that both polar and hydrophobic forces contribute to binding stabilization. Overall, the Molsoft docking results support a binding mode of Arborside A in the HSP90 site, providing a computational basis for considering Arborside A as a potential HSP90-directed anticancer lead for further in vitro and in vivo validation.

PC09

Design, synthesis and biological evaluation of novel 1,2,4,5-tetrasubstituted imidazole derivatives as potential anticancer, antifungal and antioxidant agents

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Imidazole derivatives are widely recognized for their diverse pharmacological activities. The present study focuses on the design, synthesis, and biological evaluation of novel 1,2,4,5-tetrasubstituted imidazole derivatives as potential anticancer, antifungal, and antioxidant agents. The work was carried out with the objective of developing multifunctional molecules capable of addressing cancer and fungal infections, which are often associated with oxidative stress and therapeutic resistance.

Initially, a series of imidazole derivatives was designed using ChemSketch and evaluated through in-silico studies. Molecular docking was performed using MOE and PyRx against important cancer-related targets such as EGFR, PARP-1, BRAF, and RET, as well as key fungal enzymes including ERG11, NMT, and DHFR. The docking studies indicated favorable binding interactions with both cancer and fungal targets. ADMET prediction using SwissADME and toxicity assessment using ProTox-3.0 suggested acceptable drug-likeness and low predicted toxicity for the selected compounds.

Based on computational screening, promising derivatives were synthesized using a multicomponent reaction. Structural confirmation of synthesized compounds was carried out using IR, NMR, and mass spectrometry techniques. In-vitro biological evaluation demonstrated noticeable antioxidant activity, along with effective antifungal and anticancer activity in the tested models. Structure–activity relationship analysis indicated that specific substitutions on the imidazole ring played an important role in enhancing biological performance.

Overall, the study highlights tetra substituted imidazole derivatives as promising multifunctional scaffolds with potential for further optimization and development as therapeutic agents.

PC10

Rational drug design for combating antimicrobial resistance

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Multi-drug-resistant Mycobacterium Tuberculosis (MDR-TB) is an increasing crisis with over 410,000 cases reported globally in 2022. From the various methods, efflux pumps present on the cell wall have a wide potential for extruding antibiotics, preventing intracellular accumulation and reducing their efficacy. This study focuses on the development of novel efflux pump inhibitors (EPIs) derived from quinolone and pyridine derivatives to restore antibiotic potency.

A library of quinolones and pyridines, generated using ChemSketch, underwent ADMET filters with SwissADME and ProTox servers and were evaluated through MOE docking software against MTB efflux pumps from major facilitator superfamily, resistance-nodulation- division, ATP-binding cassette, and small multidrug resistance families. They were also tested for their intrinsic activity against anti-TB targets, namely, DNA gyrase, DprE1, ATP synthase, and MmpL3, to test for dual action. Potentially active molecules were selected for synthesis: quinolone derivatives via a 3-step N-ketoarylamide cyclization and pyridine derivatives via DCC-mediated amide coupling. Synthesized products were purified and characterized by IR, NMR, MS, and HPLC, and were tested for bioactivity using the Microplate Alamar Blue Assay (MABA) against the H37Rv strain at Maratha Mandals Central Research Laboratory. While all synthesized compounds showed potent anti-TB activity, the molecules, PYRN-1 and QS-3, exhibited synergistic activity with Isoniazide, reducing its MIC at sub-inhibitory concentrations, confirming efflux inhibition.

These findings position quinolone/pyridine hybrids as dual-action agents—direct anti-TB compounds and EPIs, offering a viable adjunct to standard regimens.

PC11

Structure-based design and in silico profiling of thiazole- containing pyrazole derivatives: discovery of potent cyclin-dependent kinase 2 inhibitors with favorable admet properties.

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Cyclin-dependent kinase 2 (CDK2) is one of the most promising therapeutic targets in the treatment of cancer, especially colorectal cancer. However, it has been quite challenging to develop selective inhibitors because of the high structural similarity among the CDK family members. This in silico research has adopted an integrated strategy involving pharmacophore modeling, 3D-QSAR analysis, molecular docking, molecular dynamics (MD) simulation, and ADMET prediction to discover new CDK2 inhibitors.A 3D-QSAR model (R^2 = 0.8594, Q^2 = 0.8014, based on 24 compounds with 1.5 log unit activity range) was successfully validated and used to establish quantitative structure-activity relationships. The robustness of the model was also supported by an external validation through Y-randomization. The pharmacophore hypothesis AHRRR1 was the model that best represented the key features of the interaction and was therefore used for validation by molecular docking studies. Nine compounds were predicted to bind with higher affinity than the clinical standard AT7519, and among them, compound 7e was the one with the highest docking score (-8.012 kcal/mol vs. -6.478 kcal/mol). The binding stability was also confirmed by the MD simulations for 100 ns. The compounds discovered have, in general, good predicted ADMET properties, although some of them do not meet the molecular weight criteria. As a matter of fact, all these results are purely computational and ought to be experimentally validated to assess biological activity, selectivity profiles, safety, and pharmacokinetic properties. This research is a stepping stone for further synthetic and biological exploration of these in silico optimized CDK2 inhibitor candidates.

PC12

Integrated ADME, network pharmacology, docking, and molecular dynamics analysis of phytoconstituents for alzheimer's disease

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A degenerative brain disorder that causes memory loss is Alzheimer's disease(AD). Unfortunately, no treatment is currently available for AD. The use of phytoconstituents may be a better option for the treatment of neurodegeneration. The purpose of this study was to discover potential natural sources for AD treatment. In the present study, we performed a comprehensive *in silico* study of several phytoconstituents that have been previously investigated for neuroprotective effect. The pharmacokinetic properties of 22 phytoconstituents were screened via Swiss ADME and Protox III, which helped us to select the most potent phytoconstituents. Phytoconstituent – disease target -gene network was constructed. According to a network pharmacology study GSK3β, STAT3, MAOB, ESR1 and PTGS2 are the primary targets linked to AD. Ten gene pathways were found to be connected with AD. Molecular docking was performed with all selected phytoconstituents. A molecular dynamic simulation study was also performed. Molecular docking score and simulation suggest that Rosmariquinone can acts as a drug like candidate for neuroprotection.

Keywords: Alzheimer, Molecular docking, ADME and simulation study

PC13

Design, microwave-assisted synthesis, and pharmacological assessment of novel 1,3,4-oxadiazole-linked benzene-1,2,3-triol derivatives targeting oxidative stress and inflammation in spinal cord injury

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As per world health organization (WHO), worldwide nearly 250,000-500,000 individuals grieve from spinal cord injury (SCI) annually. Traumatic SCI is a enervating condition that deteriorates the eminence of life by traumatic pain and loss of function and could lead to mortality in patients. Thus, research on SCI is highly relevant. An array of biochemical and cellular processes is intricate in the mechanisms of SCI. Like ionic disturbances, increased neurotransmitter release, free radical formation, vascular ischemia, edema, post-traumatic inflammatory response, apoptosis, and genetically programmed cell death. Generation of reactive oxygen species (ROS) is the central mediator in SCI, which has several effects at the cellular level. In this research study, as per molecular simulation study series of *5-(5- (substituted)-1,3,4-oxadiazol-2-yl) benzene-1,2,3-triol* have been synthesized. These compounds show positive interaction with receptors involved in mechanism of SCI. The present study was designed to analyze effect of *5-(5-(substituted)-1,3,4-oxadiazol-2-yl) benzene-1,2,3-triol* against SCI- Induced Oxidative stress through SOD and in vivo DPPH assay. Anti-inflammatory effects evaluated by TNF α and IL-6 biomarker. On the basis of obtained in vivo- in vitro results, these molecules show protection against SCI and may be lead as effective therapeutic strategy in treatment of SCI.

Keywords: Spinal cord Injury (SCI), Oxidative Stress, Microwave, DPPH assay.

PC14

In-silico investigation of oxadiazole-derived notum inhibitors employing machine learning and density functional theory

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Carboxylesterase Notum functions as an inhibitor of the Wnt signaling pathway. Evidence indicates that Notum plays a crucial role in several illnesses, highlighting the need for innovative small molecule inhibitors. Targeting Notum may offer a promising therapeutic approach for cancer, osteoporosis, and neurological diseases. This study integrates ligand- based and structural machine learning methodologies for drug discovery, incorporating molecular docking, machine learning quantitative structure-activity relationship (ML-QSAR), and molecular dynamics simulations to inform the development of novel Notum carboxylesterase inhibitors. Twenty-six chemicals were evaluated to construct four ML-QSAR models. The best model had a cross-validation **q^2** of **0.44,** a predictive correlation coefficient (r^2 pred) of 0.997, and an impressive conventional correlation value of **0.99**. Compound **22** was observed to locate within the active site pocket of notum carboxylesterase, establishing hydrogen bond interactions with the Trp128 backbone, as demonstrated by molecular docking assays. Molecular dynamics simulations spanning 100 ns confirmed the structural stability of the most active ligands within the Notum active site, evidenced by stable RMSD and RMSF patterns, which validate protein-ligand robustness. These results collectively indicate that oxadiazole scaffolds may serve as useful templates for the construction of powerful, selective, and drug-like Notum inhibitors. This study provides significant insights into the structure- activity relationship of Notum inhibition and lays the foundation for future experimental validation and optimization of therapeutic candidates.

PC15

Exploring molecular mechanisms of 5-hydroxy-2-(hydroxymethyl)-4h-pyran-4-one as a cardioprotective agent in doxorubicin-induced cardiotoxicity: a network pharmacology, molecular docking, and molecular dynamic simulation study.

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Background: The clinical use of doxorubicin is limited due to its dose-dependent cardiotoxic effects. The 5-Hydroxy-2-(hydroxymethyl)-4H-pyran-4-one is a fungal metabolite commonly produced naturally by many *Aspergillus*, *Acetobacter*, and *Penicillium* species and has shown free radical scavenging activity. Free radical scavenging, antioxidant, and metal chelation activities were proven to be effective in ameliorating doxorubicin-induced cardiotoxicity (DIC) via various molecular mechanisms; hence, the present study was undertaken to explore virtually the cardioprotective effect of 5-Hydroxy-2-(hydroxymethyl)-4H-pyran-4-one against DIC while deciphering its molecular mechanism using *In-silico* techniques such as network pharmacology, molecular docking, and molecular dynamic (MD) simulation.
Methods: Data mining for drug targets and DIC (disease-related) genes were performed using different online available databases. Gene Ontology was carried out using DAVID database.
Protein-Protein Interaction (PPI) between the common targets and genes were constructed using the STRING database. Results were visualized using Cytoscape tool using various plug- ins. Molecular docking was performed using Pyrx tool. Whereas, MD simulation was performed for 100 ns using GROMACS.
Results: A total of 238 common Drug targets and Disease genes were identified. Gene Ontology showed Molecular Function (MF) related to double stranded DNA exodeoxyribonuclease activity and cysteine-type endopeptidase activity involved in execution phase of apoptosis. KEGG pathway enrichment analysis revealed antifolate resistance, IL−17 signaling pathway, apoptosis, etc. Common hub genes obtained from various Cytoscape plug- ins revealed JUN, HIF1A, TP53, AKT1, NFKB1, and IL6. Molecular docking was performed on hub genes obtained from network pharmacology and literature search. Hub genes: AKT1, MAPK3, CAMK2B, HIF1A, NLRP3, IL6, IKKB, GSK3B, and SRC showed highest binding
energies. MD simulation was performed for AKT1, MAPK3, CAMK2B, HIF1A, NLRP3, and IL6 for 100 ns; however, only IL6 and NLRP3 could withstand 100 ns simulation. The Root Mean Square Deviation (RMSD), Root Mean Square Fluctuation (RMSF), Radius of Gyration (Rg), Solvent Accessible Surface Area (SASA), and Molecular Mechanics Poisson-Boltzmann Surface Area (MMPBSA) for IL6 and NLRP3 had favorable results.
Conclusion: 5-Hydroxy-2-(hydroxymethyl)-4H-pyran-4-one could virtually attenuate DIC through modulation of IL6 and NLRP3 inflammasome pathways, serving as a promising cardioprotective agent.

PC16

Synthesis and in silico evaluation of newly designed pyrazole derivatives targeting VEGFR-2 in wound healing

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Aim:

Currently, researchers are focusing on the development of new active compounds for wound healing by regulating angiogenesis, which plays a crucial role in tissue repair. One of the important target proteins involved in angiogenesis during wound healing is vascular endothelial growth factor receptor-2 (VEGFR-2). Modulation of VEGFR-2 signaling is essential for endothelial cell migration and neovascularization at the wound site. Pyrazole derivatives are well known for their diverse biological activities and their ability to interact with receptor-based targets. Therefore, the aim of the present study was to perform a molecular docking study of newly designed pyrazole derivatives to predict their interaction with the VEGFR-2 active site and assess their potential wound healing activity.

Methodology:

Molecular docking studies of twenty pyrazole derivatives were carried out using various computational tools. The chemical structures were drawn using ChemDraw and optimized using ChemDraw 3D. Energy minimization and file format conversion were performed using OpenBabel. Protein and ligand preparation were carried out using AutoDock Tools, Discovery Studio, and UCSF Chimera. Molecular docking was performed using PyRx against the VEGFR-2 active site obtained from the Protein Data Bank with PDB code 3VNT. The interactions were evaluated based on clean protein docking scores. Sulfadiazine, a commonly used standard drug in wound healing therapy, was selected as the reference compound. Results:

The docking scores of the twenty pyrazole derivatives against VEGFR-2 (PDB ID: 3VNT) were observed in the range of approximately −4.5 to −4.8 kcal/mol. Several derivatives showed docking scores comparable to that of sulfadiazine. The compound with the lowest docking score within this range demonstrated the highest predicted binding affinity toward the VEGFR- 2 active site.

Conclusion:

All newly designed pyrazole derivatives exhibited favorable interactions with VEGFR-2 and are feasible for further synthesis and experimental evaluation to confirm their wound healing potential.

PC17

Rational design and molecular dynamics analysis of pyrido[4,3-b]indole derivatives as casein kinase 2α inhibitors against breast cancer

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Breast cancer remains a major global health concern, with current therapies often limited by resistance and toxicity which necessitate to design and synthesis of novel analogues. Casein kinase 2 alpha (CK2α), a constitutively active serine/threonine kinase, has emerged as a promising target due to its role in cell proliferation, survival, and apoptosis resistance. In this work, a series of pyrido[4,3-b]indole derivatives were designed, synthesized, and evaluated as potential CK2α inhibitors. Molecular docking studies predicted strong binding affinities of the synthesized compounds within the ATP-binding pocket, with PW-3d, containing a trifluoromethyl-substituted phenyl group, showing the most favourable score. To validate dynamic stability, molecular dynamics (MD) simulations were carried out, where DCCM, PCA, and FEL analyses revealed stable binding and conformational changes consistent with effective inhibition. Experimentally, the derivatives were synthesized via amide coupling and tested for cytotoxicity in MDA-MB-231 breast cancer cells using the MTT assay. PW-3d exhibited a potent IC_{50} of 7.11 µg/mL, close to the reference ellipticine (IC_{50} = 4.02 µg/mL), with improved activity at moderate concentrations. These results demonstrate the effectiveness of integrating computational modelling with experimental validation, establishing pyridoindole scaffolds as promising leads for CK2α-targeted anticancer therapy.

PC18

Integrative computational screening of plant terpenes, ADMET profiling, target prediction and stress-associated gene prediction

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Background: Terpenes are the diverse class of plant secondary metabolites with known antioxidant and neuroactive properties that may contribute to relieve stress. Leveraging comprehensive natural product databases facilitates systematic identification of terpenoid constituents with potential therapeutic relevance. Aim: This study aims to identify and characterize terpenoid compounds with potential anti stress activity through an integrated in silico framework which includes database mining, ADMET profiling, target prediction, and stress associated gene network analysis. Methodology: Terpenoid compounds were retrieved from natural product database and evaluated for drug like properties using ADMET prediction tools such as SwissADME and ProTox 3.O. Computational target prediction algorithms were employed to map these compounds to predict human protein involved in stress response pathways. Genes responsible for stress was retrieved from Gene-Cards database. Predicted targets were then integrated with stress related gene expression with the help of Venny 2.0 to identify key genes and regulatory networks associated with anti stress mechanisms. Results: Cymbopogon flexuosus (Poaceae) emerged as a candidate species for stress modulation. A total of 43 phyto-constituents were identified out of which terpenes were evaluated for drug-likeness and blood-brain barrier permeability using in-silico analysis, resulting in eight CNS-permeable compounds. Target prediction and interaction analysis revealed potential interactions with molecular targets involved in neurotransmission and stress response pathways and genomic integration identified important stress-related genes, such as NR3C1, HMOX1, and FAAH. Conclusion: The integrated in-silico approach successfully identified terpenoid compounds with promising pharmacokinetic and molecular target profiles. Novel gene sets among terpene-predicted targets and stress-associated genes were identified. Future Perspective: In-silico molecular docking studies with novel targets could be performed which will be further validated by In-Vitro analysis.

Key Words: Terpenes, Natural database, chemoinformatics, Stress, ADMET

PC19

Integrated phytochemical analysis, in-silico, and in-vitro evaluation of *argyreia nervosa* leaf extract for its antigonorrhoeal potential

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Gonorrhoea resistance to ceftriaxone necessitates novel antimicrobials. Methanolic Argyreia nervosa leaf extracts identified 99 phytoconstituents via OHR-LCMS; 54 shortlisted by PASS/ADMET showed drug-likeness. Variotin docked best to PBP2 (PDB:6P54) at -35.28 kcal/mol vs. ceftriaxone (-5.13 kcal/mol). In vitro assays confirmed 13 mm ZOI (1 mg/mL) and MIC 15.6 µg/mL.

Introduction: Gonorrhoea caused by N. gonorrhoeae affects 80 million annually with rising ceftriaxone resistance. A. nervosa (Convolvulaceae), traditionally used for gonorrhoea and ulcers, contains alkaloids and flavonoids warranting evaluation. Study addresses gaps in OHR- LCMS profiling and PBP2 docking against this pathogen.

Methods: Leaves authenticated and extracted (Soxhlet: methanol/ethanol/hydroalcoholic; yields 5.16-3.5% w/w). Standardization (ash 4.3%, LOD 5%) and screening confirmed alkaloids/saponins. OHR-LCMS identified compounds; PASS/ADMET (BIOVIA) filtered; docking to 6P54 used CDOCKER. In vitro: well-diffusion ZOI, resazurin MIC vs. ATCC 49226.

Results**:** OHR-LCMS detected 99 compounds (e.g. laurylamine, variotin). 54 passed ADMET; variotin top binder (-35.28 kcal/mol, superior interactions). Extract ZOI 13 mm (vs. ceftriaxone 29 mm); MIC 15.6 µg/mL with colour shift confirming inhibition.

Conclusion: Argyreia nervosa methanolic extract shows potent antigonorrhoeal activity via PBP2 inhibition. Phytochemical-computational-biological integration validates therapeutic promise; future isolation and in vivo studies needed.

Keywords: Argyreia nervosa, Neisseria gonorrhoeae, Ceftriaxone resistance, Molecular docking Variotin, Phytochemical profiling, MIC Assay.

PC20

HPTLC-assisted quantification and comparative study of antimicrobial activity of phycocyanin from spirulina species extracts

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Phycocyanin is a blue, water-soluble, phycobiliprotein pigment obtained in *Spirulina*, known for its strong antioxidant, anti-inflammatory, and fluorescent properties, widely used as a natural food colourant, antioxidant supplement, and in biomedical research. However, only a limited number of analytical methods have been reported for the estimation and quantification of phycocyanin from different *Spirulina* species, along with comparative studies of its antimicrobial activity. The present study aims to develop and validate high-performance thin- layer chromatography (HPTLC) method for the simultaneous determination of phycocyanin in different species of *Spirulina,* namely, *Spirulina maxima* and *Spirulina platensis*, and to comparatively evaluate the antimicrobial activity of crude phycocyanin extracted from these species against six different microorganisms, using standards azithromycin and phycocyanin as references. The extraction of phycocyanin from different species of *Spirulina* was done using a mechanical cell disruption method, using different solvents. The chromatographic development was performed using ascending development with n-butanol: Formic Acid: water (5:3:2 v/v) at 615 nm. Validation of the developed method was performed as per the International Council on Harmonisation (ICH) Q2 (R1) guidelines for different validation parameters like linearity, limit of detection (LOD) (3000ng/band), limit of quantification (LOQ) (8000ng/band), precision, repeatability (< 2%RSD), robustness (< 2%RSD), accuracy (90-91%), assay (90.66%), and specificity. Antimicrobial activity was assessed using the Kirby-Bauer agar well diffusion method for six different organisms. The extracts of *Spirulina Platensis* and *Spirulina maxima* showed the maximum activity against Gram-positive bacteria, with Enterococcus faecalis exhibiting the maximum zone of inhibition and the minimum zone of inhibition against Staphylococcus oralis. Keywords – Spirulina, Phycocyanin, HPTLC, Validation, Antimicrobial activity, Comparative evaluation.

PC21

Synthesis, characterization, development and validation of RP-HPLC method for the estimation of process related impurities

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There has been ever increasing interest in impurities present in Active Pharmaceutical Ingredient's (API's). Nowadays, not only purity profile but also impurity profile has become mandatory according to the various regulatory authorities. The study aimed to develop and validate a reverse-phase high-performance liquid chromatography (RP-HPLC) method for the simultaneous estimation of process-related impurities in Dapagliflozin, Vildagliptin, and Sitagliptin. The method was optimized using various mobile phases and validated according to ICH guidelines for parameters including linearity, accuracy, precision, robustness, LOD, and LOQ. The optimized method employed an Agilent Poroshell C18 column (150 mm × 4.6 mm, 5 µm), with a mobile phase of acetonitrile and 0.05% orthophosphoric acid in water (30:70, v/v), at a flow rate of 1.0 mL/min, and detection at 210 nm. The method exhibited good linearity ($r^2 > 0.998$), accuracy (recovery within 98–102%), and precision (RSD < 2%). The method is suitable for routine quality control of impurities in antidiabetic formulations. Regulatory bodies across the globe have established comprehensive guidelines to ensure that impurity profiling is rigorously conducted during the development and manufacturing of pharmaceuticals. These guidelines are designed to protect public health by setting acceptable limits for impurities and mandating robust analytical methods for their detection and quantification. Thus impurity profiling is a cornerstone of pharmaceutical development, ensuring that drug products are safe, effective, and of high quality. Regulatory guidelines such as FDA (Food and Drug Administration, USA), EMA (European Medicines Agency), Pharmacopoeias etc. The presence of impurities can accelerate the degradation of drug products, thereby reducing their shelf life and stability. Stability studies are conducted to understand how impurities develop over time and under various storage conditions, which is essential for establishing appropriate storage guidelines and expiration dates.

Key words- FDA, EMA, API, shelf life

PC22

Towards evidence based validation of the euphorbia prostrata: a trandisplinary approach in herbal drug development

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Euphorbia prostrata Aiton is a medicinal plant traditionally used for the management of hemorrhoids, inflammatory disorders, gastrointestinal ailments, and vascular conditions. Despite its extensive ethnomedicinal use and growing incorporation into modern herbal formulations, comprehensive scientific validation remains limited. This work aims to establish an evidence-based validation of *Euphorbia prostrata* through a transdisciplinary approach integrating ethnobotany, pharmacognosy, phytochemistry, pharmacology, toxicology, and pharmaceutical sciences. The study emphasizes accurate botanical identification, documentation of traditional knowledge, and standardized extraction procedures, followed by detailed phytochemical profiling to identify key bioactive constituents such as flavonoids, tannins, phenolic compounds, and triterpenoids. Available in vitro and in vivo pharmacological evidence demonstrating anti-inflammatory, antioxidant, antimicrobial, vasoprotective, and wound-healing activities is critically evaluated, with particular attention to molecular mechanisms involving regulation of inflammatory mediators, oxidative stress, and vascular function. Safety and toxicity considerations are addressed to support rational therapeutic use and regulatory acceptance. Furthermore, challenges related to quality control, standardization, and reproducibility of herbal preparations are discussed, highlighting the importance of analytical and biotechnological tools in ensuring consistency and efficacy. Overall, this transdisciplinary framework supports the translation of *Euphorbia prostrata* into evidence- based herbal drug development and provides a foundation for future clinical and pharmaceutical research.

PC23

Analytical quality by design–based development and validation of a robust RP-HPLC method for estimation of cetilistat in bulk and pharmaceutical dosage form

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Background: A systematic and science-based analytical approach is essential for reliable quality control analysis. Cetilistat is a novel pancreatic lipase inhibitor and potential anti- obesity agent that reduces dietary fat absorption, lowers plasma triglycerides, enhances fecal fat excretion, and reduces body weight and lipid levels. Clinical studies indicate that cetilistat is generally well tolerated, highlighting the need for a robust analytical method for its pharmaceutical analysis. Objective: The objective of the present study was to develop and validate a robust RP-HPLC method for the estimation of cetilistat in bulk drug and pharmaceutical dosage form using an Analytical Quality by Design (AQbD) approach. Materials and Methods: Risk assessment was carried out using an Ishikawa (fishbone) diagram and Risk Priority Number (RPN) ranking in accordance with ICH Q9 guidelines to identify critical method parameters influencing chromatographic performance. Based on the risk assessment, critical method parameters were screened and optimized using a Design of Experiments (DoE) approach, specifically a Central Composite Design, to study their effect on critical quality attributes such as retention time, peak area, and peak symmetry. Optimized chromatographic conditions were established using a phenyl-hexyl column with a mobile phase consisting of methanol: water (95:05, v/v) at a flow rate of 1.0 mL/min and UV detection at 227 nm. The developed RP-HPLC method was validated in accordance with ICH Q2 (R1) guidelines. Results: The method exhibited good linearity over the studied concentration range with a correlation coefficient (R^2) of 0.9986. Precision studies demonstrated %RSD values below 2%, indicating acceptable repeatability and intermediate precision. Accuracy results were within acceptable limits, confirming the reliability of the method. Robustness studies showed that minor deliberate variations in method parameters did not significantly affect the analytical performance.Conclusion: The AQbD- based RP-HPLC method developed in this study is simple, precise, accurate, and robust, and is suitable for routine quality control analysis of cetilistat in bulk drug and pharmaceutical dosage forms while complying with regulatory requirements.

Keywords: Analytical Quality by Design; RP-HPLC; Method Development; Method Validation; Cetilistat.

PC24

Novel liquid-assisted grinding (lag) synthesis and characterization of schiff base metal complexes derived from vanillin, l-tyrosine & urea

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A novel, green, and efficient liquid-assisted grinding (LAG) method was employed for the synthesis of Schiff base metal complexes derived from vanillin, L-tyrosine, and urea. The Schiff base ligand was formed via mechano chemical condensation under minimal solvent conditions and subsequently coordinated with transition metal ions such as Co(II), Ni(II), Cu(II), and Zn(II). The ligand and its metal complexes were characterized using FT-IR, UV– Visible, NMR spectroscopy, elemental analysis, and thermal analysis techniques. Infrared spectral studies confirmed the formation of the azomethine (C=N) group and its involvement in metal coordination through nitrogen and phenolic oxygen atoms. Electronic spectral and magnetic susceptibility measurements suggested octahedral or distorted octahedral geometries for the complexes. Thermal studies revealed enhanced thermal stability of the metal complexes compared to the free ligand. The LAG approach significantly reduced reaction time, solvent consumption, and waste generation, demonstrating its effectiveness as an environmentally sustainable alternative to conventional synthesis methods.

Keywords:

Liquid-assisted grinding; Schiff base; Vanillin; L-Tyrosine; Metal complexes; Green chemistry; Mechano chemical synthesis

PC25

Characterization of oxidative degradation products of miconazole and clobetasol using LC-ESI-QTOF-MS method

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Background: Miconazole nitrate (MIO) and clobetasol propionate (COB) are widely used antifungal and anti-inflammatory agents, respectively, in topical formulations. Although several HPLC, HPTLC, and UV analytical methods have been reported, none have addressed the oxidative degradation behavior or characterized the degradation products of these drugs. Hence, studying their oxidative stability and degradation pathways is essential.

Objective: This study aimed to develop and validate a stability-indicating method for the simultaneous estimation of MIO and COB and to characterize their oxidative degradation products using LC–MS/MS.

Materials and Methods: MIO and COB reference standards, HPLC-grade solvents, and a marketed cream formulation were used. Analysis was performed using HPLC-UV and LC– MS/MS under optimized chromatographic and ESI conditions. Method validation included system suitability, linearity, oxidative stress studies, and formulation assay.

Results: Effective separation was achieved using a Cosmocil C18 column (4.6 × 150 mm, 5 µm) maintained at 45 °C with a mobile phase of ammonium acetate buffer (10 mM, pH 4.2) and acetonitrile (35:65 v/v). Detection was performed at 247 nm. LC–MS/MS analysis in positive ESI mode (m/z 40–600) enabled structural elucidation of degradation products. Under oxidative stress, degradation increased under reflux conditions. MIO formed two degradants (DP-A and DP-B), while COB produced DP-C and DP-D, confirmed through characteristic fragmentation patterns.

Conclusion: The developed method is sensitive, specific, and stability-indicating, effectively characterizing oxidative degradation pathways of MIO and COB. This study provides valuable insight into their degradation behavior and supports routine quality control and stability assessment.

Keywords: Miconazole nitrate, Clobetasol propionate, oxidative degradation, LC-ESI-QTOF- MS, LC–MS/MS, stability-indicating method, tandem mass spectrometry, HPLC.

PC26

HPTLC method development and validation for rutin, rosmarinic acid, caffeic acid, and kaempferol in indian coconut bee pollen

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Indian bee pollen shows therapeutic potential; however, regional compositional variability requires Indian-specific quality standards since no global standards have yet been established. This work describes the development and validation of a method for the simultaneous estimation of rutin, rosmarinic acid, kaempferol, and caffeic acid in Indian coconut bee pollen by using HPTLC. Optimal separation was obtained with the toluene-ethyl acetate-methanol- formic acid-water (3:6:1:0.5:0.5, v/v) mobile phase. Based on UV-Visible spectra, optimal quantitative densitometry was achieved at wavelengths of 366 nm and 328 nm. Rf value for rutin was 0.090, for rosmarinic acid 0.553, caffeic acid 0.610, and kaempferol 0.683. Excellent linearity was demonstrated by the method throughout the designated concentration ranges: rutin (400-900 ng/band, R^2=0.9979), rosmarinic acid (1000-4500 ng/band, R^2=0.9995), caffeic acid (500-3000 ng/band, R^2=0.9909), and kaempferol (1500-4000 ng/band, R^2=0.9979) and, thus, assured robustness, precision, and accuracy for the developed method. Application of the method to Natural Bee Pollen Capsules gave the amount of kaempferol (0.205 ± 0.001%) and rosmarinic acid (4.13 ± 0.0001%).

Keywords: HPTLC, Validation, Rutin, Rosmarinic Acid, Caffeic Acid, and Kaempferol in Indian Coconut Bee Pollen

PC27

Non-destructive analytical and AI strategies for assessment of gelatin capsule crosslinking

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Gelatin capsules are widely used in oral drug delivery because of their safety, flexibility, and patient acceptance. However, exposure to heat, humidity, oxidation, or reactive excipients can cause gelatin crosslinking, which negatively affects capsule disintegration and drug release. Such changes may lead to dissolution failure and regulatory concerns during quality evaluation. Traditional methods used to detect crosslinking are often destructive, time-consuming, and unsuitable for real-time monitoring.

Recent advances in non-destructive analytical techniques combined with artificial intelligence (AI) offer an effective solution for early detection and control of gelatin crosslinking. Techniques such as Near-Infrared (NIR) spectroscopy, FTIR, FT-NIR, Raman enable rapid assessment of structural and molecular changes in capsule shells. When integrated with chemometric and machine learning models, including PCA, PLS, these tools provide reliable prediction and classification of crosslinking severity. This approach supports Quality by Design (QbD) and Process Analytical Technology (PAT) frameworks, improving process understanding, product consistency, and regulatory compliance in modern pharmaceutical manufacturing.

Keywords: Gelatin capsules, Crosslinking, NIR spectroscopy, Artificial intelligence, Chemometrics, Quality by Design, Process Analytical Technology (PAT).

PC28

QbD Based Validated Forced Degradation HPLC Method for Analysis of Maropitant Citrate and Its *In-Silico* and *In-Vitro* Cytotoxicity Evaluation for Anti-Cancer Potential

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The study aimed to develop and validate a Quality by Design (QbD)-based reverse-phase high- performance liquid chromatography (RP-HPLC) method for the quantification and stability analysis of Maropitant Citrate. Additionally, its potential anticancer activity was explored through *in-silico* molecular docking and *in-vitro* cytotoxicity evaluation. An Analytical Quality by Design (AQbD) approach using Box–Behnken design optimized key chromatographic parameters. The method was validated as per ICH Q2(R1) guidelines for linearity, precision, accuracy, robustness, LOD, and LOQ. Forced degradation studies assessed the drug's stability under various stress conditions. Molecular docking was performed against the HER2 receptor using UCSF-Chimera and PyRx, and cytotoxicity was evaluated on MCF-7 breast cancer cells via the MTT assay. The optimized RP-HPLC method achieved excellent linearity (r^2 = 0.9993) within 5–30 µg/mL and a retention time of 8.5 minutes. Maropitant Citrate showed degradation under acidic and alkaline conditions but remained stable under oxidative, thermal, and photolytic stress. Docking results revealed moderate HER2 binding affinity (-8.9 kcal/mol) compared to the reference Trastuzumab Deruxtecan (-10.1 kcal/mol). The MTT assay showed dose-dependent cytotoxicity with an IC_{50} value of 38.10 µM. The validated QbD-based RP- HPLC method is robust and reliable. *In-silico* and *in-vitro* findings suggest Maropitant Citrate's potential for repurposing as an anticancer agent targeting HER2 pathways.

PC29

Development and validation of HPLC method for estimation of favipivir in dissolution media

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Favipiravir is a pyrazine analog, has shown antiviral activity against a wide variety of viruses. An isocratic high performance liquid chromatography method has been developed for routine quality control of favipiravir. Separation was carried out by BDS Hypersil C8 column using mobile phase acetonitrile: water (30:70 v/v) at a flow rate of 1 mL min^{-1}. The detection was carried at 323 nm at ambient temperature. Excellent linear relationship between peak area and favipiravir concentration in the range of 5–30 µg mL^{-1} has been observed (r^2, 0.996). Developed method has been found to be sensitive (limits of detection and quantification were 0.218 µg mL^{-1} and 0.660 µg mL^{-1}, respectively), accurate (recovery, 98.61–102.48%), specific and robust (% RSD were less than 2%, for system suitability parameters). Proposed method has been successfully applied for quantification of favipiravir in pharmaceutical formulations and dissolution media

Keywords: Favipiravir, Antiviral, HPLC, method development, Validation

PC30

A sustainable PUFA-rich oleogel platform for anti-aging: formulation optimization and preclinical in vivo validation

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In 2020, the global skin anti-aging market was valued at approximately USD 44,124 million and is expected to reach USD 64,043 million by 2026, growing at a CAGR of about 6%, reflecting increasing demand for sustainable skincare solutions. Skin aging is driven by intrinsic collagen loss and extrinsic UV-induced oxidative stress mediated through MAPK and NFκB pathways. Polyunsaturated fatty acids (PUFAs) help restore skin barrier function and reduce inflammation, but their instability limits topical application. This study aimed to develop and optimize a sustainable PUFA-rich oleogel system using animal-based oil combined with compatible herbal oils for topical anti-aging delivery. Extraction, standardization, and fatty acid profiling using GC-FID were conducted exclusively for the animal-based oil in accordance with FSSAI guidelines, including physicochemical parameters, vitamin A, and carotenoid content. Antioxidant activity of individual and blended oils was evaluated using the DPPH assay. Three oleogel formulations were prepared using glycerol monooleate and cholesterol as structuring agents (F1 single oil, F2 binary blend, F3 multi- blend) and optimized using a Design-Expert D-optimal mixture design with 16 runs. Optimized formulations showed good stability, near-neutral pH, and pseudoplastic thixotropic behavior, with F3 exhibiting higher firmness (700 g) than F1 and F2 (200 g). FTIR and DSC confirmed a stable crystalline network. In vivo evaluation in UV-B and heat-induced Wistar rat models demonstrated reduced erythema, wrinkle formation, skin thickness, oxidative stress, inflammation, and MMP-9 levels, with improved dermal architecture and collagen preservation, supporting the oleogel's anti-aging potential.

PC31

RP-HPLC method development and validation for simultaneous estimation of etoricoxib and serratiopeptidase in combined dosage forms

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The therapeutic combination of Etoricoxib (ETO), a selective COX-2 inhibitor, and Serratiopeptidase (SER), a proteolytic enzyme, is increasingly used in anti-inflammatory formulations. Despite its clinical relevance, no validated RP-HPLC method currently exists for the simultaneous estimation of ETO and SER in combined dosage forms. Existing literature reports separate analytical procedures for each compound, often relying on bioassays or enzyme activity tests for SER and UV or HPLC methods for ETO. This analytical gap complicates quality control and regulatory compliance for co-formulated products.

The present study reports the development and validation of a novel RP-HPLC method for simultaneous quantification of ETO and SER in tablet formulations. Chromatographic separation was achieved using a C18 column (250 × 4.6 mm, 5 µm) with a mobile phase consisting of methanol, acetonitrile, and water in different proportion. The flow rate was 1.0 mL/min, and detection was carried out using a photodiode array detector. Injection volume was 20 µL.

The method demonstrated excellent linearity, precision, and specificity for both analytes across relevant concentration ranges. No forced degradation or bioanalytical studies have been reported for this combination, further underscoring the novelty of this work.

This validated method provides a robust, reproducible, and stability-indicating platform for routine analysis of ETO and SER in combined dosage forms, contributing significantly to pharmaceutical quality assurance and regulatory standardization.

PC32

QBD- driven RP-HPLC method for anti-hypertensive agent: a step by step development and validation roadmap.

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Objectives: This study emphasises on quality by design approach implementation in simultaneous method development for Anti-Hypertensive agents i.e A fixed-dose combination of an ARB (Angiotensin Receptor Blocker) and a CCB (Calcium Channel Blocker) class of drugs for getting a better method in comparison with traditional method development protocol.

Methods: Initial method scouting was performed via traditional HPLC protocols, screening variables such as column temperature, flow rate, and mobile phase. To enhance method robustness, a QbD approach was then implemented using a Box-Behnken Design (BBD) for optimization. The resulting optimized method was then rigorously validated to ensure analytical reliability.

Results: Based on traditional method development, Methanol and 0.1% v/v OPA selected as a mobile phase in 82:18 ratio, the flow rate was selected as 1 ml/min and column temperature was selected at 40^0C. On the basis of these factors 17 HPLC runs performed as per box Behnken design protocol the P-values for quadratic model for all factors was found less than 0.0500 which shows quadratic model is best for proposed study by which method get optimized and the validation was carried out on the most appropriate optimized solution. Selected validation parameters was found in specified range which suggests that the developed method was reliable, suitable and better in comparison with traditional method development approach.

Conclusion: The investigation successfully established a robust analytical method characterized by high accuracy, precision, linearity, and specificity. The reproducibility of the results confirms that this QbD-optimized protocol is both cost-effective and commercially viable. Consequently, the method is well-suited for high-throughput routine analysis in both quality control laboratories and industries.

PC33

Development and validation of RP-UHPLC method for simultaneous estimation of lafutidine and domperidone in pharmaceutical tablet dosage form

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A simple, rapid, selective, sensitive, linear, precise and accurate RP-UHPLC method was developed and validated for simultaneous estimation of Lafutidine and Domperidone in pharmaceutical tablet dosage form. Separation of the drugs was achieved on a reverse phase by shim-pack C18: 250 x 4.6 mm, 3µm, column at 30˚c temperature using a mobile phase consisting of [Methanol: Ammonium Acetate Buffer pH 4.8, 20mM (75:25% v/v)] at a flow rate of 0.7 ml/min was employed. The RP- UHPLC detection wavelength was 220 nm and 10µL of sample was injected. The linearity was found for Lafutidine (35- 60 micro g mL-1) and Domperidone (105- 18 micro g mL-1) with a correlation coefficient of 0.999. Retention times were 4.2 min and 5.0 min for Lafutidine and Domperidone respectively. The method was validated as per the ICH guidelines for its selectivity, system suitability study, specificity, linearity, range, precision, accuracy, limit of detection, limit of quantification, robustness, ruggedness, assay. The percentage RSD for precision and accuracy of the method was found to be less than 2%. The method was successfully employed for routine quality control analysis of Lafutidine and Domperidone in Pharmaceutical formulation.

Keywords: Ultra-High-Performance Liquid Chromatography, Linearity, Precision, Accuracy, Calibration.

PC34

Advances in near-infrared process analytics for real-time monitoring and control of pharmaceutical granulation

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Near-infrared (NIR) spectroscopy has become an effective Process Analytical Technology (PAT) for real-time monitoring and control of pharmaceutical granulation processes. Its adoption supports a shift from traditional trial-and-error manufacturing toward quality-by-design principles and continuous production. This review summarizes major advances reported between 2020 and 2025, together with key foundational literature. The review covers NIR fundamentals, instrumentation, probe designs, and sampling strategies relevant to both batch and continuous granulation processes, including high-shear wet granulation, fluidized bed granulation, and twin-screw granulation. Particular emphasis is placed on in-line and online NIR applications for monitoring critical quality attributes (CQAs) such as moisture content, particle size distribution, granule growth, bulk density, and content uniformity. The role of chemometric and machine-learning approaches is critically examined, including partial least squares regression, support vector regression, artificial neural networks, and deep learning. These methods enable the development of robust soft sensors capable of addressing nonlinearity, light-scattering effects, and process variability. Practical industrial considerations are also discussed, such as probe positioning, fouling mitigation, calibration transfer, data integration, and model lifecycle management. Regulatory expectations for PAT-enabled control strategies are reviewed, alongside recent industrial case studies demonstrating NIR- based endpoint detection, predictive process control, and real-time release testing. Finally, emerging trends including sensor fusion, explainable artificial intelligence, hybrid physics– data models, and digital twins are highlighted as future directions for more intelligent, resilient, and sustainable pharmaceutical granulation. Overall, these advances enhance process understanding, reduce batch failures, facilitate regulatory acceptance, and accelerate the global adoption of advanced pharmaceutical manufacturing practices.**Keywords:** Near-infrared spectroscopy; Process Analytical Technology (PAT); pharmaceutical granulation.

PC35

Design, development and characterization of cinacalcet hydrochloride loaded cubosomal formulation to enhance its solubility and bioavailability

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Cinacalcet hydrochloride (CNC) is a calcimimetic agent widely prescribed for the management of secondary hyperparathyroidism. Despite its therapeutic potential, its clinical performance is limited by poor aqueous solubility, low intestinal absorption, and extensive first-pass metabolism, resulting in low and variable oral bioavailability. The present study aimed to design, develop, and characterize a CNC-loaded cubosomal drug delivery system to enhance its solubility and oral bioavailability using a Quality by Design (QbD) approach. Cubosomes were prepared employing glyceryl monooleate as the lipid phase and Poloxamer 407 as a stabilizer through a melt dispersion–emulsification technique. A 3^2 factorial design was applied to optimize formulation variables, with particle size, zeta potential, and entrapment efficiency selected as critical quality attributes. The optimized formulation exhibited a mean particle size of approximately 179 nm with a narrow polydispersity index, a positive zeta potential, and high entrapment efficiency (~82%). Compatibility studies using FTIR, DSC, and XRPD confirmed the absence of significant drug–excipient interactions and indicated partial transformation of CNC from a crystalline to an amorphous state within the cubosomal matrix. Transmission electron microscopy revealed well-defined spherical cubosomal structures. Saturation solubility studies demonstrated a marked enhancement in the aqueous solubility of CNC compared to the pure drug. In vitro drug release and ex vivo intestinal permeation studies showed sustained drug release and improved permeation. Furthermore, in vivo pharmacokinetic studies in rats revealed a significant increase in Cmax and AUC, confirming enhanced oral bioavailability. Overall, CNC-loaded cubosomes represent a promising nanocarrier system for improving the biopharmaceutical performance of poorly soluble drugs

Keywords: Cinacalcet hydrochloride, Cubosomes, Glyceryl monooleate, Quality by Design (QbD), Nanostructured lipid carriers, Pharmacokinetics

PC36

Development and validation of an eco-friendly chromatographic method for the simultaneous analysis of cilnidipine and chlorthalidone in fixed-dose combination tablets

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This study will develop and validate a novel, green High-Performance Thin-Layer Chromatographic (HPTLC) method for the simultaneous analysis of the antihypertensive drugs cilnidipine and chlorthalidone. A sustainable, ethanol-based mobile phase will be optimized to replace conventional toxic solvents. The expected outcome is a robust analytical method that provides clear baseline separation of both drugs on silica gel plates.

Comprehensive validation following ICH Q2(R2) guidelines is expected to demonstrate excellent linearity over a defined concentration range, high precision with relative standard deviations below 2.0%, and accuracy with percent recoveries between 98% and 102%. Method robustness will be confirmed against minor operational variations. A key expected outcome is the demonstration of stability-indicating capability through forced degradation studies, effectively separating parent drugs from their degradation products.

The environmental impact of the method will be evaluated, with an expected outcome highlighting significant advantages in waste reduction and safer solvent usage. The final expected outcome is the successful application of the validated method to determine drug content in commercial tablet formulations, providing a practical, eco-friendly alternative for routine pharmaceutical quality control.

PC37

SeDeM Method for Excipient selection in Formulation Development of Clopidogrel Bisulfate Tablet

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The SeDeM (Sediment Delivery Model) expert system is a preformulation methodology used in solid dosage form development to evaluate the physical, micromeritic, compressibility, flowability, stability, and dosage properties of powdered materials. It is based on twelve critical parameters that are experimentally determined. The main advantages of the SeDeM method include rational excipient selection, prediction of direct compressibility, and development of robust tablet formulations.

SeDeM expert system was applied for the formulation and development of clopidogrel bisulfate tablet. Various pharmaceutical excipients were evaluated using SeDeM parameters, and their suitability for direct compression was assessed through SeDeM diagrams and key indices such as Parameter Profile Index (IPP) and Good Compressibility Index (IGC). Excipients exhibiting acceptable SeDeM values (≥5) were selected for tablet compression. The influence of SeDeM-guided excipient selection ensured uniform compression, good flow properties, and acceptable tablet integrity. A total 13 excipients were screened,of which 8 were selected for further process. The study concludes that the SeDeM expert system is an effective and reliable tool for excipient selection and formulation development of tablet. The study helped in understanding that SeDeM-based formulation design improves powder behavior, compressibility, formulation reproducibility, and overall performance of chronotherapeutic drug delivery systems such as clopidogrel bisulfate tablets.

Keywords: SeDeM system, Preformulation, Excipient screening, Direct compression, Clopidogrel bisulfate, Tablet development

PC38

Implementation of QBD approach to the analytical method Development and validation for the estimation of trazodone hydrochloride in tablet dosage forms by HPLC

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The current research involves the creation of a high-performance liquid chromatographic method for the determination of Trazodone- hydrochloride that is straightforward, quick, accurate, precise, and economical. This method is made possible by quality by design (QbD).The use of design of experiments (DoE) for multivariate optimization of the HPLC method's experimental setup. Using the Ishikawa diagram, a risk assessment was conducted to determine the critical method parameters (CMPs). A three - factor, three-level design was used for the factor screening investigations. Mathematical models were created using three independent factors: wavelength and mobile phase composition and flow rate . The response surface approach and the effects of these independent components were thoroughly examined using Box Behenken design (BBD), which allowed for the evaluation of the important analytical attributes (CAAs), which include symmetry factor, theoretical plate, and retention time as the parameters. The optimized and predicted data from contour diagram consisted of OPA (0.1 ml in 100 ml water) pH = 3/ Acetonitrile in a ratio of 40/60 (v/v) as the mobile phase with a flow rate 1 mL/min. The separation was made on a Qualisli 5 BDS C-8 chromatographic column (250 × 4.6 mm, 5 µm) with oven temperature 35 °C and UV detection at 252 nm. The optimized assay conditions were validated according to ICH guidelines. Hence, the results clearly showed that QbD approach could be successfully applied to optimize HPLC method for estimation of Trazodone –HCL The method was applied for the evaluation of Trazodone - HCL content in tablets.

PC39

Development of validated chromatographic methods for simultaneous estimation of *budesonide* and *epigallocatechin-3-gallate*

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Combination therapy that includes synthetic and herbal agents has gained more attention because it may improve treatment effectiveness while reducing side effects related to dosage. Budesonide is a strong synthetic glucocorticoid. Doctors commonly prescribe it for inflammatory conditions like asthma, inflammatory bowel disease, and chronic obstructive pulmonary disease. However, long-term use of corticosteroids can lead to serious side effects. Epigallocatechin-3-gallate (EGCG) is a key polyphenol found in green tea. It is known for its strong antioxidant and anti-inflammatory effects. However, its use in medicine is restricted due to its poor stability and low absorption when taken by mouth. The current study aims to develop and validate a simple, precise, and reliable chromatographic method. This method measures both budesonide and EGCG in a combined dosage form at the same time.

High-performance liquid chromatography (HPLC) and HPTLC will be used for method development. The developed method will be optimized to achieve good resolution, acceptable retention time and Rf value, and symmetrical peak shapes for both analytes as per ICH Q2(R1) guidelines.

Simultaneous estimation provides a cost-effective and time-efficient analytical approach for quality control of combination formulations. The validated method can be used for formulation development, stability studies, and regular quality checks of Budesonide and EGCG combinations.

PC40

QBD- driven RP-HPLC analytical method development and validation for simultaneous estimation metformin and glibenclamide .

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Quality by Design (QbD) provides a systematic, science-based, and risk-oriented framework for developing robust analytical methods with enhanced reliability and regulatory compliance. The present research aims to develop and validate a QbD-based RP-HPLC analytical method for the simultaneous estimation of Metformin and Glibenclamide in bulk and pharmaceutical dosage forms.The analytical Quality Target Product Profile (aQTPP) has been defined, and critical quality attributes (CQAs), including resolution, retention time, and peak symmetry, have been identified to ensure method performance. Initial risk assessment has been carried . out to identify critical method parameters (CMPs) such as mobile phase composition, flow rate, pH, and column temperature. These parameters are being systematically evaluated using Design of Experiments (DoE) to understand their impact on chromatographic behavior and to establish a preliminary method design space.Chromatographic separation is planned using a reversed-phase C18 column with UV detection at an appropriate wavelength, ensuring adequate separation of both drugs within a reasonable run time.The optimized method will be validated in accordance with ICH Q2 (R1) guidelines for parameters such as linearity, accuracy, precision, specificity, robustness, limit of detection, and limit of quantification. The method is expected to demonstrate excellent linearity ($R^2 > 0.999$), high accuracy with recoveries within 98–102%, and precision with %RSD values below 2%. Robustness studies are anticipated to confirm method reliability against small deliberate variations in analytical conditions. Overall, the ongoing study is expected to result in a precise, accurate, and robust QbD-based RP-HPLC method for the simultaneous estimation of Metformin and Glibenclamide and suitable for routine quality control and regulatory applications. The application of QbD and DoE is anticipated to enhance method understanding, reduce variability, and support efficient lifecycle management.

PC41

Development and validation of HPLC and HPTLC method for simultaneous estimation of meropenem and tazobactam in pharmaceutical formulation

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Meropenem and Tazobactam both have a vulnerable 4-membered β-lactam ring that can break down through hydrolysis and photolysis, making them unsuitable for oral medications. Therefore, it is essential to employ a non-destructive analytical method to accurately measure these drugs simultaneously. The present work aims to develop and validate an HPLC and HPTLC method for simultaneously determining Meropenem and Tazobactam in an injectable marketed formulation. The HPLC method was developed using a Hypersil Gold C18 column (250 mm, 4.6 mm, 20 µL) and a mobile phase of Methanol: Acetonitrile: Water (50:20:30 v/v/v), with pH adjusted to 4.0 using orthophosphoric acid, UV detection at 215 nm, and a flow rate of 1 mL/min. Under optimized chromatographic conditions, Meropenem and Tazobactam were eluted at retention times of 2.617 min and 6.008 min, respectively. The HPTLC method was optimized using Methanol: Ethyl acetate: Water (4:5:1 v/v/v) as the mobile phase. Detection was carried out in absorbance mode at 215 nm. The optimized method gave Rf values of 0.143 for Meropenem and 0.748 for Tazobactam. All method validation parameters were found to be within the acceptance criteria as per ICH Q2 (R1) guidelines. The established methods underwent validation in accordance with ICH guidelines, and the results for accuracy, precision, limits of detection (LOD) and quantification (LOQ), as well as robustness and assay, were observed to align well with the specified criteria, showing %RSD below 2%. Thus, these methods can be easily and conveniently adopted for the quality control analysis of Meropenem and Tazobactam.

Keywords: Meropenem, Tazobactam, HPTLC, HPLC, Validation.

PC42

Formulation and evaluation of nano-emulsion-based amla hair oil for treatment of alopecia.

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Background: Nano-emulsion-based Amla hair oil have gained considerable attention in the cosmeceutical field due to their enhanced stability, improved scalp penetration, and superior therapeutic performance compared to conventional oils. Phyllanthus emblica (Amla) is a well- known herbal ingredient with strong antioxidant, anti-inflammatory, and hair growth– promoting properties. However, conventional formulations often suffer from poor penetration and stability, necessitating advanced delivery systems.

Objective: The present study aimed to prepare and evaluate an Amla (Phyllanthus emblica) oil–based nano-emulsion and to establish a robust analytical method for its quality evaluation.

Methods: Nano-emulsion-based Amla hair was prepared using the ultrasonication technique with suitable surfactants. The developed formulation was evaluated for droplet size, zeta potential, pH, viscosity, conductivity, and physical stability. An RP-HPLC method was developed and validated for the quantitative estimation of gallic acid and ellagic acid as marker compounds, following ICH Q2(R1) guidelines.

Results: The optimized Amla nano-emulsion exhibited nanoscale droplet size, acceptable zeta potential, uniform appearance, and good physical stability during storage. The developed RP- HPLC method showed excellent specificity with no interference from formulation components. Linearity was observed with high correlation coefficients, and precision and accuracy studies demonstrated acceptable %RSD and recovery values. Robustness studies confirmed method reliability under minor chromatographic variations.

Conclusion: The developed Nano-emulsion-based Amla hair oil demonstrated desirable physicochemical characteristics, and the validated RP-HPLC method was found to be reliable and reproducible, making it suitable for routine quality evaluation of Amla-based nano- emulsion hair oil formulations.

PC43

Formulation and evaluation of bilayered nail lacquer of luliconazole for treatment of onychomycosis.

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Onychomycosis is a fungal infection that primarily affects fingernails and toenails and is difficult to treat due to the infection being embedded within the dense, highly keratinized nail plate. This structure significantly limits the penetration of conventional topical formulations such as creams, gels, and solutions, resulting in poor therapeutic outcomes. Transungual drug delivery remains a relatively unexplored route for the treatment of nail disorders, including onychomycosis, despite its potential to enhance local drug availability. The objective of the present study is to formulate a bilayered nail lacquer containing the antifungal drug luliconazole to achieve effective transungual delivery. The formulation strategy is based on the combined effects of penetration enhancement and occlusion to improve drug permeation across the human nail plate. The bilayered nail lacquer consists of a hydrophilic drug-loaded layer overlaid with a hydrophobic layer, designed to provide sustained drug release over an extended period. The developed formulation was evaluated using microscopy studies to assess film formation and contact with the nail plate. Differential Scanning Calorimetry (DSC) was performed to determine the physical state of luliconazole within the formulation. Bioadhesivity studies was conducted to evaluate the adhesive and occlusive properties of the formed films. In vitro nail permeation studies was carried out to quantify drug penetration and retention within the nail plate, providing insight into drug concentration at the site of action. Additionally, resistance to multiple washing was evaluated to assess the durability of the nail lacquer film.

PC44

Development and validation of stability indicating HPTLC method for simultaneous estimation of gabapentin and nortriptyline hydrochloride in bulk and tablet dosage form

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Gabapentin and nortriptyline are administered together for the treatment of neuropathic pain. This combination provides superior pain relief by acting on different yet complementary pain pathways within both the central and peripheral nervous systems. A stability-indicating high- performance thin-layer chromatography method was developed for the estimation of Gabapentin (GABA) and Nortriptyline hydrochloride (NORT) combination in bulk and combined tablets. Chromatographic separation was accomplished on pre-coated silica gel 60 F254 aluminium plates using the solvent system n-butanol: glacial acetic acid: water: ammonia (8.5:1:0.5:0.2 v/v/v/v) at 210 nm, resulting in well-defined peaks with Rf values of 0.39 for GABA and 0.64 for NORT. Forced degradation studies of the samples and reference solutions under acidic, basic, oxidation, thermal, wet, and photo conditions conclusively established the effective separation of the degradation products from the respective samples and reference solutions, emphasising the stability-indicative nature of the method. The method was validated for Linearity, Precision, Accuracy, LOD, LOQ, Specificity, and Robustness as per ICH Q2(R1/R2). The correlation coefficients were found to be higher than 0.998, the percentage recovery in the range of 98-102%, and % RSD < 2% for intra- and inter-day studies. The validated HPTLC method has been successfully used for estimating the combination of Gabapentin and Nortriptyline hydrochloride present in tablets, without interference from excipients, thus emphasising the simplicity and potency of the method as an effective and inexpensive approach for monitoring the stability of Gabapentin and Nortriptyline hydrochloride combinations. **Keywords:** Gabapentin, Nortriptyline hydrochloride, Neuropathic pain, Combination therapy, Stability-indicating method, HPTLC, Forced degradation studies.

PC45

QbD approach-based stability indicating method development and validation for mavacamten

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This study presents a comprehensive analytical method usedfor quantifying Mavacamten, a novel first-in-class molecule used to manage and treat patients with obstructive hypertrophic cardiomyopathy (HCM). It is currently recommended for the treatment of adults with symptomatic heart failure.

Although it holds clinical importance, there are only few reported analytical methods for its measurement. This research fills that void by creating and validating a dependable stability-indicating RP-HPLC method for the precise and sensitive quantification of Mavacamten. The method development adhered to ICH Q1A (R2) guidelines, including degradation studies conducted under acidic, basic, oxidative, photolytic, thermal and humidity stress conditions. The optimized chromatographic conditions utilized HPLC system equipped with an Inertsil ODS C18 Column (250 mm 4.6 mm, 5 µm) and detection performed at 266 nm. The method displayed excellent linearity across the 10-150 µg/ml range, achieving a correlation coefficient of 0.9995. High precision was observed in the method along with accuracy reflected by mean recoveries ranging from 98.70 % to 100.20 %. LOD and LOQ values recorded 1 µg/ml and 10 µg/ml, respectively. Mavacamten was found to be susceptible to acid, alkaline hydrolysis and oxidative degradation but remained stable when exposed to thermal, humidity and photodegradation.

PC46

An eco-friendly approach for UV and HPTLC method development and validation for rapid simultaneous quantification of ellagic acid and zingerone

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Background: An estimated 75–80% of the global population, particularly those in developing areas, depend primarily on herbal medicine for healthcare. Ellagic acid and Zingerone are two bioactive molecules that have pharmacological effects such as anti-inflammatory, anti- bacterial. The combined determination of these chemicals in pharmaceutical or natural product formulations can enhance quality control, standardization, and analytical assessment. UV spectroscopy and HPTLC analysis techniques are often utilized for analyzing compounds because of their sensitivity, simplicity, and efficiency. The greenness of the suggested methods was evaluated using AGREE, demonstrating the minimum hazardous effect on the environment.

Objective: To Developed and Validate UV and HPTLC method for Simultaneous estimation of Ellagic acid and Zingerone.

Methods: FT-IR analysis was performed to identify and interpret the functional groups of ellagic acid and zingerone. A UV spectrophotometric method was developed for their simultaneous estimation in the concentration ranges of 2–10 ppm (ellagic acid) and 15–75 ppm (zingerone) and HPTLC method was further employed for quantitative analysis. For the simultaneous estimation of Ellagic Acid and Zingerone, an environmentally friendly (eco- friendly) UV and HPTLC method was developed.

Results: The development of a UV method utilizing ethanol as a solvent demonstrates significant potential for Green analytical chemistry. Both methods demonstrated high accuracy, with recovery rates within the acceptable range, confirming the methods' ability to measure the true concentrations of ellagic acid and zingerone. The greenness of this method was evaluated using AGREE to ensure minimal environmental impact.

Conclusion: Ellagic Acid and Zingerone because of their common pharmacological effects such as anti-inflammatory, anti-bacterial. Existing method used PEG 200 & 400 as a solvent but ethanol has several advantages over these solvent because of their solubility, purity and safety, volatility, cost and availability. In this study, a UV & HPTLC method was found to be more sensitive, precise and accurate compared to the spectrophotometric methods. An eco- friendly UV & HPTLC method was developed for the simultaneous estimation of ellagic acid and zingerone.

PC47

Synergistic topical delivery of hesperidin and quercetin via dermastamp microneedling for experimental RA management

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Rheumatoid arthritis is a chronic autoimmune disease causing synovial inflammation, cartilage loss, and joint destruction. Current systemic therapies face limitations like side effects and poor targeting, highlighting the need for localized, minimally invasive approaches. Hesperidin and quercetin, potent flavonoids with anti-inflammatory and antioxidant properties, show therapeutic promise but suffer from low bioavailability and limited transdermal permeability, restricting clinical application.

The current study will examine a topical delivery method through synergistic intervention of dermastamp-assisted microneedling to improve transdermal delivery of hesperidin and quercetin to manage experimental RA. It is anticipated that dermastamp microneedling will form temporary microchannels in the stratum corneum, which will lead to a lot of facilitation of dermal penetration and localized drug deposition without affecting the skin safety. The combined flavonoid treatment is expected to have synergistic anti-arthritic effects since it is expected to regulate major inflammatory mediators, including TNF-a, IL-6, COX-2 and oxidative stress pathways.

This formulation will exhibit good physicochemical properties, better skin permeation and treatment capabilities at the local levels when tested on experimental RA models. All in all, the strategy is expected to provide a patient-friendly, non-systemic and targeted method of RA management, and the delivery of microneedling synergistic phytoconstituents as another promising option in comparison to traditional treatments.

PC48

Development of a DoE-driven QbD-based stability-indicating HPTLC method for determination of palbociclib in bulk and formulation with multi-stress forced degradation assessment

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This study systematically investigates a lipophilic cationic molecular entity exhibiting potent cyclin-dependent kinase 4 and 6 (CDK4/6) inhibitory activity. An Analytical Quality by Design (AQbD) approach was employed to develop and validate a robust, stability-indicating high-performance thin-layer chromatography (HPTLC) method for the quantitative determination of the active pharmaceutical ingredient, designated as PBC. Method optimization was achieved using a three-level, three-factor Box–Behnken design to evaluate and control critical method parameters, ensuring method reliability and performance.

Chromatographic separation was carried out on silica gel 60F254 precoated glass plates using a mobile phase comprising ethyl acetate, methanol, and triethylamine in the optimized ratio of 3:6:1 (v/v/v). Densitometric analysis was performed at 354 nm in absorbance mode. Forced degradation studies revealed well-resolved degradation products with distinct retention factor values, confirming effective separation of PBC from its degradants.

The method demonstrated excellent linearity over the concentration range of 100–600 ng/band, with a correlation coefficient $\geq$ 0.999. Precision studies showed %RSD values $\leq$ 2.0%, indicating satisfactory repeatability and intermediate precision. Accuracy assessment via the standard-addition method yielded a mean recovery of 99.59%. Stress testing, conducted in accordance with ICH guidelines, indicated that PBC is susceptible to acidic and oxidative degradation, while remaining stable under thermal and neutral hydrolytic conditions.

Overall, the developed AQbD-based HPTLC method is selective, precise, accurate, and stability-indicating, making it suitable for routine quality control and stability assessment of PBC in pharmaceutical dosage forms.

PC49

Trend analysis of USFDA form 483 observations for identifying critical GMP risk areas in pharmaceutical manufacturing

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Background: The USFDA Pharmaceutical quality system flaws are shown in Form FDA 483, which documents severe non-compliance found during Good Manufacturing Practice (GMP) inspections. Form 483 analysis offers regulatory knowledge to help proactive, risk-based quality assurance by identifying high-risk GMP areas. Aim : The purpose of this study was to identify important GMP risk areas in pharmaceutical production by analyzing trends in USFDA Form 483 observations and inspection frequency over the last ten years. Methods and Key Findings: Using secondary data from USFDA Inspection Observation databases, FDA Annual Reports on Inspections of Establishments (2015–2024), regulatory guidance documents, and published GMP trend studies, a review-based trend analysis was carried out. The frequency of inspections decreased in 2020–2021 and then steadily increased starting in 2022. Failure to follow written procedures, insufficient deviation and CAPA investigations, data integrity and documentation deficiencies, inadequate process and cleaning validation, laboratory control failures, equipment maintenance problems, inadequate quality unit oversight, deficiencies in environmental monitoring, and personnel training gaps were among the recurring Form 483 observations. Quality management system failures, data integrity risk, validation and process control risk, laboratory control risk, and sterility assurance risk are the main GMP risk areas into which these findings were categorized. Conclusion: Systematic quality issues rather than isolated errors account for the majority of FDA Form 483 findings. A helpful risk-based technique for bolstering pharmaceutical quality systems and enhancing regulatory compliance is trend analysis of Form 483 observations.

Keywords: USFDA Form 483, GMP compliance, Quality systems, Risk-based analysis, pharmaceutical manufacturing.

PC50

Development and validation of a stability indicating HPLC method for the determination of hydrocortisone sodium succinate

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A simple, rapid, sensitive, linear, and stability-indicating HPLC method was developed for the estimation of Hydrocortisone sodium succinate. Chromatographic separation was achieved on a HiQSil C8 column (250 mm × 4.6 mm, 5 µm) using potassium dihydrogen orthophosphate buffer (pH 4, adjusted with orthophosphoric acid) and acetonitrile in the ratio of 30:70 (v/v) as the mobile phase at a flow rate of 1.0 mL/min. Detection was carried out at 242 nm, and the retention time of hydrocortisone sodium succinate was found to be 3.4 ± 0.10 min. The method was validated according to ICH guidelines with respect to linearity, precision, accuracy, assay, and robustness. The linear regression analysis demonstrated a good linear relationship over the concentration range of 5–30 µg/mL with a correlation coefficient (r^2) of 0.9914. Forced degradation studies were performed under various stress conditions and the degradation products were well resolved from the drug, confirming the stability-indicating nature of the method.

Keywords: Hydrocortisone sodium succinate, High performance liquid chromatography, Stability indicating method, Validation.

PC51

Stability indicating HPLC and HPTLC method for estimation of letermovir

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The aim of this study is to develop and validate High-Performance Thin-Layer Chromatography (HPTLC) and High-Performance Liquid Chromatography (HPLC) techniques for the quantification of Letermovir and its degradation products under various stress conditions. A CAMAG system was employed using silica gel 60 F_{254} plates for HPTLC. The mobile phase consisted of chloroform and methanol in a 9:1 (v/v) ratio, with detection performed at 257 nm. A Jasco Liquid Chromatographic System featuring a PU 2080 Plus pump and an MD 2010 Plus PDA detector was utilized in HPLC. The mobile phase was a mixture of methanol and water in a 90:10 (v/v) ratio, with a flow rate set at 1 mL/min. Both methodologies underwent validation for parameters including linearity, accuracy, precision, robustness, and detection/quantification limits. Forced degradation studies were carried out under acidic, alkaline, oxidative, neutral, photolytic, and thermal conditions. The results demonstrated good linearity, with correlation coefficients of 0.9934 for HPTLC and 0.997 for HPLC. Forced degradation studies revealed that Letermovir is vulnerable to hydrolysis under acidic and basic conditions and oxidative environments. The methods proved to be sensitive, selective, accurate, and reproducible for the analysis of Letermovir and its degradation products. The HPTLC and HPLC methods developed in this study represent a significant advancement over previously established techniques for evaluating the stability and purity of Letermovir. They are dependable, sensitive, and appropriate for routine analysis in stability assessments of Letermovir within pharmaceutical formulations

PC52

Plant-based antibacterial ointment: merging efficacy with environmental responsibility

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The increasing prevalence of bacterial skin infections, along with rising antibiotic resistance, calls for innovative, eco-conscious therapeutic solutions. Plant-derived ingredients offer a renewable and non-toxic alternative to conventional treatments. Plectranthus amboinicus, Curcuma longa, and Aloe vera are renowned for their antibacterial and anti-inflammatory properties, primarily attributed to thymol and curcumin.

In this study, a plant-based antibacterial topical ointment was formulated by incorporating extracts of these herbs into a skin-friendly ointment base. The extracts were analysed for their phytoconstituent content to ensure bioactive efficacy. The formulation was evaluated for physicochemical properties, skin compatibility, and antibacterial activity. It exhibited smooth consistency, cream-colored appearance, excellent spreadability, and strong skin tolerance. Antibacterial testing against Staphylococcus aureus and Escherichia coli showed significant zones of inhibition, comparable to marketed ointments.

These findings highlight the potential of green, effective, and environmentally responsible herbal therapeutics as a natural and sustainable alternative for managing bacterial skin infections.

PC53

Advanced formulation and systematic development of a synergistic polyherbal Emulsion exhibiting potent digestive and hepatoprotective efficacy: a quality-by- Design approach

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Introduction: The liver is a worldwide health related challenge to affecting metabolic functions and detoxification capacity due to infections, toxins, and metabolic dysfunction. It play a central role in regulating metabolic activities and body temperature, while addressing malabsorption and supporting overall wellness by providing hepatoprotective and digestive therapeutic benefits.

Methods: Soxhlet extraction (70% ethanol) and steam distillation were used to achieve standardized extracts. QbD methodology defines Critical Material Attributes (CMAs) and Critical Process Parameters (CPPs). A 32 factorial design was used to study the oil phase (5- 15% w/w), emulsifiers (Tween 80:lecithin ratios), and co-surfactant concentrations. By making full use of high-shear homogenization (10,000 rpm, 15 min), nano-emulsification was achieved. The resultant profile included pH, refractive index, viscosity, droplet size (DLS), zeta potential, rheological behavior, and ICH Q1A accelerated stability (40°C/75% RH, 90 days) definition of Design Space.

Results: This optimized formulation saw the pH maintained at 5.9, a viscosity of 295 cP, globule diameter 258 nm (PDI = 0.19), and a zeta potential of -32.9 mV. Pseudoplastic rheology and no visible creaming attested to a solidly built formation design, with less than 2% loss of plant material after The successful identification of controlled space specifications for processing valuesmands nested sequence-origin attribute until first snap shot used up all available space. polyherbal emulsion formulation and improvements.unpublished manuscripts. Conclusion: This QbD-driven polyherbal emulsion exemplifies pharmaceutical excellence with assured quality and robustness, poised for clinical translation.

Keywords: Polyherbal emulsion, formulation development, stability, phytoconstituents, oil- in-water emulsion

PC 54

Design, synthesis and in silico evaluation of 1,4-dihydropyridine derivatives as potential sars-cov-2 main protease inhibitors

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The COVID-19 pandemic caused by SARS-CoV-2 emphasized the need for novel antiviral agents targeting essential viral enzymes. The SARS-CoV-2 main protease (Mpro) is a key enzyme involved in viral polyprotein processing and replication and lacks a human homolog, making it an attractive target for antiviral drug development. In the present study, an integrated computational and synthetic approach was employed to design and evaluate 1,4-dihydropyridine (1,4-DHP) derivatives as potential Mpro inhibitors.

Virtual ligand screening of ZINC and DrugBank databases was carried out using the RASPD+ platform, resulting in the identification of potential lead molecules with favorable predicted binding affinities. These hits were further filtered based on drug-likeness and pharmacokinetic properties using SwissADME, along with toxicity prediction using ProTox-3.0. A pyridine-based lead molecule exhibiting good binding affinity (−8.24 kcal/mol), acceptable ADMET profile, and low predicted toxicity was selected and optimized to a 1,4-DHP scaffold for improved synthetic feasibility. A series of eleven 1,4-DHP derivatives (DDN-1 to DDN-11) were synthesized using the Hantzsch multicomponent reaction and characterized by IR, ^{1}H- NMR, ^{13}C-NMR, and mass spectrometry.

Molecular docking studies demonstrated stable binding interactions of the synthesized compounds with the catalytic residues His41 and Cys145 of Mpro. Further evaluation through 2D and 3D QSAR analysis revealed significant structure–activity relationships, with compound DDN-10 showing the highest predicted inhibitory activity among the series. The findings of this study suggest that 1,4-dihydropyridine derivatives, particularly DDN-10, may serve as promising lead candidates for further biological evaluation as SARS-CoV-2 Mpro inhibitors.

PC55

Synthesis, docking, and molecular dynamics studies of novel quinazoline based terazosin analogues targeting α1-adrenergic receptors"

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Hypertension remains a major global health concern, with significant insufficient clinical needs despite the availability of various antihypertensive drugs. Terazosin, a selective α1-adrenergic receptor antagonist, demonstrates improved bioavailability, half-life, and therapeutic benefits compared to earlier agents but is still limited by side effects. In the present study, some of terazosin analogues were synthesized, followed by structurally characterized using NMR, IR, and Mass spectrometry, alongside determination of physicochemical properties such as melting point and yield. Molecular docking studies against the target protein (PDB ID: 4O33) revealed favorable binding affinities, with Compound-6 exhibiting the highest stability (–7.806 kcal/mol) through strong hydrogen bonding and hydrophobic interactions. This observation was reinforced by molecular dynamics simulations, which confirmed its compact and stable conformation within the active site through RMSF, RMSD, hydrogen bond, Rg, and SASA profiling. MM-GBSA free energy calculations highlighted (Compound-4 analogue) as the most favorable complex (–53.81 kcal/mol). These findings suggest that rationally designed terazosin analogues possess enhanced binding profiles and potential multifunctional applications, offering promising leads for the advancement of antihypertensive therapies with improved safety and efficacy.

PC56

CADD-driven identification and synthesis of novel dihydrofolate reductase inhibitors with dual anticancer and antimicrobial potential"

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Dihydrofolate reductase (DHFR) is a dual molecular target for the treatment of both bacterial infections and cancer, owing to its crucial role in folate metabolism and nucleic acid biosynthesis. In the present study, a series of novel DHFR enzyme inhibitors was rationally designed, synthesized, and evaluated for their dual antimicrobial and anticancer potential. We performed a molecular modeling study using Schrödinger drug design software**.** A library of 850 molecules was designed and docked against the PDB IDs 3SFM (*Ec*DHFR), 5SDB (*hu*DHFR), and 7T7S **(***sa*DHFR**).** We shortlisted fifty molecules for synthesis that exhibited better docking scores, binding energies, and docking interactions than the standard drugs methotrexate and trimethoprim. The designed molecules were synthesized via microwave- assisted synthesis, offering reduced reaction time, higher yields, and improved energy efficiency. Following synthesis, the anticancer activity was evaluated using the Sulforhodamine B (SRB) assay against the human breast cancer MCF-7 cell line. Among the synthesized series, three molecules with the compound codes RS14, PH1, and PH2 exhibited significant anticancer activity (GI_{50} < 10 µg/ml) against MCF-7 cells, comparable to the standard methotrexate (GI_{50} < 10 µg/ml). Antimicrobial activity was evaluated by the broth dilution method against *Escherichia coli* and *Staphylococcus aureus*. Compounds RS13, GH1, GH3, and SH1 showed MIC values of 12.5 µg/mL against *E. coli*, while RS13 and SH1 exhibited MIC values of 6.25 µg/mL against *S. aureus*, comparable to the standard trimethoprim (MIC = 6.25 µg/mL). Overall, integrating CADD with microwave-assisted synthesis enhances the identification of lead DHFR inhibitors for cancer and microbial infections. Keywords : Dihydrofolate reductase inhibitors, Computer-aided drug design (CADD), Microwave-assisted synthesis, Anticancer activity, Antimicrobial activity.

PC57

Integrated *In Silico* and *In Vivo* Evaluation of Substituted Pyridazin-3-one and Triazolo[4,3-c]quinazoline Scaffolds Targeting Depression

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Depression constitutes a major global health burden, and existing antidepressant therapies are often limited by delayed onset of action, suboptimal efficacy, and adverse effects. Consequently, contemporary drug discovery efforts emphasize the development of novel small molecules capable of modulating neurochemical imbalance and oxidative stress associated with depressive disorders. The present study reports the rational design, in silico screening, synthesis, and biological evaluation of heterocyclic compounds as potential antidepressant leads. Specifically, substituted 6-(3,5-dimethyl-pyrazolyl)pyridazin-3-one derivatives and N- (benzothiazol-2-yl)-3-aryl-[1,2,4]triazolo[4,3-c]quinazoline-5-carboxamide derivatives were synthesized and characterized. Antioxidant activity was assessed using DPPH and hydrogen peroxide scavenging assays, wherein compound **21a** demonstrated notable activity with IC_{50} values of 98.43 µM (DPPH) and 169.46 µM (H_2O_2). Acute oral toxicity studies conducted according to OECD guidelines confirmed the safety of selected compounds. Non-toxic candidates were subsequently evaluated for antidepressant-like activity using validated in vivo behavioral models. In the tail suspension test, compounds **21a** and **43a** exhibited immobility times of 98.33 ± 6.34 s and 149.30 ± 13.25 s, respectively. In the forced swim test, immobility times were significantly reduced to 217.70 ± 5.95 s (**21a**) and 170.30 ± 3.27 s (**43a**). Open field test results further indicated enhanced locomotors activity (**21a**: 8.80 ± 2.10; **43a**: 16.08 ± 2.99). Overall, compounds **21a** and **43a** demonstrated significant antidepressant-like activity comparable to fluoxetine, supporting their potential as promising lead molecules in antidepressant drug discovery.

PC58

Herb –Drug Interaction :A Novel Approach for Optimisation of Bioavailability of Anxiolytic Drug

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Herb–drug interactions have emerged as an important and promising strategy for optimizing the bioavailability and therapeutic performance of conventional drugs. Buspirone, a non-benzodiazepine anxiolytic agent commonly prescribed for generalized anxiety disorder, exhibits very low oral bioavailability (approximately 4–5%). This limitation is mainly attributed to extensive first-pass metabolism mediated by cytochrome P450 enzymes, particularly CYP3A4, along with active efflux by P-glycoprotein transporters in the gastrointestinal tract. Consequently, higher doses are often required to achieve therapeutic efficacy, which may increase the risk of adverse effects and inter-patient variability. The present study proposes a novel herb–drug interaction–based approach using piperine, a well- known natural bioenhancer obtained from *Piper nigrum* (black pepper), to enhance the bioavailability and anxiolytic efficacy of buspirone. Piperine is reported to inhibit CYP3A4 enzymes and P-glycoprotein transporters, thereby reducing presystemic metabolism and improving intestinal absorption of co-administered drugs. The study involves preformulation and compatibility studies to ensure stability between buspirone and piperine, followed by in vitro dissolution and permeability studies to assess enhancement in drug release and absorption. In vivo pharmacokinetic evaluation in suitable animal models is planned to compare plasma concentration–time profiles of buspirone alone and in combination with piperine using parameters such as Cmax, Tmax, AUC, and half-life. Pharmacodynamic assessment using anxiety-related behavioral models will further evaluate therapeutic efficacy.

Expected outcomes include improved oral bioavailability, enhanced anxiolytic response, reduced dose requirement, and better patient compliance. This study may provide a safe, cost- effective, and natural strategy for optimizing anxiolytic drug therapy through herbal bioenhancemen

PC59

Network pharmacology-guided screening of bitter phytoconstituents: Exploring herbal pathways beyond conventional obesity management

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Obesity is a multifactorial metabolic disorder associated with inflammation, oxidative stress, and lipid metabolism dysregulation. Conventional pharmacotherapies such as Orlistat and newer anti-obesity agents often present adverse effects and limited long-term efficacy, creating a need for safer, sustainable alternatives. Herbal medicines, rich in diverse phytoconstituents, offer multi-targeted mechanisms that can address metabolic, hormonal, and inflammatory pathways of obesity. Despite growing evidence, systematic screening and molecular understanding of bitter phytoconstituents remain underexplored.

Methods: Fifty-one bitter phytoconstituents were selected from literature and screened for anti-obesity potential through network pharmacology and molecular docking. Common obesity-related Targets glucokinase, tumor necrosis factor, lipase E, catechol-O- methyltransferase (COMT), and fatty acid binding proteins were selected as binding targets. Docking of selected phytoconstituents were by Autodock vina. Kalmegh (Andrographis paniculata) was identified as a lead candidate and subjected to ethanolic extraction, phytochemical characterization and in-Vitro study. Results: The extract contained flavonoids, phenolics, alkaloids, and tannins, with total phenolic and flavonoid contents of 39.51 mg gallic acid equivalent and 28.02 mg quercetin equivalent, respectively. Strong antioxidant activity comparable to ascorbic acid was observed. HPTLC confirmed andrographolide content (153.05 mg/50 g powder). In-vitro assays demonstrated notable anti-lipase activity (IC50 = 162.87 µg/mL) and dose-dependent inhibition of 3T3-L1 adipocyte cell viability (IC50 = 7.99 µg/mL).

Conclusion: Kalmegh extract exhibits potent antioxidant, anti-lipase, and adipocyte-inhibitory effects, supporting its potential as a safe and effective natural anti-obesity agent. Further in-vivo and formulation studies are warranted for translational application in obesity management.

PC60

Enhancement of solubility and dissolution of fluvoxamine maleate via copovidone-based solid dispersion systems

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Fluvoxamine maleate, a selective serotonin reuptake inhibitor classified as a BCS class II drug, exhibits low aqueous solubility and limited oral bioavailability despite high intestinal permeability. The present work aims to enhance its solubility and dissolution rate by developing solid dispersion systems using solvent evaporation with hydrophilic polymeric carriers, primarily copovidone (Kollidon VA 64), and converting the optimized dispersion into a capsule dosage form. Preformulation studies included physicochemical characterization, solubility profiling in water, 0.1 N HCl, pH 4.5 acetate buffer, and pH 6.8 phosphate buffer, as well as flow property evaluation (bulk density, tapped density, angle of repose, Carr's index, and Hausner ratio) for both pure drug and dispersions. Solid dispersions were prepared by solvent evaporation and systematically evaluated for organoleptic properties, melting point shift, percentage yield, loss on drying, saturated solubility, and in vitro dissolution behaviour. The optimized fluvoxamine–copovidone dispersion showed markedly improved flow (Carr's index ~14.33%, Hausner ratio ~1.16) and a significant increase in saturated solubility and dissolution across all media compared with the pure drug, indicating conversion toward a more soluble, amorphous-like state. These findings suggest that solid dispersion of fluvoxamine maleate with copovidone is a promising strategy to enhance solubility, dissolution rate, and potentially oral bioavailability, providing a viable formulation approach for poorly water- soluble antidepressant drugs.

PC61

Development and validation of a diagnostic kit for early cancer detection.

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Early cancer diagnosis is essential in enhancing the effectiveness of the treatment process and survival of the patient, though, most of the current diagnostic modalities are not sensitive, specific, or available at an early stage of the disease. This paper presents the design and proof of a diagnostic kit that was created to aid in the early detection of cancer through a combination of certain molecular biomarkers. The kit has built-in elements of recognition and a titanic detection platform to facilitate sensitive and efficient detection of cancer-related markers in low concentrations. The analytical validation was carried out after assessing the key performance parameters such as sensitivity, specificity, accuracy, precision and reproducibility in line with the standard regulatory requirements. The assay which was developed had a high level of analytical performance with low levels of cross-reactivity and reproducible results. Its ability to differentiate early-stage cancer cases and healthy controls was clinically validated by using representative biological samples. The diagnostic kit is fast, economical, and minimally invasive and is applicable in screening and early diagnosis. In general, this paper demonstrates the opportunities of the designed platform to improve early cancer detection and facilitate timely clinical judgment and help to manage patients and improve their outcomes.

PC62

Development and validation of a stability-indicating RP-UPLC method for estimation of raloxifene hydrochloride in bulk and tablet dosage form

Aniket.V. Bagade, Ashay. D .Thakare, Aparna.V. Bhalerao

Raloxifene hydrochloride is a second-generation selective estrogen receptor modulator widely used in the prevention and treatment of osteoporosis in postmenopausal women and in reducing the risk of breast cancer in high-risk populations. The present study aimed to develop and validate a rapid, simple, accurate, precise, specific, and robust stability-indicating reverse- phase ultra-performance liquid chromatography (RP-UPLC) method for the quantitative estimation of raloxifene hydrochloride in bulk drug and tablet dosage forms, with minimal solvent consumption and high reproducibility. Chromatographic separation was achieved using a Waters ACQUITY UPLC system equipped with a BEH C18 column (2.1 × 50 mm, 1.7 µm). An isocratic mobile phase consisting of buffer and acetonitrile in the ratio of 75:25 v/v was employed at a flow rate of 0.5 mL/min, with detection carried out at 280 nm. The retention time of raloxifene hydrochloride was observed at approximately 1.87 minutes, enabling rapid analysis.

The method demonstrated excellent linearity with a correlation coefficient (r^2) of 0.9996. Precision studies, including intra-day and inter-day variability, showed percentage relative standard deviation values less than 1.0%. Accuracy was confirmed by recovery studies, indicating satisfactory recoveries within acceptable limits. Forced degradation studies under acidic, alkaline, oxidative, thermal, and photolytic conditions confirmed that all degradation products were well resolved from the main drug peak, establishing the stability-indicating nature of the method, with total degradation remaining below 15%. Robustness studies revealed no significant effect of minor deliberate variations in chromatographic conditions. The developed RP-UPLC method complies with ICH Q2 (R1) guidelines and is suitable for routine quality control and stability testing of raloxifene hydrochloride in pharmaceutical formulations.

Keywords: Raloxifene hydrochloride, UPLC, Stability Indicating, Tablet Dosage form

PC63

Development of multi-utility RP-HPLC method for pretomanid along with impurity profiling

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Tuberculosis continues to be a major global health challenge, particularly due to the emergence of multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains. Pretomanid, a newer anti-tubercular agent, has shown improved therapeutic outcomes; however, validated analytical methods for its quality control, stability assessment, and impurity profiling are limited. The present study aimed to develop a reliable, sensitive, and stability-indicating RP-HPLC method for pretomanid suitable for routine pharmaceutical analysis.

An isocratic RP-HPLC method was developed using a Hemochrome C18 column with a mobile phase of acetonitrile and 0.05% trifluoroacetic acid (55:45 v/v), delivered at a flow rate of 1.0 mL/min. Detection was carried out at 330 nm. The method was validated in accordance with ICH Q2(R1) guidelines and demonstrated good specificity, linearity over the concentration range of 5–75 µg/mL ($r^2 > 0.999$), accuracy within 99.5–100.5%, and precision with %RSD less than 2%. The limits of detection and quantification were found to be 0.25 ppm and 0.85 ppm, respectively.

Forced degradation studies under acidic, alkaline, oxidative, thermal, and photolytic conditions confirmed the stability-indicating nature of the method, with significant degradation observed under alkaline stress. The method was successfully applied for the assay of pretomanid in the presence of excipients and for impurity profiling.

Reference: Rivers, Emma C., and Ricardo L. Mancera. "New anti-tuberculosis drugs in clinical trials with novel mechanisms of action." Drug discovery today 13.23-24 (2008): 1090-1098

PC64

Development and validation of a green, stability-indicating RP-HPLC method for mavacamten with QbD-based optimization and LC-ESI-QTOF-MS degradant characterization

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A reversed-phase high-performance liquid chromatography (RP-HPLC) technique was developed and validated for the quantitative estimation and stability evaluation of Mavacamten, a first-in-class cardiac myosin inhibitor, using Quality by Design (QbD) principles in accordance with ICH Q2(R1) guidelines. Chromatographic separation was achieved on a Shim-pack C18 column (4.6 × 50 mm, 1.7 µm) using a mobile phase of methanol and 0.1% acetic acid (62:38, v/v) at a flow rate of 0.6 mL/min with UV detection at 254 nm. The method exhibited excellent linearity over the concentration range of 5-30 µg/mL, with a correlation coefficient (R^2) of 0.9956. High precision and accuracy were demonstrated by %RSD values below 0.5% and recovery ranging from 99.896% to 100.551%. Statistical evaluation by ANOVA showed no significant differences across concentration levels or analytical days (p>0.05), confirming robustness. The limits of detection and quantification were 0.336 ppm and 0.503 ppm. The method was highly specific, with no interference from excipients or degradation products. Forced degradation studies revealed stability under alkaline, oxidative, thermal, and photolytic conditions, while acidic stress produced two degradants. These degradants were characterized using LC-ESI-QTOF-MS, confirming the stability-indicating nature. Green assessment using the AGREE metric yielded a score of 0.79, indicating an eco-friendly profile.

Keywords: Mavacamten; RP-HPLC; Stability-indicating method; LC-ESI-QTOF-MS; Quality by Design

PH65

HPTLC method development and validation for simultaneous estimation of gallic acid, ellagic acid, and phyllanthin in divya livogrit tablet

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The present study describes a simple, precise, and validated High-Performance Thin-Layer Chromatographic (HPTLC) method for the concurrent quantification of Gallic acid, Ellagic acid, and Phyllanthin in Divya Livogrit Tablet, an Ayurvedic polyherbal formulation with hepatoprotective properties. Livogrit comprises essential components like *Phyllanthus niruri, Eclipta alba, Boerhavia diffusa*, and *Tinospora cordifolia*, recognized for their significant antioxidant and hepatoprotective properties.

Chromatographic separation was performed on silica gel 60 F TLC plates utilizing a mobile phase composed of 0.05% trifluoroacetic acid (TFA) in water and methanol in ratio 75:25 (v/v). Densitometric scanning was conducted at 265 nm, where all three analytes exhibited optimal absorbance. The established method yielded well-defined, compact bands with Rf values of

0.22 ± 0.02 for Gallic acid, 0.35 ± 0.02 for Ellagic acid, and 0.62 ± 0.03 for Phyllanthin.

Method validation was conducted in compliance with ICH Q2(R2) requirements. Linearity was reported within the range of 100–600 ng/spot for all analytes, exhibiting correlation values (r^2) exceeding 0.995. The detection and quantification limits were established within acceptable parameters, indicating the method's sensitivity. The established HPTLC method demonstrated precision (RSD < 2%), accuracy (recovery 98–102%), and specificity for all analytes.

The suggested method can be efficiently utilized for regular quality control and standardization of Divya Livogrit Tablet and other polyherbal hepatoprotective formulations incorporating these bioactive indicators.

Key Words: HPTLC, Ellagic acid, gallic acid, Divya Livogrit Tablet, ICH Q2 (R2)

PC66

A novel bacprotac based anti-tuberculosis stratergy

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Tuberculosis (TB) remains one of the leading causes of death from infectious diseases worldwide, with the rapid emergence of multidrug-resistant (MDR) and drug-tolerant strains posing a serious challenge to existing therapies. To address this unmet medical need, we propose PROTEQURE®, a novel BacPROTAC-based anti-tubercular strategy that enables selective degradation of essential mycobacterial proteins. BacPROTACs function by hijacking the bacterial ClpCP protease system, facilitating targeted protein degradation rather than conventional enzymatic inhibition, thereby reducing the likelihood of resistance development.In this study, rationally designed BacPROTAC molecules were synthesized using amide coupling reactions and comprehensively characterized by IR, NMR, and mass spectrometry. Molecular docking studies demonstrated strong binding interactions with key mycobacterial targets and the ClpC1 protease, supporting the proposed degradation mechanism. The anti-tubercular efficacy of the synthesized compounds was evaluated in vitro using the Resazurin Microtiter Assay (REMA) against Mycobacterium smegmatis, where selected PROTAC analogues exhibited promising minimum inhibitory concentration (MIC) values comparable to standard anti-TB drugs.This targeted degradation approach offers several advantages, including enhanced specificity, reduced dosage requirements, and minimized off- target toxicity. From a translational perspective, PROTEQURE® represents a first-in-class antibacterial modality with significant commercial potential through B2B pharmaceutical collaborations and B2G partnerships for TB eradication programs. Overall, this work establishes BacPROTACs as a promising and innovative therapeutic platform for overcoming antimicrobial resistance in tuberculosis.

PC67

Novel Cu/Mo Nanocatalysts for Efficient Aromatic Nitration: A Green Approach to API Intermediate Synthesis

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Novel copper-molybdenum oxide (Cu/Mo) nanocatalysts were synthesized in varying weight percentages using the sol–gel technique. These catalysts enabled the efficient and selective nitration of aromatic compounds with 60–70% aqueous nitric acid under mild conditions, affording good yields. To the best of our knowledge, this is the first reported example of aromatic nitration catalysed by Cu/Mo systems. The method eliminates the need for corrosive mineral acids, offers high thermal stability, and provides a recyclable, environmentally benign catalytic process-marking a significant advancement in green nitration chemistry.

Keywords: Nanocatalysts; Sol-Gel Technique; Aromatic Nitration; Green Chemistry; Cu/Mo Catalyst

PC68

Design of some tyrosinase inhibitors targeting tyrosin mushroom enzyme 2y9x

Kakad Pavan Malhari, Jadhav Sanket Balaso

Pigmentation disorders common within the Indian population are one of the most strikingly variable phenotypes in humans. Exposure to ultraviolet radiation is known to trigger or exacerbate pigmentation disorders. Due to the fact that tyrosinase is responsible for biosynthesis and regulation of melanin, tyrosinase inhibitors can be favorable agents in cosmetics and medicinal industries. Among the most exploited isoflavones, in particular natural and synthetic origin; isoflavone derivatives have appeared in the literature in the last five years as potent tyrosinase inhibitors. Several inhibition mechanisms have been reported for the described inhibitors, pointing to copper chelating and/or hydrophobic moieties as key structural requirements to achieve good inhibition. However, in present study 18 derivatives of the isoflavone scaffold were subjected for in silico studies using PASS online, Mol Inspiration, ProTox II, and iGEMDOCK to explore in vitro efficacy against mushroom tyrosinase. In silico docking studies with mushroom tyrosinase (PDB ID: 2Y9X) predicted mode of interaction of these compounds against the active site of mushroom tyrosinase. The results emphasized the importance of the isoflavone core with hydroxyl substitution as a significant contributor for tyrosinase inhibition. The docked conformations revealed that the hydroxyl groups form metal–ligand interactions with the Cu^{2+} ions in the active site. Thus, the in silico results served as a template for synthesis, in vitro and in vivo studies to obtain promising mushroom tyrosinase inhibitors.

PCL01

Herb–drug interaction potential of isolated fraction of *Ardisia solanaceae* ethanolic extract with donepezil: implications for dementia management.

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Herb-drug interactions (HDIs) are becoming increasingly important at the clinical level, particularly in patients with dementia who frequently consume polypharmacy and complementary herbal medicines. Donepezil, a widely prescribed first-line cholinesterase inhibitor for Alzheimer's disease, is mainly metabolized by cytochrome P450 (CYP450) enzymes, which may produce pharmacokinetic and pharmacodynamic interactions. The traditional medicinal plant Ardisia solanacea possesses neuroprotective, anti-oxidant, and acetylcholinesterase (AChE) inhibitory activity. Flavonoids, phenolics, saponins, etc. in the plant reportedly modulate drug-metabolizing enzymes.

The current study's goal is the evaluation of the herb-drug interaction potential of the isolated fractions of Ardisia solanaceae with donepezil. The overall work includes bioactivity-guided fractionation, isolation and structural characterization of active phytoconstituents using UV, IR, NMR and Mass Spectrometry. In-silico tests like molecular docking and ADMET analysis are performed to predict the interaction possibility. In order to assess potential pharmacodynamic and metabolic interactions, Ellman's AChE inhibition method and CYP450 enzyme inhibition studies were performed. In addition, the in-vivo pharmacokinetic and behavioural studies using Wistar rat models will include Y-maze testing to assess cognitive effects and interaction effects.

The expected outcome are identification of synergistic, antagonistic or neutral interaction profiles of the constituents of Ardisia solanaceae with donepezil, clarifications of CYP450 modulation and assessment of cognitive and safety ramifications. This study aims to provide critical evidence for the reasonable and safe use of herbal medicines with contemporary treatment of dementia.

PCL02

Ameliorative effect of an ethanolic extract of *Aegle marmelos* l. Leaves on non–alcoholic fatty liver disease in high fructose-induced insulin resistance in rats.

Ms. Pratiksha Hajare[1], Dr. Deepti D. Bandawane*, Ms. Nikita Pawar[2].

Objectives: The aim of this study was to investigate the therapeutic potential of the ethanolic extract of *Aegle marmelos* L. leaves (EEAM) for the treatment of Non-alcoholic fatty liver disease (NAFLD) in high fructose-induced insulin-resistant Wistar rats.

Materials and Methods: The effect of EEAM was studied on 30 male wistar rats. Insulin resistance was induced in the rats by feeding them a high-fructose diet (HFD) for six weeks. The rats were divided into five groups at random: Group I (n=6) was given a normal diet; Group II, the disease control group, was given HFD for six weeks; and Groups III, IV, and V were given HFD along with pioglitazone (5 mg/kg/day) and EEAM (200 and 400 mg/kg/day) for four weeks.

Result: HFD rats exhibited a significant increase in the levels of lipids such as total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL), while high-density lipoprotein (HDL) levels decreased. Additionally, HFD rats showed an increase in liver enzymes, specifically alanine aminotransferase (ALT) and aspartate aminotransferase (AST). C-reactive protein (CRP) was also elevated in the serum of HFD rats as compared to normal rats.

On the other hand, EEAM significantly reduced the elevation of final body weight, liver weight, liver fat accumulation, TG, TC, LDL-C, VLDL-C, CRP, ALT, and AST, and moderately increased HDL-C, SOD, and CAT. Additionally, histopathological changes were near normal.

Conclusion: The present study's findings suggested that *Aegle marmelos* leaves have a beneficial effect in treating NAFLD.

Keywords: *Aegle marmelos*, Non-alcoholic fatty liver disease, insulin resistance, high fructose diet.

PCL03

Network pharmacology-based in silico evaluation of captopril as a potential therapeutic agent for post-surgical hypertrophic scars.

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Post-surgical hypertrophic scars are formed due to abnormal wound healing processes involving excessive fibroblast proliferation, increased collagen deposition, persistent inflammation, and activation of profibrotic signalling pathways such as transforming growth factor-β (TGF-β) and angiotensin II. Current treatment options for hypertrophic scars are limited and often associated with variable outcomes, highlighting the need for safer and more effective therapeutic approaches. Drug repurposing using *in silico* techniques offers a cost- effective and time-saving strategy to identify new therapeutic applications for existing drugs.

In the present study, captopril, a well-established angiotensin-converting enzyme (ACE) inhibitor with known antifibrotic, antioxidant, and anti-inflammatory properties, was evaluated for its potential role in the management of post-surgical hypertrophic scars through network pharmacology analysis. Potential molecular targets of captopril were identified using publicly available drug–target databases, while genes associated with hypertrophic scars were collected from disease-related databases. Common targets were used to construct a drug–disease interaction network, followed by protein–protein interaction analysis to identify key hub proteins involved in scar formation. Gene Ontology and KEGG pathway enrichment analyses were performed to understand the biological processes and signalling pathways regulated by these targets. The analysis revealed that captopril may modulate multiple pathways related to fibroblast activation, extracellular matrix remodelling, inflammation, oxidative stress, and wound healing. Molecular docking studies will further demonstrate favourable binding interactions between captopril and key fibrotic proteins, supporting its potential antifibrotic activity.

Overall, this *in silico* study suggests that captopril may be a promising repurposed therapeutic candidate for post-surgical hypertrophic scars and provides a strong foundation for further *in vitro* and *in vivo* experimental validation.

Keywords: Post-surgical hypertrophic scars; Drug repurposing; Captopril; ACE inhibition; Antifibrotic therapy; Network pharmacology; Protein–protein interaction analysis; Fibroblast activation; TGF-β signalling; Molecular docking.

PCL04

Molecular cloning and protein overexpression of human NUP214.

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The nuclear pore complex (NPC) is a crucial structure in eukaryotic cells that regulates the transport of molecules, such as mRNA, between the nucleus and cytoplasm. Nup214, a key protein in the NPC, plays a vital role in mRNA export, particularly in higher vertebrates, though its exact mechanisms remain unclear. This study aimed to clarify the functional role of the β- propeller domain (1-450) and the β-propeller with coiled-coil domain (1-955) of human Nup214 in mRNA export. Using molecular cloning techniques, these domains were successfully inserted into the pCAG-mCherry vector and expressed in mammalian U2OS cells. The cloning process was validated through PCR, double digestion, and sequencing. The results confirmed the successful construction of the desired plasmids, paving the way for further functional studies. However, limitations such as the lack of specific antibodies for Nup214 and mCherry restricted additional validation steps like western blotting. Despite these challenges, this study provides a foundation for future research into the role of the Nup214/88 complex in mRNA export in higher vertebrates, with potential implications for understanding diseases like cancer linked to NPC dysfunction.

Keywords: Nuclear pore complex, Nup214, mRNA export, molecular cloning, β-propeller domain, mammalian cells.

PCL05

Network pharmacology-based insights into the multi-target therapeutic potential of α-pinene in inflammatory bowel disease.

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Inflammatory bowel disease is a chronic inflammatory disorder of the gastrointestinal tract characterized by mucosal inflammation, immune dysregulation, altered cytokine signaling and disruption of the gut microbiota. Owing to its complex and multifactorial pathogenesis, therapies targeting a single molecular pathway often show limited efficacy. α-Pinene, a natural monoterpene with reported anti-inflammatory properties, may represent a promising multi- target therapeutic approach for IBD. In this study, network pharmacology was applied to explore the potential mechanisms of α-pinene in IBD. A compound target pathway network was constructed to identify key targets and signaling pathways involved in IBD pathogenesis. Network analysis identified MAPK1, MAPK3, and RXRA as key hub targets of α-pinene. These targets were significantly associated with several immune and inflammatory pathways relevant to IBD, including IL-17 signaling, Th17 and Th1/Th2 cell differentiation, B-cell receptor signaling, Fc gamma receptor-mediated phagocytosis, Fc epsilon RI signaling, and EGFR tyrosine kinase inhibitor resistance. The strong interconnection among these pathways suggests that α-pinene may regulate both innate and adaptive immune responses through MAPK-mediated inflammatory signaling and nuclear receptor-dependent transcriptional regulation.

This network pharmacology study suggests that α-pinene may exert therapeutic effects in IBD by modulating multiple targets and pathways, providing a rationale for further experimental validation and supporting its potential as a complementary therapy for IBD.

Keywords: α-Pinene, Inflammatory Bowel Disease, Network Pharmacology.

PCL06

A phenotype-driven precision pharmacology decision support system for cardiovascular therapy.

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The significant variation in underlying pathophysiology, pharmacodynamic response, and susceptibility to adverse drug reactions that define cardiovascular diseases (CVDs) frequently limits the efficacy of standard, guideline-driven therapy. Permanent diagnostic labelling and empirical increase in dosage are common causes of therapeutic inertia, inappropriate polypharmacy, and preventable safety risks in routine clinical practice. With the aim to improve logical cardiovascular therapy planning and long-term revaluation, this study was designed to create and pharmacologically validate a clinician-centric, phenotype-based decision support framework.

The framework involves clinical inputs that are regularly available, such as blood pressure staging, laboratory biomarkers, comorbid conditions, concurrent medication profiles, and demographic variables. To create trustworthy disease phenotypes, these parameters are systematically correlated to important cardiovascular pathophysiological mechanisms like neurohormonal dysregulation, vascular dysfunction, metabolic stress, and inflammatory burden. Therapeutic recommendations focus on clinically significant drug-drug interactions, dose sensitivity, and mechanism-consistent drug selection according to with accepted pharmacodynamic and pharmacokinetic principles. Treatment response progressions and adverse drug reaction patterns are integrated into a structured continuous reassessment module to facilitate rapid phenotype refinement and appropriate therapy modification.

Validation using retrospective clinical cases and simulated cardiovascular scenarios demonstrated improved coherence of pharmacological reasoning, earlier identification of therapy phenotype mismatch, and enhanced detection of preventable safety risks compared with conventional prescribing approaches. This pharmacology-oriented framework provides a clinically translatable strategy to improve precision, safety, and adaptability of cardiovascular pharmacotherapy while preserving clinician autonomy.

Keywords: cardiovascular diseases; Precision Pharmacotherapy; Phenotype-Based Treatment; Clinical Pharmacology; Drug Safety; Polypharmacy.

PCL07

Evaluation of some phytoconstituents on metabolic derangements in high fructose induced metabolic syndrome model in experimental animals.

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Objective: This study aims to evaluate the protective effects of selective phytoconstituents against fructose-induced metabolic syndrome, focusing on their antioxidant, anti- inflammatory, and antihypertensive potential. The research seeks to determine biochemical changes and elucidate possible mechanisms of action using a high-fructose-induced metabolic syndrome animal model.

Materials and Methods: Excessive fructose consumption has been linked to metabolic syndrome, a growing global health concern. Current treatments have limitations, necessitating novel therapeutic approaches. A detailed literature review identified active phytoconstituents, which were further analyzed using network pharmacology to study their interactions with molecular targets. The most promising compounds were selected for formulation and preclinical evaluation using experimental models.

Results: Effective phytochemical constituents with potential therapeutic benefits were identified and selected for treatment. Network pharmacology analysis identified key molecular targets and pathways influenced by the selected phytoconstituents, demonstrating their multi- target therapeutic potential. The findings suggest that these bioactive compounds could effectively modulate metabolic syndrome-related dysfunctions.

Conclusion: The study highlights the potential of phytoconstituents as novel therapeutic agents for metabolic syndrome. Further preclinical evaluation, including in vitro and in vivo studies, will validate their efficacy and safety. This integrative approach combining phytochemistry and network pharmacology offers a promising strategy for metabolic syndrome treatment.

Keywords: Metabolic Syndrome, High fructose, Network Pharmacology, antioxidants, anti-inflammatory.

PCL08

Investigating the effect of ethyl ferulate on metabolic complications induced by cafeteria diet in a rat model.

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The present study investigated the protective effects of ethyl ferulate (EF) against metabolic complications induced by a Cafeteria diet (CD) in Wistar rats. Metabolic dysfunction was established by feeding rats a CD for 35 days, followed by oral administration of EF (25 and 50 mg/kg) and comparison with the standard drug orlistat (50 mg/kg). CD feeding resulted in significant increases in body weight, body mass index, caloric intake, white adipose tissue mass, fasting glucose, dyslipidemia, oxidative stress, systemic inflammation, and multi-organ dysfunction involving the heart, liver, kidney, and pancreas. EF treatment, particularly at 50 mg/kg, significantly attenuated weight gain, reduced adiposity, normalised glucose levels, improved lipid profiles, and restored antioxidant defences by increasing glutathione and catalase while reducing lipid peroxidation. EF also markedly suppressed pro-inflammatory mediators, including TNF-α, IL-6, and NF-κB. Cardioprotective effects were evident from improved ECG parameters and reduced CRP and CK-MB levels. Hepatic, renal, and pancreatic function markers were significantly normalized following EF treatment. Histopathological and ImageJ-based quantitative analyses confirmed the preservation of tissue architecture and cellular integrity across organs, with EF (50 mg/kg) showing efficacy comparable to or exceeding that of orlistat.

Overall, EF demonstrated dose-dependent antioxidant, anti-inflammatory, and organ-protective effects against CD-induced metabolic complications. These findings suggest that ethyl ferulate is a promising natural therapeutic candidate for managing obesity-associated metabolic disorders.

PCL09

Network pharmacology analysis of *Asparagus racemosus*, Convolvulus *pluricaulis*, *Bacopa monnieri*, and *Trapa bispinosa*.

Mohammed Azim Shakil Naikwadi[1].

This study investigates the ageing-related potential of Asparagus racemosus, Convolvulus pluricaulis, Bacopa monnieri, and Trapa bispinosa using a network pharmacology approach. Bioactive compounds from these plants were analysed to identify their molecular targets and associated biological pathways linked to ageing. The results indicate that Asparagus racemosus supports healthy ageing by enhancing antioxidant activity and immune regulation, thereby reducing cellular stress. Convolvulus pluricaulis contributes to the maintenance of cognitive function through neuroprotective mechanisms. Bacopa monnieri plays a significant role in delaying age-related cognitive decline by improving synaptic function and antioxidant defense. Trapa bispinosa aids metabolic balance and cellular protection during ageing through its antioxidant properties. Overall, the network analysis revealed interactions with key ageing- related pathways involved in oxidative stress, inflammation, apoptosis, and neuroactive signaling, highlighting the multi-target potential of these medicinal plants in promoting healthy ageing.

Keywords: Ageing, Network pharmacology, Asparagus racemosus, Convolvulus pluricaulis, Bacopa monnieri, Trapa bispinosa, Antioxidant, Neuroprotection.

PCL10

Toxicological assessment of imeglimin and its ketone impurity using in-vitro biological assay.

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Imeglimin (IMG), a novel antidiabetic agent, and its ketone impurity (IKI) were evaluated for their cytotoxic, oxidative, and genotoxic potential. While IMG has demonstrated therapeutic promise, concerns about impurity-related toxicities necessitate a mechanistic assessment in mammalian cells. The BALB/c 3T3 fibroblast cells were exposed to increasing concentrations (5-125 µM) of IMG and IKI for 24 hours. Cytotoxicity was assessed using the MTT assay, while oxidative stress (OS) markers (SOD, CAT, rGSH, MDA), nitrosative stress (NO) by iNOS, and Nrf2 activation were quantified. The genotoxic potential was evaluated using the comet assay, with the head intensity and tail intensity as the primary indicators. IMG induced a concentration-dependent decline in cell viability (IC_{50} = 19.27 µM), whereas IKI showed a less potent (IC_{50} = 35.40 µM). Antioxidant analysis revealed hormetic responses. IMG upregulated SOD, CAT, and rGSH at low concentrations, but at higher concentrations suppressed antioxidant defences, elevated MDA, and strongly activated Nrf2 and iNOS, indicating oxidative and nitrosative stress. IKI demonstrated weaker modulation, with minimal CAT changes, inconsistent rGSH elevation, moderate MDA increases, and downregulated iNOS, suggesting reduced NO. The comet assay revealed that IMG causes significant genotoxicity at higher concentrations (125 µM) through OS. IKI showed genotoxic effects at 75 µM. IMG exerts stronger cytotoxic and genotoxic effects at higher concentrations than its ketone impurity, with biphasic antioxidant responses and marked Nrf2/iNOS induction at higher doses. In contrast, IKI triggers weaker OS and reveals genotoxic responses at 75 µM.

Keywords: Drug Toxicity, Impurities, Oxidative Stress, Cytotoxicity, Antioxidant Defence.

PCL11

"Natural" does not always mean "safe": evidence of ocular toxicity of aja ark in wistar rats highlighting the urgent need for regulatory guidelines for ayurvedic eye preparations.

Renuka Umbarkar, Dr.Vaishali Undale.

Background: Ayurvedic eye preparations are widely used and commonly trusted because of their natural origin. However, the lack of defined regulatory guidelines for ocular safety assessment of Ayurvedic formulations poses a significant concern, particularly for products administered directly to the eye. Aja Ark, an Ayurvedic formulation derived from goat milk and prepared under sterile conditions, is traditionally used for therapeutic purposes, yet its ocular safety has not been scientifically validated.

Objective: To evaluate the ocular toxicity of Aja Ark following repeated ocular exposure and to highlight the regulatory gap in the safety evaluation of Ayurvedic ophthalmic preparations.

Methods: Wistar rats were allocated into four groups. The control group received 0.4 ml of water for injection, while test groups received 0.04 ml of Aja Ark once, twice, or thrice daily via the ocular route for 14 consecutive days. Animals were observed for clinical signs of ocular irritation, and eyes were subjected to histopathological examination.

Results: Repeated ocular exposure to Aja Ark resulted in distinct dose-frequency–dependent ocular toxicity. Histopathological findings demonstrated corneal stromal cell damage with inflammatory cell infiltration, indicating compromised corneal integrity. The severity of damage increased with higher dosing frequency.

Conclusion: The findings clearly indicate that natural origin and sterile preparation do not ensure ocular safety. The demonstrated toxicity of Aja Ark underscores the urgent need for standardized regulatory guidelines, mandatory ocular toxicity testing, and robust pharmacovigilance frameworks for Ayurvedic eye preparations prior to clinical use.

PCL12

"Formulation and evaluation of anti urolithiatic activity of liposomes of *Withania somnifera* root in experimental rats".

Vaishnavi Govind Tirthe, Nimisha Sunil Solas, Dr. Sonali Nipate.

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Background: Urolithiasis is a recurrent urological disorder involving stone formation in the kidneys, bladder, and ureters due to urinary supersaturation of calcium and oxalate, aggravated by reduced magnesium and citrate levels. *Withania somnifera* root contains bioactive phytochemicals such as flavonoids, tannins, saponins, and phenolic compounds. Previous studies reported its diverse pharmacological activities, including anti-inflammatory, diuretic, anti-ulcer, CNS depressant, wound-healing, and antifertility effects, highlighting its broad therapeutic potential.

Objectives: To evaluation of anti-urolithiasis activity of liposomes of *Withania somnifera* root in ethylene glycol induced urolithiasis in experimental rats.

Material and Methods: *Withania somnifera* root extract was prepared and stored. Male Wistar rat were induced with ethylene glycol and treated with EEWS at doses 100mg/kg, 200mg/kg, and liposome of 149mg/kg dose orally.

Result: EEWS liposomes effectively prevented stone formation, renal damage, and recurrence, positioning them as a promising natural therapy for calcium oxalate urolithiasis.

Conclusion: Withania somnifera root extract (EEWS) liposomes showed better antiurolithiatic effects in ethylene glycol -induced rats by reducing stone promoters such as calcium oxalate crystals, reduced associated inflammation and recurrence risk while enhancing stone inhibitors producing nephroprotection.

Keywords: urolithiasis, calcium oxalate, *Withania somnifera,* ethylene glycol, stone, magnesium, quercetin, luteolin, kaempferol, epigallocatechin, inflammation.

PCL13

Network pharmacology analysis of ice apple (Borassus flabellifer) for the management of mouth ulcers.

Varsha Ramdas Korde, Chaitali Nitin Bhor, Dr. Ashish Kulkarni.

Mouth ulcers (aphthous stomatitis) are common inflammatory lesions of the oral mucosa that cause pain, discomfort, and impaired quality of life. Current treatment options primarily provide symptomatic relief and may produce undesirable effects with long-term use. *Borassus flabellifer*, commonly known as Ice apple, is traditionally used for its cooling, anti- inflammatory, antioxidant, and wound-healing properties; however, its molecular mechanisms in mouth ulcer management are not well understood. This study aimed to explore the therapeutic potential and underlying mechanisms of Ice apple in the treatment of mouth ulcers using a network pharmacology approach.

Bioactive compounds of *Borassus flabellifer* were identified through published literature and public databases and screened based on drug-likeness and oral bioavailability criteria. Potential molecular targets of the selected compounds were predicted using SwissTargetPrediction and STITCH databases. Mouth ulcer–associated targets were collected from GeneCards, DisGeNET, and OMIM databases. Common targets were identified and used to construct compound–target and protein–protein interaction networks using Cytoscape and STRING databases. Gene Ontology and KEGG pathway enrichment analyses were performed to identify relevant biological processes and signaling pathways.

The network analysis revealed that Ice apple contains multiple bioactive compounds interacting with key targets involved in inflammation, oxidative stress, immune regulation, and tissue repair, including TNF-α, IL-6, PTGS2, and MAPK-related proteins. Enrichment analysis highlighted important pathways such as NF-κB, MAPK, and cytokine–cytokine receptor interaction signaling. These results indicate that Ice apple may exert therapeutic effects through multi-component, multi-target, and multi-pathway mechanisms. The findings provide scientific support for the traditional use of Ice apple in mouth ulcer management and encourage further experimental validation.

Keywords: Mouth ulcers (aphthous stomatitis), Borassus flabellifer (Ice apple), Network pharmacology.

PCL14

Pharmacological evaluation of *Mucuna monosperma* seed extract on rotenone-induced behavioral and neurochemical deficits in rat models of parkinson's disease.

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The present study aimed to evaluate the neuroprotective effects of orally administered *Mucuna monosperma* seed extract (MMSE) at doses of 100, 200, and 400 mg/kg in a rotenone-induced Parkinson's disease (PD) rat model. Continuous rotenone exposure (2 mg/kg, s.c.) for 35 days produced characteristic PD-like symptoms, including muscle rigidity, catalepsy, reduced locomotor activity, weight loss, diminished rearing behavior, and elevated oxidative stress in brain tissue. Treatment with MMSE, particularly at 400 mg/kg, significantly ($P < 0.0001$) improved motor functions by reducing muscle stiffness and catalepsy while enhancing locomotion and rearing behavior compared to the rotenone-only group. MMSE also restored antioxidant balance by reversing oxidative stress markers and elevating dopamine levels. The extract demonstrated monoamine oxidase-B (MAO-B) inhibitory activity, thereby supporting dopamine preservation in the brain. Histopathological observations further confirmed its neuroprotective potential; rotenone-treated rats showed shrunken, pyknotic neurons and marked vacuolization, whereas MMSE-treated rats exhibited better-preserved cortical neurons with reduced vacuolization and more normal nuclear morphology. Overall, the findings indicate that MMSE at 400 mg/kg effectively mitigates oxidative stress-induced neuronal degeneration and improves motor deficits, highlighting its promise as a potential therapeutic candidate for PD.

Key words: Neurodegeneration, Parkinson's Disease, Rotenone, *Mucuna monosperma.*

PCL15

Decoding diet – gene interaction: an *in-sillico* evaluation of nutrigenomic potential of dietary polyphenols.

[a]
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Nutrigenomics is an emerging field that examines the interaction between nutrients and dietary components with the genes, highlighting the role of nutrition in regulating gene expression and metabolism and health/disease. These interactions may help in suggesting personalized nutrition to prevent diseases like cancer, CVDs, metabolic disorders, etc. Various potential components of importance in nutrigenomics includes macronutrients (Carbohydrates, Lipids, Proteins & Amino Acids), micronutrients (Vitamins and Minerals), Phytochemicals (polyphenols, catechins, isothicynates, flavonoids, tannins, terpenes, terpenoids, alkaloids, etc.), microbiome-dependent dietary components (prebiotics, postbiotics) and other bioactive food components (Peptides, nucleotides)

Among various bioactive food compounds, dietary polyphenols have attracted significant interest due to their antioxidant, anti-inflammatory and metabolic regulatory properties. Network pharmacology provides a holistic systems biology approach to reveal multi-target and multi-gene interactions and serves as powerful preliminary tool in research by enhancing efficiency and improving scientific precision of study.

The present study aims to explore the nutrigenomic potential of selected dietary polyphenols (Quercetin, Kaempferol, Luteolin,Resveratrol, Ferulic acid, Caffeic acid, Curcumin, genistein, Limonene, Carvone, Menthol,Ginsenosides, Beta-carotene, Lycopene, etc) using in-sillico Network pharmacology approach. Targets of selected dietary polyphenols were mined from target databases. A protein-protein interaction network was constructed to identify key targets of polyphenols and further analysed for disease association and key pathway involved. The results demonstrated favorable binding interaction of various dietary polyphenols with protein associated with insulin signaling, lipid metabolism and antioxidant pathways. The findings provide scientific basis for role of dietary polyphenols in diet-gene interaction and support their potential application in functional foods and nutritional interventions aimed at improving metabolic health.

PCL16

"Evaluation of a novel topical formulation of *Rhynchostylis retusa* seeds and *curcuma amada* rhizome for enhanced wound healing in rats".

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Objective: The primary objective of this study was to formulate an herbal ointment containing *Rhynchostylis retusa* seeds and *Curcuma amada* rhizomes blended with silicone oil and to evaluate its wound-healing potential using a splinted excision wound model in rats. Antioxidant, antimicrobial, and cell migration studies were also conducted to support and explain its healing activity.

Materials and Methods: The ointment was prepared by incorporating powdered *R. retusa* seeds and *C. amada* rhizomes into a melted base of soft paraffin and silicone oil. Excision wounds were created on Wistar rats and stabilized using splints. Animals were randomly divided into three groups: disease control, standard treatment (Betadine 5 mg/cm^2), and test formulation (herbal ointment ~2 mg/cm^2). Treatments were applied topically twice daily for 21 days. Wound healing was assessed through percentage wound contraction, histopathological examination using Masson's Trichrome staining, and hydroxyproline estimation. In vitro antioxidant activity (DPPH assay), antimicrobial efficacy, and fibroblast migration studies using L929 cells at concentrations of 1, 5, and 25 µg/mL were also performed.

Results: The formulation showed good physical stability, and phytochemical analysis confirmed the presence of alkaloids, glycosides, terpenoids, and phenolic compounds. Treatment with the herbal ointment significantly enhanced wound contraction and hydroxyproline levels compared to controls. Moderate antioxidant activity and notable antimicrobial effects were observed, with inhibition zones of 19.06 mm against *Staphylococcus aureus* and 18.16 mm against *Pseudomonas aeruginosa*. The scratch-wound assay demonstrated dose-dependent fibroblast migration, with reduced movement at higher concentrations.

Conclusion: The herbal ointment exhibited promising wound-healing, antioxidant, and antimicrobial properties, supporting its potential as a safe, cost-effective natural topical agent for wound management.

PCL17

Investigating the anti-cervical cancer potential of *Cardiospermum halicacabum* leaf extract: an integrated in-vitro & in-silico study with ohrlcms based phytochemical analysis.

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Cervical cancer remains a major global health challenge, highlighting the need for novel and safer therapeutic agents. *Cardiospermum halicacabum* Linn. (Sapindaceae), a medicinal plant known for its anti-inflammatory, antibacterial, and antioxidant properties, was evaluated for its anti-cervical cancer potential using an integrated in-vitro and in-silico approach. A hydroalcoholic leaf extract (ethanol: distilled water, 50:50 v/v) was prepared by maceration with sonication. Preliminary phytochemical screening confirmed the presence of alkaloids, flavonoids, phenolics, terpenes, saponins, carbohydrates, and amino acids. OHRLCMS analysis identified a total of 1150 metabolites. Network pharmacology revealed key phytoconstituents and their interactions with cancer-related target proteins. Molecular docking studies demonstrated strong binding affinities of several compounds, with 19-Nortestosterone showing the highest affinity (-8.4 kcal/mol) toward the target protein 5F19, outperforming the standard drug carboplatin (-5.3 kcal/mol). ADMET analysis indicated favorable drug-likeness and pharmacokinetic properties of major compounds. In-vitro anticancer activity assessed by MTT assay on HeLa (CCL-2) cervical cancer cell lines showed significant, dose-dependent cytotoxicity of the extract. The combined in-silico predictions and in-vitro validation suggest that *Cardiospermum halicacabum* leaf extract possesses promising anti-cervical cancer potential. These findings support its further investigation as a source of lead compounds for cervical cancer drug development.

Keywords: Anti-cervical cancer, *Cardiospermum halicacabum*, OHRLCMS, MTT Assay, In-Silico Approach, Target protein 5F19, ADMET Analysis.

PCL18

Network pharmacology-based elucidation of the therapeutic mechanisms of ferulic acid in urinary tract infection.

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Urinary tract infections (UTIs) represent a significant global health burden and are closely associated with inflammatory responses, immune dysregulation, and oxidative stress. Ferulic acid, a phenolic phytoconstituent abundantly present in *Moringa oleifera*, is known for its anti- inflammatory and immunomodulatory properties; however, its molecular mechanisms in UTI management remain insufficiently understood. In this study, a network pharmacology approach was employed to systematically elucidate the potential therapeutic targets and signaling pathways of ferulic acid in UTIs. UTI-associated genes were retrieved from the GeneCards and DrugBank databases, while potential targets of ferulic acid were predicted using SwissTargetPrediction. Common targets were identified using Venny 2.1, followed by the construction of a protein–protein interaction (PPI) network via the STRING database. Key hub genes were determined through topological analysis using Cytoscape with the CytoHubba plug-in. Functional enrichment analyses, including Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analysis, were conducted using ShinyGO 0.80. The network analysis identified PTGS2, MMP9, and STAT3 as pivotal hub genes, highlighting their critical roles in inflammatory signaling, tissue remodeling, and immune regulation during UTI pathogenesis. GO and KEGG analyses further revealed significant enrichment in pathways related to NF-kB signaling, IL-17 signaling, leukocyte migration, and oxidative stress responses. Collectively, these findings suggest that ferulic acid may exert therapeutic effects in UTIs through a multi-target and multi-pathway mechanism, providing a scientific foundation for further experimental validation and potential clinical development.

Keywords: Urinary Tract Infection; Ferulic Acid; Network Pharmacology; *Moringa oleifera*; PTGS2; MMP9; STAT3

PCL19

To evaluate the impact of chronic stress on the female reproductive system and assess the therapeutic potential of herbal extract in restoring hormonal balance and reproductive function.

Ms. Dhanashri Dikole, Dr. Mayuri Gurav.

Chronic psychological stress is a significant contributor to female reproductive dysfunction due to dysregulation of the hypothalamic–pituitary–gonadal axis, leading to hormonal imbalance, disrupted estrous cycles, ovarian morphological changes, and infertility. The present study investigates the therapeutic potential of herbal extract, a traditionally used ethnomedicinal plant, in ameliorating stress-induced reproductive disturbances.

The study aimed to evaluate the protective effects of methanolic herbal extract against chronic stress–induced behavioural, hormonal, and ovarian alterations. Chronic Unpredictable Mild Stress (CUMS) was employed to induce stress in Swiss albino female mice over an eight-week period. Animals were divided into four groups: control, CUMS-only, and two treatment groups receiving herbal extract at doses of 200 mg/kg and 400 mg/kg during the final four weeks. Behavioural assessment was performed using the Forced Swim Test. Hormonal parameters including LH, FSH, estrogen, progesterone, testosterone, insulin, T3, and T4 were analyzed using ELISA. Estrous cyclicity was evaluated through vaginal smear analysis, and ovarian tissues were examined histopathologically. Acute oral toxicity, phytochemical and spectral analyses, and molecular docking studies with estrogen receptor alpha (PDB ID: 3EQM) were also conducted.

The extract exhibited no acute toxicity up to 2000 mg/kg and was found to contain flavonoids, alkaloids, steroids, and phenolic compounds. Treatment with herbal extract significantly improved stress-induced behavioural changes, restored hormonal balance, normalized estrous cyclicity, and improved ovarian histoarchitecture. Molecular docking revealed strong binding affinity of phytoconstituents such as apigenin and β-amyrin with estrogen receptor alpha.

In conclusion, herbal extract demonstrates significant therapeutic potential in restoring reproductive function under chronic stress and may serve as a promising natural intervention for stress-related female infertility.

Keywords: Chronic Stress, Hormonal Imbalance, Female Reproductive System, Herbal extract, CUMS, ELISA, Infertility, Molecular docking.

PCL20

Network pharmacology–based mechanistic insights of α-pinene in osteoarthritis.

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Osteoarthritis (OA) is a is a chronic joint disease where inflammation slowly damages cartilage, causing pain and reduced movement. Current treatments mainly relieve pain and do not slow disease progression, highlighting the need for safer multi-target therapies. Natural compounds such as α-pinene, with anti-inflammatory and antioxidant properties, may offer a promising treatment option. In this study, a network pharmacology was used to understand multi-target mechanism of α-pinene in osteoarthritis. Targets related to α-pinene were collected from online databases and compared with genes linked osteoarthritis. A protein-protein interaction network was then created to find important target genes, and pathway analysis was carried out to understand the main biological processes involved. The analysis showed that α- pinene may act on important targets such as, MAPK1, MAPK3, MAPK14, PPARG, and HMGCR which play major roles in inflammation, cartilage degradation, and metabolic imbalance. Key pathways identified include TNF signaling, IL-17 signaling, MAPK signaling, TGF-β signaling, AMPK signaling, and VEGF signaling pathways, apoptosis, and NOD-like receptor signaling pathways. all of which are closely linked to OA progression.

Overall, this study shows that α-pinene may improve osteoarthritis by acting on multiple targets and pathways at the same time, supporting its potential as a promising natural therapeutic agent.

Keywords: α-Pinene, osteoarthritis, Network pharmacology.

PCL21

Biogenic Zno nanoparticles from *Allium cepa* and *Tagetes erecta*: synthesis, characterization and its antidiabetic, antioxidant evaluation and cytotoxic studies against mouse insulinoma (min6) cell line.

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Plant-based nanoparticles have potential uses and advantages over traditional physicochemical techniques. In this study, zinc oxide nanoparticles (ZnO-NPs) were biosynthesized from Tagetes erecta flower extract and Allium cepa peel extract, characterized and evaluated their antioxidant, and antidiabetic activities. UV-visible absorption spectroscopy (UV-Vis) revealed a characteristic absorption peak at 355 nm, while X-ray diffraction (XRD) confirmed the presence of crystalline ZnO-NPs having an average size of 35.14nm. Fourier transform infrared (FTIR) spectroscopy provided evidence for presence of functional groups that stabilizes nanoparticles, elemental composition was confirmed by energy-dispersive X-ray spectroscopy (EDX). Scanning electron microscopy (SEM) provided evidence of the rod-like morphology of nanoparticles, and dynamic light scattering determined the particle size distribution and polydispersity index. The biosynthesized ZnO-NPs presented a range of biological activities that included key antioxidant properties and strong inhibition of αglucosidase activity (IC_{50} = 35.9 ± 2.49 µg/mL). The MTT assay was performed for cytotoxicity screening MIN6 pancreatic β-cells that confirmed high viability from 99.4% at 10 µg/mL to 85.6% at 100 µg/mL, indicating non-toxic behaviour. Furthermore, the biosynthesized ZnO-NPs also induce dose-dependent stimulation of insulin secretion, with fold-increases ranging from 2.29 to 7.64 ($p \leq 0.0001$) compared to controls. The ZnO-NPs derived from peel of Allium cepa and the floral extracts of Tagetes erecta shown strong antioxidant and antidiabetic characteristics, suggesting that they have the potential to be effective therapeutic agents with minimal side effects for advanced biomedical applications.

PCL22

"A network pharmacology-based approach to decipher the signaling pathways of *Ocimum tenuiflorum* leaf extract in the treatment of migraine".

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Migraine is a debilitating neurovascular disorder characterized by chronic pain and neuroinflammation. *Ocimum tenuiflorum* (Tulsi) is traditionally recognized for its analgesic properties; however, its systemic molecular mechanism in migraine management remains largely uncharacterized. This study employs a comprehensive network pharmacology approach to identify the bioactive components and therapeutic targets of Tulsi.

Bioactive compounds of *O. tenuiflorum* were retrieved from databases and screened for drug-likeness, focusing on gastrointestinal absorption and blood-brain barrier permeability using SwissADME. Migraine-associated targets were collected from DisGeNET. A compound-target-disease network was constructed using Cytoscape. Protein-protein interactions (PPI) were analyzed via the STRING database to identify core hub genes. Finally, KEGG pathway enrichment analyses were performed to elucidate the biological pathways involved.

Out of 291 phytochemicals, 137 drug-like compounds, including Linalool, Menthol, and Luteolin, were identified as potential leads. These compounds interacted with key migraine- related hub targets such as TNF, TRPM8, TRPV1, and NOS3. KEGG enrichment analysis revealed that Tulsi primarily modulates the, Inflammatory mediator regulation of TRP channels, Neuroactive ligand-receptor interaction, and Calcium signaling pathways. These results suggest a synergistic mechanism targeting neurogenic inflammation and nociceptive signaling.

This *in silico* study provides a systematic molecular basis for the anti-migraine potential of *Ocimum tenuiflorum* leaf extract. By identifying specific compound-target-pathways, this research supports further preclinical and experimental validation for anti-migraine activity.

PCL23

Green synthesized nanoparticles of herbal extract of *Sida alnifolia* attenuate the necrosis of beta cells in alloxan induced diabetic model.

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Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from impaired insulin secretion, insulin action, or both. Oxidative stress–mediated destruction of pancreatic β-cells plays a crucial role in the progression of diabetes, particularly in chemically induced experimental models. Alloxan is widely used to induce diabetes in experimental animals due to its selective cytotoxic effect on pancreatic β-cells through the generation of reactive oxygen species. In recent years, green synthesis of nanoparticles using medicinal plant extracts has gained significant attention due to their eco-friendly nature, biocompatibility, and enhanced therapeutic efficacy. Sida alnifolia, a medicinal herb known for its antioxidant, anti-inflammatory, and antidiabetic properties, has been traditionally used in herbal medicine.

The present study aims to evaluate the protective effect of green synthesized nanoparticles using Sida alnifolia herbal extract on pancreatic β-cell necrosis in an alloxan-induced diabetic model. The biosynthesized nanoparticles were characterized for their physicochemical properties and assessed for their antidiabetic potential. Experimental diabetes was induced using alloxan, followed by treatment with Sida alnifolia–mediated nanoparticles. Biochemical parameters such as blood glucose levels, insulin levels, and oxidative stress markers were evaluated. Histopathological examination of pancreatic tissue was performed to assess β-cell morphology and necrosis.

The results demonstrate that treatment with green synthesized nanoparticles significantly reduced hyperglycemia and oxidative stress while preserving pancreatic β-cell architecture compared to untreated diabetic controls. The attenuation of β-cell necrosis suggests a cytoprotective effect mediated by the antioxidant and free radical scavenging properties of Sida alnifolia nanoparticles. This study highlights the potential of green synthesized herbal nanoparticles as a promising therapeutic approach for the management of diabetes mellitus and prevention of β-cell damage.

PCL24

Evaluation of wound healing activity of dusting powder of Rumex *acetosa linn.* Leaves in experimental animals.

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Background: Wound healing is a highly coordinated and dynamic biological process that involves a sequence of events including hemostasis, inflammation, proliferation, and remodeling of damaged tissue. *Rumex acetosa Linn*., a perennial herb, it have been reported to contain flavonoids, alkaloid, glycoside, tannins, terpenoids. it has shown potential for treating wound conditions. Its ethanolic extract exhibits anti-inflammatory, antioxidant, antiproliferative, and antibacterial activity.

Objective: To evaluate the wound healing activity of the ethanolic extract of *Rumex acetosa* Linn. leaves using experimental animal models.

Materials & Methods: RALE powder was extracted by maceration, filtered, evaporated by
rotary evaporator and preparation of dusting powder. In these circular excision experimental models, focusing on measurement of wound contraction, hydroxyproline content.

Results: Ethanolic extract of *Rumex acetosa* Linn. leaves showed a significant wound healing effect in experimental animals. Treatment with the extract produced a dose-dependent increase in the rate of wound contraction and a marked reduction in the period of epithelialization when compared with the control group.

Conclusion: The study shows that (RALE) has wound-healing properties. The plant's medicinal significance was further supported by its significant anti-inflammatory, antibacterial properties. Therapeutic agent for wound care and quicker healing with less scarring.

Keywords: *Rumex acetosa*, Betadine.

PCL25

Comparative study on hematological and pulmonary effect of pyrethroid- based mosquito repellents in adult wistar rats.

Shubham Hanumant Dhavale, Smita Ashok Donagaon.

Introduction: Mosquito-repellent products such as coils, sticks, fast cards, and sprays are commonly used in homes to control mosquitoes. These products contain pyrethroid insecticides and regular inhalation of their fumes may affect health. The present study evaluates the effects of long-term exposure to pyrethroid-based mosquito repellents on lung tissue and blood parameters in adult Wistar rats.

Methods: The rats were divided into five groups: control, coil, sticks, fast card, and spray. Animals in the test groups were subjected to daily inhalation of mosquito-repellent fumes in a controlled environment. Blood samples were collected for analysis of white blood cells, red blood cells, hemoglobin, and platelets. After the exposure period, lung tissues were collected for weight measurement and microscopic examination.

Result: The results showed increased blood cell counts and hemoglobin levels in all exposed groups compared to the control group. A decrease in body weight and an increase in lung weight were also observed. Lung tissue examination revealed gradual damage, ranging from mild inflammation to severe tissue injury. The most severe effects were seen in the spray group, followed by fast card, sticks, and coil groups.

Conclusion: In conclusion, prolonged exposure to mosquito-repellent fumes causes noticeable lung damage and haematological changes in rats. These findings suggest that careful and limited use of pyrethroid-based mosquito repellents is important to reduce possible health risks.

PCL26

Pushpvari neosomal formulation: a promising strategy against PCOS.

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Background: Polycystic Ovary Syndrome (PCOS) is a common endocrine-metabolic disorder in women of reproductive age, characterized by hyperandrogenism, anovulation, and ovarian cysts. Current pharmacological treatments often exhibit side effects and limited long-term efficacy, prompting interest in herbal alternatives.

Method and Materials: Female Wistar rats were divided into six groups: Normal control, Disease control (letrozole-induced), Standard treatment (Clomiphene Citrate), and three treatment groups receiving 10 mg/kg and 20 mg/kg of Shatavari and Shatpushpa niosomal formulations. Niosomes were prepared using the thin-film hydration method. Vaginal smears were used to confirm estrous cycle disruption and recovery. Evaluations included body weight, hormonal assays (Estrogen, Testosterone), lipid profile, and ovarian histopathology.

Results and Discussion: Letrozole treatment induced irregular estrous cycles, increased body weight, elevated testosterone levels, and polycystic ovarian morphology. Treatment with niosomal co-therapy significantly restored hormonal balance, normalized estrous cycles, improved lipid parameters, and reversed ovarian morphological alterations. The 20 mg/kg dose showed more pronounced effects, comparable to Clomiphene Citrate. The niosomal delivery enhanced the bioavailability and sustained release of the herbal actives, leading to improved therapeutic response.

Conclusion: The combination of *Asparagus racemosus* and *Anethum sowa* in niosomal form demonstrated promising anti-PCOS effects in rats. This formulation offers a safe, natural alternative to conventional therapies and supports further clinical exploration.

Keywords: Polycystic Ovary Syndrome, Shatavari, Shatpushpa, Niosomes, Letrozole, Herbal therapy, Hormonal imbalance, Wistar rats.

PCL27

Network pharmacology-driven insights into Ehretiquinone and rutin for Alzheimer's disease.

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Alzheimer's disease is a complex neurodegenerative disorder marked by amyloid-β buildup, tau hyperphosphorylation, neuroinflammation, oxidative stress, and synaptic dysfunction. Due to their multifactorial nature, single-target treatments have not shown much clinical effectiveness, underlining the importance of multi-target approaches. This study used a network pharmacology approach for investigating the therapeutic potential and molecular mechanisms of two phytoconstituents, Rutin and Ehretiquinone, against Alzheimer's disease. Potential targets of Rutin and Ehretiquinone were identified using in silico target prediction techniques, and it was discovered that these targets intersected with genes associated with Alzheimer's disease. Protein-protein interaction analysis and pathway enrichment were used to identify important core targets, including as APP, GSK3B, EGFR, MAOA, and MMP3, which are strongly linked to amyloid processing, tau phosphorylation, neuroinflammation, and neuronal survival. KEGG pathway analysis revealed a significant rise in Alzheimer disease (hsa05010), PI3K-Akt, MAPK, JAK-STAT, TNF signaling, FoxO signaling, and glycine, serine, and threonine metabolic pathways. Network research shows that Ehretiquinone and Rutin interact with several targets along these pathways, suggesting a synergistic mechanism of action. In particular, GSK3B modulation suggests a potential role in reducing tau hyperphosphorylation, and its association with APP- related signaling suggests regulation of amyloid-β pathogenesis. Additionally, the regulation of inflammatory and survival pathways supports their neuroprotective effect.

Keywords: Hyperphosphorylation, In silico, Rutin, Ehretiquinone.

PCL28

Colorimetric diagnostic kit: Parkinson's disease detection.

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Aim: The present study was carried out to developed a diagnostic tool or technique for detection of homovanillic acid (HVA) in urine sample for early diagnosis of Parkinson's diseases via point of care diagnostic approach.

Background: Parkinson's disease (PD) is the second most common neurodegenerative disease after Alzheimer's disease and the fastest-growing neurodegenerative disorder in the world. By 2050 Parkinson's disease will have become a greater public health challenge for patients. The major issue with PD is that it takes several years of biological changes until the patient starts to experience physiological symptoms that could affect their daily lives. Several methods for Parkinson's disease detection (HPLC, LC-MS/MS, ELISA, sensor-based techniques) show high sensitivity but are limited by high cost, complexity, and low throughput. We developed a simple, non-invasive, cost-effective colorimetric method suitable for early diagnosis and large- scale screening.

Method: Chromophoric reactions for HVA were developed through reagent and solvent screening and applied in artificial biological fluids, rat urine, and human urine. The method was optimized and UV-validated per ICH guidelines (linearity, accuracy, LOD, LOQ, recovery), with assessments of reaction time, pH, and interference. Preclinical studies (PD models) evaluated detection limits alongside behavioral and histopathological confirmation. A pilot clinical study validated qualitative and quantitative detection of HVA in human urine.

Results: Optimized chromophoric reactions enabled rapid (1-min) UV detection of HVA with good linearity, sensitivity, and ICH validation. Preclinical disease models confirmed metabolite alterations, supported by behavioral and histopathology data.

Keywords: PD: Parkinson's disease, HVA: Homovanillic acid.

PCL29

Evaluating the effect of n-hexane extract of *Daucus carota* root on high cholesterol and high fat diet induced non-alcoholic fatty liver disease in experimental animals.

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Background: Non-alcoholic fatty liver disease (NAFLD) is a prevalent metabolic liver disorder associated with insulin resistance, dyslipidaemia, and oxidative stress. Due to the lack of approved pharmacological therapies, plant-derived agents with antioxidant and lipid- lowering properties are being increasingly explored.

Objective: This study aimed to evaluate the protective effect of the n-hexane extract of *Daucus carota* root (DCE) against high-cholesterol high-fat diet (HCHFD) induced NAFLD in experimental animals.

Materials and Methods: NAFLD was induced by feeding a high-cholesterol high-fat diet containing cholesterol, cholic acid, and corn oil for 30 days. Group I served as the normal control (saline), Group II served as the disease control (HCHFD), Group III served as the standard treated with (pioglitazone 3 mg/kg, p.o.), and Group IV, V and VI received the DCE at doses of 125, 250 and 500 mg/kg (p.o.) along with HCHFD for 30 days. Liver weight and hepatic fat content were recorded. Serum lipid parameters, liver function enzymes, inflammatory marker and hepatic oxidative stress biomarkers were evaluated. Histopathological changes were assessed.

Results: Treatment with *Daucus carota* n-hexane extract produced improvements, including reduced hepatic lipid content, normalization of serum lipid profile and liver enzymes, restoration of antioxidant defences, decreased oxidative stress markers, and preservation of hepatic architecture, which were disrupted with HCHFD. Histopathological findings confirmed reduced hepatic steatosis and improved liver architecture.

Conclusion: The DCE exhibits significant protective effects against diet-induced NAFLD, mediated through antioxidant, anti-inflammatory, and lipid-lowering mechanisms.

Keywords: NAFLD, *Daucus carota*, High-cholesterol High-fat diet, Protection, Oxidative stress, Lipid profile.

PCL30

"Polyherbal hair oil mitigates cyclophosphamide-induced hair loss in rats: enhanced IGF gene expression as a potential mechanism".

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Introduction: A common and upsetting side effect of cancer treatment is chemotherapy-induced alopecia (CIA), which frequently causes severe mental and psychological suffering. Hair loss may be lessened by using herbal extracts made from flowers, seeds, and oils.

Aim: To assess the efficacy of a polyherbal oil formulation consisting of seed and flower extracts, with the potential to support hair growth as well as lessen hair fall in mitigating CIA in Cyclophosphamide-induced hair loss.

Materials and Methods: Phytochemical analysis of the oil was conducted to identify flavonoids, tannins, saponins, alkaloids, and phenolics. Thirty-two rats were divided into four groups: A (Normal Control – saline), B (Disease Control – Cyclophosphamide), C (Standard – Minoxidil 10%+Cyclophosphamide), and D(Treatment – Polyherbal oil + Cyclophosphamide). Alopecia was induced in groups B, C, and D using Cyclophosphamide (150 mg/kg, IP). Treatments were administered to groups B, C, and D from Day 9 to Day 21. On Day 21, Hair regrowth, Histopathological analysis, and IGF-1 mRNA expression were evaluated.

Results: The polyherbal oil significantly boosted hair regrowth in comparison to the disease control group. Only slight follicle damage was revealed by histological analysis. IGF-1 gene expression was significantly higher in the treatment group than in the disease control group, indicating better follicular rejuvenation.

Discussion: The active phytochemicals and antioxidant properties of the polyherbal oil probably contributed to the faster anagen-phase transition, efficient inflammation reduction, and maintenance of epidermal integrity.

Conclusion: The polyherbal oil has promising potential for CIA management. Further research and clinical trials are required to confirm its therapeutic efficacy.

PCL31

Network pharmacology approach to elucidate the molecular mechanisms of quercetin and ferulic acid in rheumatoid arthritis.

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Analysis of network pharmacology discovered molecular targets and signalling pathways that are key in the therapeutic potential of quercetin and ferulic acid in management of rheumatoid arthritis (RA) disease. The analysis determined PTGS2, EGFR, MMP2, MMP9, ABCB1, ESR2, MET, PARP1, APP, and CA2 as central hub genes, which are crucial in the regulation of inflammation, modulation of immune response, and degradation of the connective tissue in relation to inflammatory pathogenesis of RA. The enrichment analysis of pathways has identified two potential pathways namely IL-17 signalling pathway and NF-KB signalling pathway as active, both of which are already known to regulate pro-inflammatory cytokine synthesis, expression of matrix metalloproteinase enzymes and the activation of immune cells, and thus contribute to synovial inflammation and joint destruction. The PubChem database was consulted in order to acquire chemical and structural data of quercetin and ferulic acid, whereas the prediction of their potential molecular targets was done through Swiss Target Prediction. Genes of rheumatoid arthritis were obtained as Gene Cards database and overlapping of targets between the phytoconstituents and disease-related genes were carried out with help of Venny

2.1. Protein Protein interaction (PPI) of the sharing targets was conducted by means of STRING database, and the interaction network was created and assessed with the help of Cytoscape to indicate hub genes of interest. Further enrichment pathway analysis helped to explain biological processes involved further. All in all, the results postulate that quercetin and ferulic acid may have potential anti-rheumatoid effects by multi-target and multi-pathway mechanisms due to their regulation of the IL-17 and NF-KB-mediated inflammatory processes. These findings have a powerful mechanistic foundation of the pharmaceutical development and sophisticated drug-vying utilization of these phytoconstituents in the management of rheumatoid arthritis.

Keywords: Network Pharmacology; Quercetin; Ferulic Acid; Rheumatoid Arthritis; IL-17 Signalling Pathway; NF-KB Signalling Pathway.

PCL32

Evaluation of anxiolytic activity of *Cocculus hirsutus* leaves in mice.

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Anxiety is linked to fear and manifests as a future-oriented mood state consisting of a complex cognitive, affective, physiological, and behavioral response system. Currently, wide range of anxiolytics are available. However, these drugs need several weeks of treatment to cause the remission of anxiolytics symptoms and are associated with multiple side effects including risk of dependence, weight gain, sexual dysfunction, mood swings, complex sleep behaviours, etc. with these limitations of the currently available anxiolytics, there is a growing interest in the investigation of alternative therapeutic approaches useful for the management of Anxiety. Several medicinal plants have been reported to alleviate anxiety often by modulating brain neurotransmitters like GABA and serotonin or through altering body's stress response. *Cocculus hirsutus* is a traditional medicinal plant rich in flavonoids & alkaloids. *C. hirsutus* has been reported to have neuroprotective activity which make it promising complementary treatment for the treatment of psychiatric disorders, mainly anxiety. In present study, anxiolytic activity of hydroalcoholic extract of *Cocculus hirsutus* leaves (CH 100 & 200 mg/kg, po) was evaluated using EPM test, Light and Dark method and Hole Board Method. Treatment with CH 100 & 200 mg/kg, po showed a significant and dose dependent increase in entries and time spent in open arm in EPM test, increase in time spent in light compartment in light & dark model and also increased the nose pocking duration in hole board test method. This suggested that CH 100
& 200 mg/kg, po, possess anxiolytic activity and hence can be used as a valuable plant supplement to treat anxiety disorders.

PCL33

Neuroprotective activity of isolated bioactive metabolites and their underlying mechanisms in the treatment of Alzheimer's disease.

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by memory loss, cognitive decline, oxidative stress, and cholinergic dysfunction. Current therapies provide only symptomatic relief, thereby necessitating the search for novel neuroprotective agents. Natural bioactive metabolites have emerged as promising candidates due to their multi-targeted pharmacological actions. The present study aimed to explore the neuroprotective potential of isolated bioactive metabolites and their underlying mechanisms using computational approaches.

A network pharmacology-based analysis was performed to predict the key targets and pathways associated with selected metabolites, highlighting their involvement in regulating oxidative stress, amyloid aggregation, and cholinergic signaling. Molecular docking studies further revealed strong binding affinities of these metabolites with Alzheimer's-related targets such as acetylcholinesterase, beta-secretase, and tau-related kinases, suggesting their role in modulating multiple pathological hallmarks of AD.

The study provides a mechanistic basis for the neuroprotective activity of bioactive metabolites and supports their potential as multi-target therapeutic leads. Future investigations will involve in vitro and in vivo validation to substantiate their efficacy and safety in the management of Alzheimer's disease.

Keywords: Alzheimer's disease, bioactive metabolites, neuroprotection, network pharmacology, molecular docking.

PCL34

Evaluation of anti-gout activity of ethanolic extract of *Adhatoda vasica nees* leaves in potassium oxonate-induced gout model in rats.

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Background: Gout is a metabolic inflammatory disorder caused by hyperuricemia and monosodium urate crystal deposition in joints. Reduced renal excretion of uric acid plays a key role in disease progression, highlighting the importance of uricosuric agents. *Adhatoda vasica Nees*, a well-known traditional medicinal plant, is rich in bioactive alkaloids such as vasicine, vasicinone, and deoxyvasicine. Among these, vasicine exhibits anti-inflammatory, antioxidant, and uricosuric-like properties, supporting the therapeutic potential of *A. vasica* leaves in gout management.

Objective: To evaluate the anti-gout and antihyperuricemic activity of the ethanolic extract of *Adhatoda Vasica Nees* leaves (AVEE) in potassium oxonate-induced gout in rats.

Materials & Methods: Gout was induced by intraperitoneal administration of potassium oxonate. AVEE was administered orally at doses of 200 and 400 mg/kg. Evaluation included serum and urine uric acid, creatinine levels, erythrocyte sedimentation rate (ESR), liver enzymes, pain perception parameters, radiological examination, and histopathological analysis of ankle joints.

Results: Based on the study, AVEE notably reduced serum uric acid, creatinine, ESR, and liver enzyme levels while increased urinary uric acid and creatinine excretion. Pain perception was improved markedly in AVEE treated groups. Radiological and histopathological findings showed reduced joint swelling, uric acid crystal deposition, synovial hyperplasia, and pannus formation.

Conclusion: AVEE exhibited significant antihyperuricemic, anti-inflammatory, and renoprotective effects, indicating its potential as a natural therapeutic agent for gout management.

Keywords: Gout; Hyperuricemia; *Adhatoda vasica Nees*; Potassium oxonate; Antihyperuricemic activity.

PCL35

Network pharmacology-based evaluation of therapeutic potential of *Cymbopogon citratus* leaves in PCOD.

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PCOD has become the most common multifactorial endocrine disorder characterized by hormonal imbalances, metabolic dysfunctions, menstrual irregularities, hyperandrogenism, insulin resistance, infertility, and emotional distress. The root cause of disease is not yet clearly defined. Current pharmaceutical treatments offer symptomatic relief but often pose limitations related to long-term safety and tolerability. In search of alternative multi-targeted therapies, several herbs showed promise in managing PCOD symptoms like hormonal imbalance, insulin resistance, and irregular cycles through anti-inflammatory, antioxidant, and hormone- regulating effects. These multitarget mechanism of herbs used in PCOD is in line with network pharmacology approach by targeting multiple pathways. *Cymbopogon citratus* also referred as Lemongrass (Family: Poaceae) is a perennial herb, enriched with diverse phytoconstituents. Literature has reported its use in Primary Dysmenorrhea, Abnormal Uterine Bleeding and menstruation. However, it is not yet explored for its usefulness in for PCOD. In present study, an *in-silico* network pharmacology approach was undertaken to exploit the potential mechanism of phytoconstituents of *C. citratus* in PCOD. The active phytoconstituents of *C. citratus* and their target, PCOD target were obtained from databases to identify PCOD related targets of *C. citratus.* The protein –protein interaction networks was constructed to identify top 10 hub proteins namely, AR, CYP19A1, SHBG, SRD5A1, AKR1C3, CYP19A1, SRD5A1, AKR1C1, AKR1C2 and AKR1C3. Further, KEGG pathway enrichment analysis highlighted steroid hormone biosynthesis and ovarian steroidogenesis as key pathways of target genes. This validates the therapeutic potential of *Cymbopogon citratus* in PCOD.

PCL36

Docking-based evaluation of herbal molecules for inflammation and metabolic dysregulation.

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Diabetes, obesity, and rheumatoid arthritis are complex metabolic and autoimmune disorders characterized by chronic inflammation and dysregulated metabolic signaling. Targeting multiple molecular pathways simultaneously is essential for effective disease management. In the present study, a molecular docking–based approach was employed to evaluate the therapeutic potential of bioactive compounds derived from selected medicinal plants against key molecular targets involved in inflammation and metabolic dysregulation, including INS, AKT1, TNF, IL-6, EGFR, GADPH, SRC, and BCL2.

Docking analysis revealed strong binding affinities of several herbal molecules with proteins regulating insulin signalling, lipid metabolism, inflammatory responses, immune activation, and cell survival. Compounds targeting AKT1 and INS demonstrated potential to modulate glucose homeostasis and lipid accumulation, while interactions with TNF and IL-6 suggested anti-inflammatory activity relevant to rheumatoid arthritis. Additionally, binding to EGFR, SRC, and BCL2 indicated possible roles in immune regulation and cytoprotection.

Among the evaluated medicinal plants, *Eucalyptus globulus*, *Moringa oleifera*, and *Salvia officinalis* exhibited prominent multi-target binding profiles, supporting their relevance in integrative management of metabolic and inflammatory disorders. Overall, this docking-based evaluation provides molecular-level evidence supporting the use of herbal molecules as multi- target therapeutic agents and highlights their potential in the development of novel interventions for diabetes, obesity, and rheumatoid arthritis.

Keywords: Molecular docking, Diabetes, Obesity, Rheumatoid arthritis, Inflammation, Herbal molecules, Multi-target therapy.

PCL37

Understanding the impact of multi-drug resistant tuberculosis on patients quality of life: a cross sectional study.

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Background: Multidrug-Resistant Tuberculosis (MDR-TB) poses a significant challenge to global health, not only due to its resistance to standard treatments due to its resistance to first- line anti-tuberculosis drugs but also its profound impact on patients' quality of life (QoL). The National Tuberculosis (TB) Prevalence Survey in India disclosed a remarkable 31.3% crude prevalence of Tuberculosis Infection (TBI) among individuals aged 15 and above, emphasizing the substantial scale of the challenge. This study aims to evaluate the impact of MDR TB on the QoL of affected patients, considering physical, psychological, and social dimensions.

Study Design: A cross-sectional study was conducted involving 70 patients diagnosed with MDR TB at Aundh Chest Hospital in Pune. Participants completed the Short Form Health Survey (SF-36) questionnaire, which assesses QoL across eight domains: Physical Functioning, Role Physical, Bodily Pain, General Health Perceptions, Vitality, Social Functioning, Role Emotional and Mental Health. Statistical data were analysed using Descriptive Statistics, Reliability Analysis, Correlation Analysis, Regression Analysis with Stata software (V.16.0) to determine the factors influencing QoL.

Results: A total of 70 MDR TB patients who previously participated in the endTB clinical trials were approached for this study. Of these, 55 (78.6%) participated, including 27 males (49.1%) and 28 females (50.9%), aged 16-54 years. Participants' educational backgrounds were diverse, ranging from no formal education to postgraduate studies. The SF-36 subscale scores showed good physical functioning (mean = 90.82, SD = 12.72, Cronbach's alpha = 0.82) and high social functioning (mean = 94.77, SD = 13.33, Cronbach's alpha = 0.34), but lower vitality (mean = 79.55, Cronbach's alpha = 0.37). Health-related quality of life (HRQoL) was impaired across all domains ($p < 0.01$), with an overall mean Mental Component Summary (MCS) score of 88.52% (SD = 16.6). Most patients (60%) had Physical Component Summary (PCS) scores above 90%, while 7.28% had PCS scores below 60, indicating ongoing physical health challenges for some.

Conclusion: MDR TB substantially impairs patient's quality of life, highlighting the need for comprehensive care approaches that address both medical and psychosocial aspects of the disease. Interventions aimed at reducing treatment duration, managing symptoms, and mitigating stigma is crucial for improving the overall well-being of MDR TB patients. **Keywords:** Multidrug-resistant tuberculosis, quality of life, SF-36, physical health, psychological well-being, social stigma, mental helath.

PCL38

Ameliorative effect of *Solanum xanthocarpum* against chemical induced diabetic nephropathy in rats.

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Diabetic nephropathy is a major microvascular complication of diabetes mellitus and the leading cause of end-stage renal disease, characterized by progressive renal dysfunction driven by persistent hyperglycaemia, oxidative stress, and metabolic disturbances. *Solanum xanthocarpum* has demonstrated antioxidant and antidiabetic activities; however, its renoprotective potential in diabetic nephropathy remains inadequately explored. In the present study, diabetes was induced in male Wistar rats using streptozotocin (55 mg/kg). Diabetic rats were treated with *Solanum xanthocarpum* leaf extract (SXLE; 100 and 200 mg/kg/day) for eight weeks. Body weight, blood glucose levels, kidney hypertrophy index, serum and urine biochemical parameters were evaluated. Renal oxidative stress markers and histopathological changes were also assessed. Streptozotocin-induced diabetic rats exhibited marked hyperglycaemia, renal hypertrophy, elevated serum creatinine and blood urea nitrogen, albuminuria, dyslipidaemia, increased oxidative stress, and severe renal histopathological damage. Treatment with SXLE significantly improved renal function, glycaemic control, antioxidant status, lipid peroxidation, and histological architecture in a dose-dependent manner, with the 200 mg/kg dose showing superior efficacy. These findings suggest that *Solanum xanthocarpum* leaf extract offers significant protection against diabetic nephropathy, likely through metabolic regulation and antioxidant mechanisms, and may serve as a promising adjunct therapeutic agent.

PCL39

Investigating the cardioprotective and antidiabetic effects of ethyl ferulate in STZ-induced diabetic rats with isoproterenol-induced myocardial infarction.

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Background: Diabetes mellitus significantly heightens the risk of myocardial infarction (MI), with both conditions driven by oxidative stress, inflammation, and metabolic dysfunction. Current therapeutic options often fall short in addressing these interconnected pathologies.

Objective: The present study investigates the dual antidiabetic and cardioprotective effects of Ethyl Ferulate (EF) in a rat model of STZ-induced diabetes compounded by isoproterenol (ISO)-induced MI.

Methods: Adult male Wistar rats were grouped and treated with EF (25 and 50 mg/kg) or metformin after diabetes induction via streptozotocin and MI induction via isoproterenol. Biochemical, ECG, and histological evaluations were conducted, including assessments of oxidative stress markers, inflammatory cytokines, cardiac injury biomarkers, and histopathology of heart and pancreas tissues.

Results: EF significantly ameliorated hyperglycemia, improved body weight and food intake patterns, reduced ST-segment elevation in ECG, and restored antioxidant enzymes (GSH, Catalase) while lowering MDA levels. EF also reduced pro-inflammatory cytokines (TNF-α, IL-6, NF-KB), cardiac biomarkers (CK-MB, CRP), and preserved tissue architecture in both heart and pancreas. The 50 mg/kg dose of EF demonstrated efficacy comparable to metformin.

Conclusion: Ethyl Ferulate shows promising dual-function effects in mitigating diabetic and cardiac complications through antioxidant, anti-inflammatory, and metabolic regulatory pathways. These findings support further clinical exploration of EF as a natural therapeutic candidate for diabetes-associated myocardial infarction.

Keywords: Ethyl Ferulate; Myocardial Infarction; Diabetes Mellitus; Streptozotocin; Isoproterenol; Antioxidant; Anti-inflammatory; NF-KB; TNF-α; Oxidative Stress; Wistar Rats; Met formin; Histopathology.

PCL40

Identification of natural COX-2 inhibitor for depression through network pharmacology approach.

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Depression is a multifactorial neuropsychiatric disorder in which neuroinflammation plays a key pathogenic role. Cyclooxygenase-2 (COX-2), an inducible inflammatory enzyme, has been validated as an important therapeutic target in depression, as evidenced by the antidepressant efficacy of the selective COX-2 inhibitor celecoxib. However, the antidepressant potential of natural COX-2 inhibitors remains largely unexplored. In the present study, fifteen natural compounds reported to possess selective COX-2 inhibitory activity were initially selected. Molecular docking was subsequently performed against the COX-2 enzyme to evaluate their binding affinity and interaction profiles, resulting in the identification of five compounds— chrysin, alantolactone, tanshinone I, tryptanthrin, and gigantol—with favorable docking scores. The predicted target genes of these five compounds were then compared with known depression-associated targets to identify common genes. Protein–protein interaction analysis using the STRING database, revealed the involvement of multiple depression-related pathways, including neuroinflammatory signaling, neurotransmitter regulation, neurotrophin signaling, and stress-response pathways. The integrated docking, target comparison, and pathway enrichment results suggest that these natural COX-2 inhibitors may exert antidepressant effects through multi-protein and multi-pathway modulation. Overall, this study provides a systematic in silico framework supporting the potential of natural COX-2 inhibitors as promising and underexplored candidates for the treatment of depression, warranting further experimental and clinical validation.

PCL41

Pharmacological evaluation of nephroprotective activity of methanolic extract of Momordica dioica fruits in doxorubicin-induced nephrotoxicity in wistar rats.

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Background: Chemotherapeutic drug administration causes systemic toxicity, also known as nephrotoxicity or nephrotic syndrome, which impacts multiple organs, including the kidneys. Drug-induced acute kidney injury (DI-AKI) recognized as a prevalent adverse drug reaction has been on the rise during treatment.

Objectives: The study aimed to evaluate the kidney-protective effects of methanolic extracts of Momordica dioica fruit.

Methods: Methanol was used to extract the air-dried fruit of Momordica dioica in accordance with OECD Guideline 423, and the methanolic extract underwent an acute oral toxicity test. The active constituents responsible for the biological activity were identified using HPTLC analysis. Animals were randomly assigned to nine groups: normal control, disease control, Vitamin E (250 mg/kg, orally), methanolic extract of Momordica dioica (MeEMD) at 100, 200, and 400 mg/kg (orally), and combination groups receiving Vitamin E with MeEMD (std+100, std+200, and std+400 mg/kg). Nephrotoxicity was induced using a single intraperitoneal dose of Doxorubicin (15 mg/kg). Seven days after Doxorubicin administration, animals were treated with MeEMD dissolved by 0.1% CMC. Blood urea and serum creatinine levels were measured as indicators of kidney function. Additionally, antioxidant activity, free radical scavenging potential, and levels of malondialdehyde (MDA) in kidney tissues were evaluated. Histopathological examination of the kidneys was also conducted.

Results: Treatment with MeEMD significantly reversed these changes, indicating renal protection. Moreover, Doxorubicin reduced GSH levels and increased MDA, indicating oxidative stress, while treatment groups exhibited noticeable recovery in antioxidant status and tissue integrity.

Conclusions: The results indicate that the methanolic extract of Momordica dioica fruits exhibits significant nephroprotective and therapeutic potential, with no observed toxicity. Its effects are likely attributed to strong antioxidant and anti-inflammatory properties, suggesting its potential as an effective treatment option for acute kidney injury induced by nephrotoxins such as Doxorubicin.

Keywords: Drug-induced acute kidney injury (DI-AKI), Doxorubicin, Wistar rats, MeEMD.

PCL42

In-vitro pharmacological profiling of selected *Eranthemum* species emphasizing antioxidant and anti-inflammatory activities.

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This study systematically compared the *in vitro* antioxidant and anti-inflammatory activities of hydroalcoholoc extracts from three *Eranthemum* species: *E. purpurascens* (HA EP), *E. roseum* (HA ER), and *E. pulchellum* (HA EN). Antioxidant potential was evaluated through DPPH radical scavenging, nitric oxide (NO) inhibition, reducing power and hydrogen peroxide (H_2O_2) scavenging assays. Anti-inflammatory activity was evaluated via inhibition of protein denaturation, membrane stabilization and proteinase inhibitory action. HA EP demonstrated superior antioxidant activity with the lowest IC_{50} values across all assays (DPPH: 65.36 µg/mL; H_2O_2: 126.48 µg/mL). In anti-inflammatory tests, HA EP also showed the strongest inhibition of protein denaturation (IC_{50}: 166.02 µg/mL) and membrane stabilization (IC_{50}: 172.97
µg/mL). HA ER and HA EN exhibited moderate to weak activities. These findings position *E. purpurascens* as the most promising species for therapeutic applications requiring combined antioxidant and anti-inflammatory effects.

PCL43

Network pharmacology analysis of curcumin and gallic acid in spasticity.

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Spasticity is a neurological disorder characterized by increased muscle tone and exaggerated reflexes, usually resulting from central nervous system injury and persistent neuroinflammation. Due to its multifactorial pathophysiology, multi-target therapeutic strategies are required. In this study, a network pharmacology approach was employed to explore the molecular mechanisms of curcumin and gallic acid in spasticity management. Targets of both phytoconstituents were collected from public databases and intersected with spasticity-associated genes. Protein–protein interaction networks, Gene Ontology biological process enrichment, and KEGG pathway analyses were conducted to identify key genes and signaling pathways. Biological process analysis highlighted significant involvement in inflammatory response, regulation of neuronal excitability, oxidative stress response, and apoptosis. KEGG enrichment indicated that the AGE–RAGE signaling pathway plays a central role in neuroinflammation and neuronal dysfunction. Hub genes identified included carbonic anhydrase family members (CA2, CA5A, CA6, CA7, and CA14), which regulate neuronal pH and synaptic function, and SERPINE1, associated with inflammation and tissue remodeling. Dysregulation of these genes may lead to increased motor neuron excitability and muscle stiffness. Curcumin and gallic acid showed multi-target interactions with these genes, suggesting synergistic neuroprotective and anti-inflammatory effects. Overall, this study provides a mechanistic rationale for the potential role of curcumin and gallic acid in spasticity and supports further experimental validation.

Keywords: Curcumin, Gallic Acid, Spasticity, Network Pharmacology, AGE–RAGE Signaling, Neuroinflammation, Carbonic Anhydrase, Multi-target Therapy.

PCL44

Decoding polyherbal formulations for neuroprotection in diabetes-associated cognitive impairment through network pharmacology.

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Cognitive impairment is becoming a common complication and risk factor of diabetes mellitus caused by constant insulin resistance, oxidative stress, neuroinflammation and synaptic dysfunction. These disease mechanisms have a great overlap with molecular mechanisms of neurodegeneration in the type of an Alzheimer disease. The current research was conducted to examine the neuroprotective effect and potential of polyherbal formulation through a network pharmacology system to explain the multi-target effects. Bioactive phytoconstituents of *Syzygium cumini* (seed), *Bacopa monnieri* (leaf), *Barleria cristata* (leaf), and *Calacanthus grandiflorus* (leaf) were obtained in the publicly accessible phytochemical databases. Selection of compounds was done according to drug-likeness and oral bioavailability. Potential molecular targets were predicted and overlapped with genes in diabetes related cognitive impairment and neurodegenerative disorders. Protein-protein interaction analysis and pathway enrichment studies were conducted and a network of compound-target-pathway was created with Cytoscape software.

Network analysis determined important hub targets of AKT1, TNF, IL6, STAT3, GSK3B, and APP and indicated that insulin signaling, inflammatory response, oxidative stress, and synaptic plasticity were modulated. Pathway enrichment analysis showed that there was strong activity in AGE-RAGE signaling, PI3K-Akt pathway, neuroactive ligand-receptor interaction and Alzheimer disease-related pathways. These results demonstrate that there is a synergistic effect of several phytoconstituents that affect interdependent molecular networks. The present research offers a mechanistic explanation of the therapeutic value of the polyherbal formulation against cognitive impairment related to diabetes, as well as, justifies additional experimental research in the form of preclinical trials.

Keywords: Diabetes, Cognitive impairment, Polyherbal Formulation, Network pharmacology.

PCL45

Prevention of bleaching toxicity from sanitary napkin/ pad: management of skin disease.

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Women constitute half of world population. Indian women have high mortality rates, particularly during childhood and in their reproductive years. Maternal mortality and morbidity are two health concerns that may be related to high levels of fertility. We are highlighting the points towards poor health concern and providing alternative strategy for the same. Woman's period or menstrual cycle is very sensitive topic in India. On the growth of make in India, mission growth of sanitary pads/napkins minimizes the prices. Few techno commercial ads and movies propagated awareness regarding sanitary pads to underprivileged population. In India 23 million girls, drop their schools every year when they start menstruating. The commercially available sanitary pad/napkin are not safe to use, during processing, it contains hazardous chemicals. The intermittent bleaching process produces Dioxin and is available along with the wood pulp. According to WHO, 70% of females suffer from UTI related infection caused by chemicals and usually transported through sanitary pad /napkin. In this research, direct contact between skin surface and sanitary napkin/pad can be minimized by fabricating thin polymeric layer on the surfaces. The fabricated polymeric layer did not alter the performance of sanitary napkins but avoided absorption of cancer-causing chemicals at the interface of the skin. Polymeric films contain some active ingredients which show therapeutic activity against microbes, UTI, Congenital Abnormalities and dysmenorrhea. In this study we evaluate characteristic property, physical parameter and biocompatibility of film.

Keywords: Menstrual hygiene, Polymeric film, Biocompatibility.

PCL46

Evaluation of immunomodulatory and antiarthritic activity of *Capparis zeylanica* fruit extract by using fca-induced arthritis in experimental animals.

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Objectives: To test the immunomodulatory and anti-arthritic activity of ethanolic extract of *Capparis zeylanica* fruit (EECZ) in animal models.

Materials and Methods: EECZ was prepared using ethanol extraction and analysed for phytochemical constituents. The immunomodulatory activity was assessed using sheep red blood suspension in rats, with Methotrexate (1 mg/kg) as the reference drug. The anti-arthritic effects were evaluated using animals with arthritis induced by FCA. Parameters assessed included paw edema, motor coordination, nociceptive threshold, and, post-sacrifice, biochemical- C-reactive protein (CRP), rheumatoid factor (RF), alkaline phosphatase (ALP), aspartate aminotransferase (AST), alanine aminotransferase (ALT), hematological- Hemoglobin (Hb), Red Blood Cells (RBC), White Blood Cells (WBC), Erythrocyte Sedimentation Rate (ESR), radiographic, histological, and cytokine-Tumor Necrosis Factor alpha (TNF-α), Interleukin 1 (IL-1), Interleukin-6(IL-6) indicators.

Results:

EECZ (200 mg/kg) significantly reduced paw oedema, and in Hemagglutination (HA) Antibody titre, Agglutination in the number of wells decreased with EECZ. The results of the HA titre indicate that EECZ exhibits a good immunosuppressive property. In both models, the results were comparable to those of Methotrexate. The extract notably reduced inflammatory cytokines and biochemical markers, improved haematological parameters, and preserved joint architecture, as confirmed by histopathological examination.

Conclusion:

The ethanolic extract of Capparis zeylanica fruit exhibited notable immunomodulatory and anti-arthritic properties, providing scientific validation for its traditional therapeutic applications. These results point to its potential as a natural treatment for arthritic and immunomodulatory conditions.

Keywords: *Capparis zeylanica*, Antiarthritic activity, Immunomodulatory effects.

PCL47

"Biancaea decapetala: from folk healer to molecular target – unveiling anti-inflammatory potential and safety".

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Introduction: Biancaea decapetala (BD) is a traditional medicinal plant known for its antimicrobial, anti-inflammatory, antiviral, and antioxidant properties. Despite its widespread ethnomedicinal use, its pharmacological potential remains inadequately explored. This study aimed to evaluate BD seeds through an integrated approach involving molecular docking, in vivo anti-inflammatory screening, antimicrobial assays, and acute and subacute toxicity assessments to determine efficacy and systemic safety, particularly for applications in developing nations.

Material and methods: BD seed constituents were subjected to ADMET analysis and molecular docking against inflammatory mediators TNF-α, IL-1β, and IL-6. Anti-inflammatory activity was assessed in Wistar rats using carrageenan-induced paw edema and croton oil–induced ear edema models. Safety evaluation followed OECD 423 and OECD 407 guidelines, including hematological analysis, serum biochemistry, organ weight assessment, and histopathology.

Results: ADMET analysis identified Caesaldekarin A and Phanginin Q as promising compounds with favorable pharmacokinetic profiles. Docking studies showed strong interactions of Caesaldecapes A and Caesaldekarin A with TNF-α, IL-1β, and IL-6. BD seed powder significantly reduced inflammation in a dose-dependent manner, with 400 mg/kg showing effects comparable to indomethacin. Antibacterial activity was observed against *Streptobacillus moniliformis* and *Spirillum minus*. Acute toxicity studies indicated an LD_{50} above 2000 mg/kg, and subacute exposure caused no significant toxicological changes.

Conclusion: BD seeds exhibit potent anti-inflammatory and antimicrobial activities with a wide safety margin, supporting their traditional use and therapeutic potential in managing inflammatory and infectious disorders.

PCL48

Phenolic acids in colonic inflammation: an integrated network pharmacology and targeted drug delivery perspective.

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One of the major pathological characteristics of inflammatory bowel diseases (IBD) is colonic inflammation which includes immune maladjustment, over-production of pro-inflammatory cytokine, oxidative stress, and defect of the intestinal epithelial barrier which leads to long- standing mucosal damage. In spite of regular administration of aminosalicylates, corticosteroids, immunomodulators, and biologics, the long-term usefulness of these therapeutic interventions is frequently curtailed by the adverse effects on the system and lack of site-specificity. Phenolic acids as a category of naturally occurring polyphenolic compounds have thus been a subject of research which may in turn be used in treating diseases but this has been inhibited by their low levels of gastro intestinal stability, oral bioavailability and lack of specificity distribution. To determine the mechanistic nature of their activity, the network pharmacology analysis was conducted to reveal the possible multi-target and multi-pathway interactions which can be associated with colonic inflammation. The interaction networks between the compound and its target and between the proteins revealed a few of these, which are related to inflammation and immune processes, viz., EGFR, PTGS2, STAT3, TLR4, MMP9, ERBB2, and GSK3B. The analysis of KEGG pathways showed that it was significantly associated with inflammatory and immune-regulatory pathways including IL-17, HIF-1 and PI3K Akt signalling, involved in cytokine signalling, oxidative stress, immune activation, and epithelial barrier dysfunction. These results indicate an assumption that phenolic acids can have therapeutic outcomes when modulating several inflammatory pathways in a coordinated manner. Moreover, colon-targeted drug delivery systems can also be used to amplify their therapeutics in that they have the ability to release drugs locally and reduce their breakdown in the proximal gastrointestinal tract.

Keywords-: Phenolic acids; Colonic inflammation; Network pharmacology; IL-17 signaling pathway; Targeted drug delivery; Inflammatory bowel disease.

PCL49

Network pharmacology-based study of the protective mechanism of alpha pinene on asthma.

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Asthma is a chronic inflammatory disease of respiratory tract and one of the major global concern due to its huge health care burden. Phytoconstituents are one of the promising approach towards the development the newer remedies for chronic diseases. Alpha pinene, a monoterpene claimed in the literature to be used for inflammatory disorders like asthma. Hence the present study is planned to evaluate potential of alpha pinene for anti – asthmatic activity using network pharmacology studies. Swiss Target Prediction database was used to obtain alpha pinene related targets whereas asthma related gen targets were obtained from Gene Card database. Venny 2.0 database was used to identify common targets. From this we identified total 81 common targets, which were further screen using cytoscape SSS databases to sorted out the top genes. Total 37 top targets identified such as MAPK3, ESR1, HMGCR, CYP19A1, PGR, MAPK1, PPARG, MAPK14, NR3C1, PPARA, etc. Further, these 37 genes were uploaded in shiny go database and string database. From this we found that total 160 pathways targeted by the alpha pinene for asthma. For our study, we selected total 10 pathways, which may be targeted by alpha pinene, those pathways are, Arachidonic acid metabolism, Camp signaling pathway, inflammatory mediator pathway, Efferocytosis, Th17 cell differentiation, T cell receptor signaling pathway. Th1 and Th2 cell differentiation, IL-17 signaling pathway, Inflammatory mediator reg. of TRP channels, TNF signaling pathway, AMPK signaling pathway, MAPK signaling pathway. Drug – Target – pathways relationship has been established by using cytoscape database.

PCL50

Sinapic acid improves neuropathic outcomes in diabetic rats: behavioral, biochemical, and molecular insights.

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Diabetic neuropathy (DN), a debilitating complication of diabetes, is mediated by hyperglycemia-induced oxidative stress, inflammation, and neural dysfunction. While amitriptyline (AMT) is a standard treatment for diabetic neuropathy, its long-term use is associated with tolerability and safety concerns, whereas methylcobalamin (MeCbl) is generally well tolerated but often requires prolonged or repeated dosing to sustain neurotrophic benefits. Sinapic acid (SA), a natural phenolic compound, has shown promise in metabolic and neurological disorders. This study evaluated the therapeutic efficacy of SA alone and in combination with AMT and MeCbl in a high-fat diet (HFD) and streptozotocin (STZ)-induced rat model of diabetic neuropathy. Rats received HFD followed by STZ to induce type 2 diabetes and were treated with SA, AMT, MeCbl, or their subtherapeutic combination for six weeks. Behavioral assessments (thermal and cold sensitivity, grip strength), oxidative stress markers (MDA, SOD, catalase, GSH), proinflammatory cytokines (IL-6, TNF-α), metabolic parameters (glucose, lipids, insulin), and histological changes in pancreatic and sciatic nerves were evaluated. SA significantly alleviated neuropathic pain, improved motor function, reduced hyperglycemia, and restored antioxidant defenses. It also attenuated inflammation and protected against tissue degeneration. The combination of SA, AMT, and MeCbl at reduced doses showed additive effects in mitigating neuropathic and metabolic alterations. SA ameliorates DN via modulation of oxidative and inflammatory pathways and supports nerve protection and glycemic control. Molecular docking demonstrated strong SA binding to PPARγ (−7.20 kcal/mol), suggesting metabolic regulation, and moderate affinity for TRPV1 (−5.17 kcal/mol), implicating antinociceptive action.

PCL51

Network pharmacology, molecular docking and molecular dynamics simulation studies to predict the molecular targets of khellin in Alzheimer's disease.

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Background: Khellin (Khe) is a furanochromone found in the fruit of *Ammi visnaga* and has been used in folk medicine as a vasodilator, antispasmodic drug with cardioactive, anti- asthmatic effects and as a neuroprotective effect. Although Khe has such important biological activities, its molecular mechanisms in the action as a neuroprotective have not been entirely clarified yet. In present study *in silico* techniques used to understand the molecular mechanisms of Khe action as a neuroprotection and determine its therapeutic potential in Alzheimer's disease (AD).

Methods: The physicochemical properties, drug-likeness, and absorption, distribution, metabolism, excretion, and toxicity (ADMET) properties of Khe were studied to evaluate its pharmacokinetic property. The targets associated with AD in the network pharmacology approach were predicted by SwissTargetPredicton, STRING (version 12.0), and GeneCards. Functional gene enrichment studies such as Gene Ontology analysis and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analysis were carried out by ShinyGO (version 0.85.1) to analyze the biological processes, molecular functions, and related cell components and pathways. The molecular docking experiment was carried out by AutoDock Version 2.1 on the major AD targets. The molecular dynamic (MD) simulation study (100 ns; Desmond with the 2023-4 system) was then applied to characterize the complex-formation nature and interaction time between the proteins and the Khe molecules.

Results: Khe possessed bioavailability, drug-likeness, and ADMET characteristics. The targets retrieved by network pharmacology analysis were heat shock protein 90 alpha family class A member 1 (HSP90AA1), nuclear factor kappa-light-chain-enhancer of activated B cells inhibitor alpha (NFKBIA) and mechanistic target of rapamycin (mTOR). These targets are key nodes with high drug betweenness, symbolizing the crucial role played by these targets within the pathological mechanism associated with AD. The results from the docking analysis depicted a stronger binding affinity of Khe to these targets compared to donepezil, with binding energy values of -8.5 kcal/mol (HSP90AA1), -7.5 kcal/mol (NFKBIA), and -7.2 kcal/mol (mTOR). The MD simulation analysis demonstrated that the Khe-HSP90AA1 complex showed more stability compared to the Khe-NFKBIA and Khe-mTOR complexes, defining the potential role played by Khe within the regulation of tau hyperphosphorylation, protein aggregation, and amyloid-beta-induced neuroinflammation.

Conclusion: The integrative *in silico* analysis of this study reveals that Khe has promising neuroprotective actions through the modulation of principal targets related to AD.

Keywords: Khellin; Alzheimer's disease; Network Pharmacology; Molecular Docking; Molecular dynamic simulation.

PCL52

Evaluation of in-silico and in-vitro anti-cancer approach of Moringa oleifera in colon cancer.

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Background: Although chemotherapy and radiotherapy have improved outcomes in colon cancer, their clinical utility is often limited by drug resistance, systemic toxicity, and tumor recurrence, highlighting the need for safer, multitargeted therapies derived from natural sources.

Objective: The present study aimed to evaluate the anticancer potential of Moringa oleifera using integrated in silico and in vitro approaches against human colon cancer.

Methods: In silico network pharmacology, protein–protein interaction analysis, Gene Ontology and KEGG enrichment, and molecular docking were performed to identify cancer- related targets of *Moringa oleifera* bioactive. In vitro anticancer effects were evaluated in HCT- 116 colon cancer cells using MTT assay and flow cytometry to assess cytotoxicity, apoptosis, ROS generation, and DNA fragmentation.

Results: Network analysis identified key targets, including ESR1, GSK3B, PTGS2, MMP9, and PARP1, with significant enrichment of the PI3K-Akt signalling pathway. Molecular docking demonstrated strong ligand–protein interactions, with a docking score of 8. In vitro studies revealed moderate cytotoxic activity. Flow cytometric analysis showed a significant induction of apoptosis (65.26%), increased oxidative stress, and measurable DNA damage (26.13%) in treated cells compared with untreated controls.

Conclusion: *Moringa oleifera* demonstrates significant multitargeted anticancer activity against colon cancer, supporting its potential as a promising natural therapeutic candidate.

Keywords: Moringa oleifera; Colon cancer; PI3K-Akt signalling pathway; Molecular docking; Flow cytometry; Cytotoxicity.

PCL53

Evaluation of protective effect of *Nyctanthes arbor-tristis* leaves on diet induced non-alcoholic fatty liver disease in wistar rats.

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Background: Non-alcoholic fatty liver disease (NAFLD) is a common metabolic liver disorder associated with obesity, insulin resistance, dyslipidemia, and type 2 diabetes mellitus, and may progress to steatohepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma. Lack of approved pharmacotherapy necessitates exploration of safer alternatives.

Objective: The present study aimed to evaluate the protective effect of ethanolic extract of *Nyctanthes arbor-tristis* leaves (NAT) against diet-induced NAFLD in Wistar rats.

Materials and Methods: NAFLD was induced using a high-cholesterol high-fat diet (HCHFD) which was fed once daily for 30 days. Group I was maintained as control group, while Group II was maintained as the control group (saline). Group III was given standard drug (pioglitazone 3 mg/kg, p.o.). Treatment groups III, IV, V were administered NAT at doses of 50, 100 and 200 mg/kg respectively through oral gavage for 30 days along with HCHFD. Metabolic, biochemical, oxidative stress, inflammatory, and histopathological parameters were evaluated to assess protective effects.

Results: Oral administration of NAT for 4 weeks substantially improved HCHFD induced NAFLD in Wistar rats. NAT reduced body and liver weight, corrected dyslipidemia, and significantly lowered serum ALT, AST and ALP levels. Treatment also decreased TNF-α levels and enhanced antioxidant enzymes. Histopathology showed reduced hepatic steatosis and improved liver architecture, confirming the hepatoprotective potential of *Nyctanthes arbor-tristis*.

Conclusion: *Nyctanthes arbor-tristis* leaves showed substantial hepatoprotective effects against diet-induced NAFLD, by showing antioxidant, anti-inflammatory and lipid-lowering actions.

Keywords: NAFLD, *Nyctanthes arbor-tristis*, Hepatoprotection, HCHFD, Oxidative stress.

PCL54

In-silico study on the repurposing of amiloride for inflammatory acne papules and pustules.

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Inflammatory acne vulgaris, clinically manifested by papules and pustules, is a multifactorial dermatological disorder involving dysregulated inflammatory pathways, immune responses, sebaceous gland activity, and epidermal barrier dysfunction. Conventional therapies such as antibiotics and retinoids are associated with adverse effects, antibiotic resistance, and limited long-term efficacy, highlighting the need for safer and mechanism-based therapeutic alternatives. Amiloride, a well-known epithelial sodium channel (ENaC) blocker, has recently gained attention for its anti-inflammatory and immunomodulatory properties, suggesting its potential for drug repurposing in inflammatory acne.

In this study, an in silico drug repurposing strategy was employed using network pharmacology and molecular docking approaches to elucidate the mechanistic role of amiloride in acne pathogenesis. Network pharmacology was utilized to identify common molecular targets between amiloride and inflammatory acne, construct drug–target–pathway interaction networks, and uncovered key signaling pathways involved in inflammation, immune regulation, and skin homeostasis. This systems-level approach helps to understand the multi- target and multi-pathway actions of amiloride rather than a single-target effect.

Molecular docking was further performed to validate the binding affinity and interaction stability of amiloride with core protein targets identified from the network analysis, thereby confirming the plausibility of direct molecular interactions. The expected outcomes of this study include identification of key therapeutic targets, confirmation of strong ligand–protein interactions, and mechanistic insights supporting ENaC inhibition as a novel anti-inflammatory strategy for acne management. Overall, this integrated computational approach provides a strong theoretical basis for repositioning amiloride as a potential therapeutic agent for inflammatory acne.

PCL55

Therapeutic effect of Macrotyloma uniflorum verdc seeds extract in letrozole induced polycystic ovary syndrome rats.

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Background- Polycystic Ovary Syndrome (PCOS) is a common hormonal and metabolic disorder in reproductive-age women, frequently associated with insulin resistance and metabolic abnormalities. Around 50–70% of women with PCOS show insulin resistance, leading to hyperglycemia, dyslipidemia, obesity, and hormonal imbalance. *Macrotyloma uniflorum* seeds possess antidiabetic, anti-inflammatory, antioxidant, and anti-obesity activities, mainly due to bioactive compounds such as flavonoids (quercetin, kaempferol), phenolic acids, phytosterols, fatty acids, and essential minerals.

Objective- To evaluate therapeutic effect of *Macrotyloma uniflorum* verdc seeds extract (MUSE) in letrozole induced polycystic ovary syndrome rats.

Materials and Methods- Dried *M. uniflorum* seeds were extracted by maceration. PCOS was induced in rats with letrozole (1 mg/kg) and confirmed by metabolic and histological parameters. Standard treatment received clomiphene (1 mg/kg), while test groups received MUSE (200–400 mg/kg, 4 weeks) with phytochemical analysis.

Result- *M. uniflorum* seed extract maintained a regular estrous cycle, significantly increased estrogen, and reduced testosterone, body weight, blood sugar, and total cholesterol levels in PCOS.

Conclusion- *M. uniflorum* seed extract effectively ameliorated PCOS in rats, likely due to flavonoids (quercetin, kaempferol), phenolic acids, and phytosterols, which exhibit antioxidant, anti-inflammatory, antihyperlipidemic, and antidiabetic properties.

Keywords- *M. uniflorum*, quercetin, gallic acid, PCOS, Anti-inflammatory, Antioxidant, Antihyperlipidemic, Antidiabetic, FSH, LH.

PCL56

Computational and experimental evaluation of phyto-constituents for the development of an anti-asthmatic formulation.

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Asthma, a chronic inflammatory airway disease and the 11th leading cause of death in India, poses a growing health burden with increasing prevalence among young and adult populations. Current therapies provide only symptomatic relief and are often associated with side effects, underscoring the urgent need for novel therapeutic strategies. This study integrates computational and experimental approaches to explore phytochemical-based alternatives for asthma management. A systematic literature survey was conducted to identify bioactive phytoconstituents, which were subsequently analyzed through network pharmacology to map their interactions with asthma-related molecular targets and signaling pathways. The network analysis revealed critical hubs and multi-target interactions suggestive of therapeutic relevance. To further validate these findings, molecular docking studies were performed, confirming strong binding affinities and stable interactions of selected phytochemicals with key asthma- associated targets, thereby reinforcing their potential efficacy. Based on these results, the most promising phytoconstituents were formulated into a novel preparation and subjected to preclinical evaluation using experimental animal models. The formulation will be demonstrated for anti-asthmatic activity, supporting the predictive accuracy of the computational analysis. This integrative strategy not only provided a comprehensive understanding of asthma pathophysiology but also identified promising phytoconstituents with multi-target actions, advancing the concept of phytochemical-based therapeutic development. The findings establish a robust foundation for future in vitro and in vivo investigations to optimize formulation, assess safety, and validate efficacy, ultimately contributing toward the development of a novel, effective, and safer treatment option for asthma.

Keywords: Chronic Airway Inflammation, Bioactive Compounds, Target Identification, computational Pharmacology, Preclinical Evaluation.

PCL57

"Decoding multi-target neuroprotection of a selected phytoconstituent in Alzheimer's disease through network pharmacology and rat model validation".

Harsh Prasanna Pukale, Dr. Aniket Garud, Dr. Niraj Vyawahare.

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, cholinergic dysfunction, oxidative stress, neuroinflammation, and neuronal loss. Current therapeutic agents provide only symptomatic relief and are associated with limited efficacy and adverse effects, highlighting the need for safer and multi-targeted alternatives. Phytoconstituents have emerged as promising neuroprotective candidates due to their pleiotropic mechanisms of action. The present study aims to decode the multi-target neuroprotective potential of a selected phytoconstituent in Alzheimer's disease using an integrated network pharmacology approach followed by experimental validation in rat models.

Network pharmacology analysis was performed by identifying phytoconstituent-related targets using public databases, followed by Alzheimer's disease-associated target mining. Protein– protein interaction networks, Gene Ontology, and KEGG pathway enrichment analyses were employed to elucidate key molecular pathways involved in neuroprotection. The in silico findings suggested modulation of multiple AD-relevant targets, including acetylcholinesterase, antioxidant defense enzymes, inflammatory mediators, and apoptosis-related proteins.

Based on network predictions, preclinical validation was carried out in aluminum chloride and scopolamine-induced Alzheimer's rat models. Behavioral assessments were conducted using standard cognitive tests, followed by biochemical estimation of oxidative stress markers and cholinergic parameters. Histopathological evaluation of brain tissue further supported the neuroprotective effects.

The integrated network pharmacology and experimental approach demonstrates that the selected phytoconstituent exerts multi-target neuroprotection in AD, supporting its potential as a disease-modifying therapeutic candidate. This study highlights the value of combining computational predictions with in vivo validation for the rational development of plant-based interventions in Alzheimer's disease.

Keywords: Alzheimer's disease; Phytoconstituent; Network pharmacology; Neuroprotection; Rat model; Oxidative stress; Acetylcholinesterase; Cognitive dysfunction.

PCL58

"Multi-target therapeutic potential of coumarin derivatives in Alzheimer's disease: a network pharmacology".

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by memory loss, cognitive impairment, and behavioural abnormalities. The disease is primarily associated with the accumulation of amyloid-β (Aβ) plaques, tau protein hyperphosphorylation, oxidative stress, neuroinflammation, and dysfunction of the cholinergic system. These pathological events lead to neuronal death, synaptic loss, and a gradual decline in cognitive function. Currently available therapies provide only symptomatic relief and fail to halt disease progression, highlighting the urgent need for novel therapeutic agents targeting multiple pathogenic pathways.

Coumarin derivatives are a class of naturally occurring and synthetic benzopyrone compounds known for their diverse pharmacological properties, including antioxidant, anti-inflammatory, enzyme-modulating, and neuroprotective effects. Several coumarin-based molecules such as esculetin, scopoletin, umbelliferone, daphnetin, and synthetic 4-hydroxycoumarin analogs have demonstrated promising activity against AD-related targets. These compounds have been reported to inhibit acetylcholinesterase and butyrylcholinesterase, reduce Aβ aggregation, attenuate oxidative stress, and suppress neuroinflammatory mediators in experimental models. Due to their multi-target potential, favorable structural diversity, and ability to cross the blood– brain barrier, coumarin derivatives represent attractive lead candidates for the development of disease-modifying therapies for Alzheimer's disease.

Keywords: Alzheimer's disease, Coumarin derivatives, Amyloid-β aggregation, Acetylcholinesterase inhibition, Oxidative stress, Cholinergic dysfunction, Cognitive impairment, Multi-target-directed ligands (MTDLs), Network Pharmacology.

PCL60

Anticataleptic effect of *Curcuma amada* ethanolic extract in laboratory animals.

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Background: Catalepsy is a major extrapyramidal side effect associated with drugs that alter dopaminergic transmission or increase histamine release in the brain. Traditional medicinal plants with antihistaminic and dopaminergic properties may offer safer therapeutic alternatives. *Curcuma amada* (mango ginger) is reported to possess mast cell-stabilising and neuropharmacological activities.

Objective: The present study aimed to evaluate the anticataleptic activity of the ethanolic extract of *Curcuma amada* rhizomes in experimental animal models.

Methods: Anticataleptic activity was assessed in Wistar albino rats using clonidine-induced and haloperidol-induced catalepsy models. The ethanolic extract of *Curcuma amada* (200 mg/kg, i.p.) was administered, and its effects were compared with standard drugs pheniramine maleate and levodopa. Catalepsy duration was measured using the bar test at various time intervals. Phytochemical screening and estimation of total phenolic and flavonoid content were also performed.

Results: The ethanolic extract significantly reduced the duration of catalepsy induced by both clonidine and haloperidol ($p < 0.001$). The effects were comparable to standard treatments, indicating involvement of antihistaminic and dopaminergic mechanisms. Phytochemical analysis revealed the presence of flavonoids, phenolics, alkaloids, and terpenoids, which may contribute to the observed activity.

Conclusion: The findings demonstrate that *Curcuma amada* ethanolic extract possesses significant anticataleptic activity, supporting its traditional use and suggesting potential therapeutic benefits in managing extrapyramidal side effects.

Keywords: Curcuma amada, Catalepsy, Antihistaminic activity, Dopaminergic activity, Haloperidol, Clonidine, Rat model.

PCL63

Systems-level insight into Diosmin as a neuroprotective agent in Alzheimer's disease: a network pharmacology, molecular docking approach.

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Background: Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by cognitive decline, cholinergic dysfunction, oxidative stress, and neuroinflammation, for which current therapies offer only modest symptomatic relief. Flavonoid diosmin, identified as a phytoconstituent in *Bryophyllum pinnatum*, has recently shown promising multi-target neuroprotective potential in AD models.

Methods: An integrated network pharmacology and molecular docking approach. Putative targets of diosmin were retrieved from public chemogenomic databases and intersected with AD-related genes to construct a compound-target-pathway network. Protein-protein interaction analysis and functional enrichment (GO, KEGG) were performed to identify hub genes and key signaling pathways implicated in AD pathogenesis. Molecular docking was carried out against major AD-relevant targets, including acetylcholinesterase (AChE), monoamine oxidase-B (MAO-B), and other hub proteins.

Results: Network analysis revealed that diosmin is associated with targets involved in cholinergic transmission, amyloid processing, oxidative stress, and apoptosis, converging on MAPK and PI3K-Akt signaling pathways that are central to AD pathology. Docking studies showed that diosmin exhibits high binding affinity toward AChE and MAO-B, with docking scores comparable to or better than reference ligands.

Conclusion: This systems-level *in silico* investigation highlights Diosmin as a promising multitarget neuroprotective candidate for AD and provides a robust mechanistic basis for subsequent experimental and translational validation.

PCL64

"Network Pharmacology-Based Investigation of Aegle marmelos Reveals Potential Therapeutic Targets in Schizophrenia."

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Schizophrenia is a complex neuropsychiatric disorder involving multiple molecular targets and signaling pathways. Traditional medicinal plants offer a promising source of multi-target therapeutic agents. Aegle marmelos, a medicinal plant widely used in traditional medicine, was investigated in this study for its potential anti-schizophrenic activity using a network pharmacology approach. Phytochemicals of Aegle marmelos were collected from public databases and screened for drug-likeness. Potential targets of these phytochemicals were predicted and intersected with schizophrenia-associated genes obtained from disease databases. Network construction and analysis were performed to identify key targets and pathways. KEGG pathway enrichment analysis revealed significant involvement of neurotransmission- and signal transduction–related pathways. Notably, dopamine receptor D2 (DRD2), serotonin receptor 2A (HTR2A), AKT serine/threonine kinase 1 (AKT1), and catechol-O-methyltransferase (COMT) were identified as common targets between Aegle marmelos phytochemicals and schizophrenia-related genes. These targets are well-established contributors to the pathophysiology of schizophrenia, particularly in dopamine and serotonin signaling, synaptic plasticity, and neurodevelopment. Disease–gene association analysis further confirmed the relevance of these targets to schizophrenia, supporting the therapeutic potential of Aegle marmelos. Overall, this study provides a systems-level insight into the multi-target mechanisms of Aegle marmelos and suggests its potential as a complementary therapeutic candidate for schizophrenia. Further experimental and clinical validation is warranted.

Keywords: Aegle marmelos, Anti-schizophrenic activity, Network pharmacology

PCL65

"Redefining Candy: Where Taste Meets Health"

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Background: Sugar candies are widely consumed across all age groups; however, excessive intake of added sugars is strongly associated with weight gain, obesity, and related metabolic disorders. In modern fast-paced lifestyles, particularly in households with working parents, promoting healthy eating habits among children remains challenging.

Objective: The objective of this study was to develop a functional candy that maintains sweetness and consumer acceptability while supporting weight management, metabolic health, and reduced sugar intake.

Materials and Methods: A novel candy was formulated using cow colostrum as the functional ingredient and sucralose as a non-caloric sweetener. Sucralose, a chlorinated derivative of sucrose, is approximately 600 times sweeter than table sugar and is not metabolized for energy, resulting in minimal effects on blood glucose and insulin levels.

Results: The developed candy showed a significant reduction in added sugar while maintaining desirable taste and texture. The inclusion of cow colostrum enhanced the nutritional value by providing immune-supportive benefits, making the product suitable for children, adults, elderly, and diabetic individuals. The availability of multiple flavors improved palatability and regular consumption.

Conclusion: The formulated candy represents a unique obesity-friendly and diabetic-friendly alternative to conventional sugar-based confectionery. Its innovative composition supports metabolic and immune health while preserving consumer appeal, highlighting its potential as a healthier snack option.

Keywords: Obesity management, Low-calorie sweetener, Cow colostrum.

PCL66

"Network Pharmacology Insights into the Neurochemical Basis of Alcohol Withdrawal Syndrome"

Akshada V. Bhoyarekar, Dr. Smeeta Sadar, Dr. Niraj Vyawahare

A clinically significant neuropsychiatric condition called Alcohol Withdrawal Syndrome (AWS) arises when long-term consumption of alcohol suddenly ceases or is reduced. It is frequently observed in medical institutions and presents with symptoms ranging from minor autonomic problems to serious complications like delirium tremens and convulsions. AWS has a complex pathophysiology that involves molecular and neurochemical alterations in the central nervous system.

The γ-aminobutyric acid (GABA)ergic and glutamatergic neurotransmitter systems are the major areas where chronic alcohol consumption causes adaptive disruptions. Long-term alcohol intake lowers excitatory glutamatergic activity while increasing inhibitory GABAergic transmission. These neuroadaptations cause increased glutamatergic signaling and decreased GABA-mediated inhibition following withdrawal, triggering neuronal hyperexcitability and withdrawal symptoms. AWS is also linked to oxidative stress, ion channel dysregulation, neuroinflammation, and disrupted intracellular signaling pathways, which further increase disease severity.

Network pharmacology offers a systems-level method for integrating protein–protein interaction networks, pathway enrichment analysis, and disease-associated genes to address the intricacy of these interrelated pathways. This approach emphasizes important regulatory nodes in AWS, including GABA receptor subunits, glutamate receptors, inflammatory mediators, and signaling pathways such as PI3K–Akt and neuroactive ligand–receptor interactions.

In summary, network pharmacology enhances understanding of the molecular networks underlying alcohol withdrawal syndrome and promotes identification of novel multi-target therapeutic strategies.

Keywords: Alcohol Withdrawal Syndrome, GABAergic Dysfunction, Network Pharmacology, Neurotransmitter Imbalance, Therapeutic Targets

PCG01

Formulation and Evaluation of Herbal extract for sunscreen

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Herbal drug-infused sunscreen cream proves to be highly efficient and possesses minimal harm, making it increasingly valuable for various drug delivery systems. The present study includes the extracts of *Sauropus androgynus* as active ingredient. Sunscreen cream formulations [F1 to F6] were prepared. *Sauropus androgynus* is commonly known as Chakramuni and called as multi-vitamin plant. Multivitamins nourish the skin from within by providing essential nutrients that support various functions like cell regeneration, collagen production, protection against environmental damage and also has anti-aging properties. Formulations were greenish yellow to pale green, homogeneous, and suitable pH for skin. Increased extract concentrations, reduced spread ability but increased viscosity. FTIR study ensured compatibility. HPLC analysis showed drug content of 91.76% to 98.24%. *In vitro* drug release varied with concentration. F5 formulation had effective antibacterial action. SPF values ranged from 8.86 to 14.35. Stability studies confirmed F5 as the most stable.

Keywords: *Sauropus androgynus*, Sunscreen, Herbal sunscreen, sunscreen cream, SPF.

PCG-02

Formulation and evaluation of polyherbal face serum: a natural alternative for skincare management

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Cassia fistula Linn. (Aragwadha), from the Leguminosae family, known as Indian Laburnum, is rich in tannins, flavonoids, glycosides, and phenolic compounds exhibits antioxidant, anti- inflammatory, antimicrobial, and skin-protective effects. This study focused on developing and evaluating a novel polyherbal face serum using Aragwadha fruit pulp extract, Manjistha extract, Aloe vera gel, salicylic acid, glycerine, and preservatives for anti-acne, anti-aging, and skin hydration benefits. Extracts were prepared via decoction for Aragwadha at 80°C for 3 hours and maceration for Manjistha in 80% methanol for 48 hours, followed by formulation through homogenization on a magnetic stirrer. Optimised batches (F1 and F2) were prepared. The prepared(F2) serum underwent physicochemical evaluation namely pH 5.4-5.6, good spreadability 5-7 cm, non-irritant), stability testing at freeze (6°C), room (25-27°C), and incubator (40°C) temperatures showing no phase separation even after 1 month. Microbial assay against Candida albicians, Escherichia coli, and Staphylococcus aureus were carried out to demonstrate broad spectrum activity. Results indicate the serum's lightweight consistency, rapid absorption, and efficacy in improving skin texture, reducing hyperpigmentation, acne, and oxidative damage while maintaining stability. This phytocosmeceutical bridges Ayurvedic traditions with modern formulations, offering a natural alternative for daily skincare without adverse effects.

Keywords: Phytocosmeceuticals, Face serum, Antiacne, Antiaging, Antioxidant

PCG03

Polyherbal Formulation for Depression: Standardization and Preclinical Study

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Depression is a major global health challenge, prompting interest in plant-based therapies that offer safer and holistic alternatives to conventional antidepressants. In this study, a polyherbal formulation was developed using medicinal plants traditionally recognized for mood- enhancing, antioxidant, anti-inflammatory, and neuroprotective properties. Phytoconstituent profiling identified compounds involved in neurotransmitter regulation and stress-related biochemical pathways. Standardization included organoleptic evaluation, physicochemical analysis, and qualitative phytochemical screening, confirming the presence of bioactive markers and establishing quality control specifications. Preclinical evaluation was conducted in laboratory animals using the Chronic Unpredictable Mild Stress (CUMS) model to induce depression. The formulation was administered orally, with alpha-pinene (from rosemary) as a key constituent. Behavioral assessments demonstrated significant improvements in parameters associated with depressive-like states, while biochemical analyses indicated modulation of stress pathways. The antidepressant-like activity appears to result from the synergistic interaction of multiple phytoconstituents acting across diverse neurobiological targets. The formulation exhibited a wide safety margin and produced measurable improvements in both behavioral and biochemical markers of depression. These findings highlight the therapeutic relevance of standardized herbal formulations and underscore the importance of phytoconstituent profiling for ensuring efficacy, safety, and reliability in managing depressive disorders within traditional and modern healthcare systems.

Key words

Depression, Chronic Unpredictable Mild Stress (CUMS), Polyherbal formulation, α-Pinene Rosemary, Phytoconstituents, Antidepressant activity, Neuroprotective effects, Oxidative stress, Anti-inflammatory activity, Behavioral assessment, Biochemical marker, Standardization, Quality control, Oral administration.

PCG-04

"Bioactivity Guided Extraction, And Evaluation Of *Pterocarpus santalinus* Linn. for Antiulcer Activity"

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Peptic ulcer disease may be caused by several factors such as stress and prolonged use of non-steroidal anti-inflammatory drugs, although in many cases its exact etiology remains unclear. It is generally accepted that ulcer formation results from an imbalance between aggressive factors and the endogenous defense mechanisms that maintain gastric mucosal integrity. Owing to the limitations of conventional therapies, increasing attention has been directed toward plant- derived compounds as potential anti-ulcer agents. In the present study, the heartwood of *Pterocarpus santalinus* Linn. was procured from the local market, dried, powdered, and then extracted with ethanol using a Soxhlet apparatus, yielding a blackish-brown residue with a percentage yield of 3% w/w. Preliminary phytochemical analysis revealed the presence of glycosides, flavonoids, alkaloids, tannins, and phenolic compounds. Thin layer chromatography was employed for preliminary separation, followed by solvent-based fractionation of the extract. Among the fractions obtained, the ethanol–water fraction exhibited significant in vitro anti-ulcer activity and was therefore selected for further study. Active constituents were isolated using preparative TLC and characterized by FTIR, H-NMR, and GC-MS spectral analysis, which confirmed the isolated compound to be a stilbene derivative. The results suggest that the isolated stilbene moiety possesses promising anti-ulcer activity and may serve as a potential herbal alternative for the treatment of gastric ulcers.

Keywords: *Pterocarpus santalinus*, anti-ulcer, TLC, NMR, GC-MS

PCG-06

"Phytochemical profiling of corosolic acid from *Costus igneus*: A natural antidiabetic agent explored through HPTLC, molecular docking &*in vitro* studies"

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Costus igneus, commonly known as the insulin plant, is widely recognized in traditional medicine for its antidiabetic potential. This study involved the qualitative and quantitative evaluation of two *Costus igneus* leaf powder samples—Sample 1 from Maharashtra and Sample 2 from Tamil Nadu—focusing on corosolic acid, a bioactive pentacyclic triterpenoid known for its antidiabetic, antioxidant, anticancer, and antimicrobial activities. Soxhlet extraction using ethanol was employed, and the presence of corosolic acid was confirmed through ultraviolet spectroscopy, Fourier-transform infrared spectroscopy, and high- performance thin-layer chromatography analysis. The optimized method used a mobile phase of toluene: ethyl acetate: 0.1% formic acid (7:3), and derivatization with anisaldehyde-sulfuric acid yielded an R_f value of 0.56 at 512 nm. The method was validated per ICH Q2 (R1) guidelines for linearity (r^2 = 0.995), precision (%RSD < 2%), accuracy (98.5–115% recovery), LOD (5.74), and LOQ (17.4). Quantitative analysis by vanillin-sulfuric acid assay showed higher triterpenoid content in Sample 1 (205 mg/5 mL) than in Sample 2 (75.16 mg/5 mL). *In silico* docking revealed strong interactions between corosolic acid and Glucose Transporter type4, suggesting enhanced glucose uptake. Enzyme inhibition assays showed significant alpha-amylase and alpha-glucosidase inhibition, supporting the antidiabetic potential of *Costus igneus* as a natural source of corosolic acid.

PCG-07

Golden healing: harnessing the power of piperine and curcumin in hydrogel patches for wound healing

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Wound healing remains a significant clinical challenge, necessitating innovative approaches for improved outcomes. This study explores the potential of a hydrogel patch incorporating curcumin and piperine, natural compounds renowned for their anti-inflammatory and wound healing properties, respectively. The hydrogel patch offers a promising platform for controlled release of these bioactive agents, optimizing their therapeutic effects. Curcumin, a polyphenol derived from turmeric, exhibits antioxidant, anti-inflammatory, and antimicrobial properties, crucial for wound healing. Piperine, an alkaloid found in black pepper, enhances curcumin's bioavailability and possesses its own wound healing properties. By encapsulating these compounds within a hydrogel matrix, sustained release kinetics are achieved, ensuring prolonged exposure to the wound site. This facilitates a synergistic effect, augmenting tissue regeneration, angiogenesis, and collagen synthesis. Moreover, the hydrogel patch provides a protective barrier against external pathogens, minimizing the risk of infection. Preclinical studies demonstrate accelerated wound closure, reduced inflammation, and improved tensile strength with the curcumin and piperine hydrogel patch compared to conventional dressings. Thus, this innovative approach holds immense potential for advancing wound care therapies, offering a safe, cost-effective, and efficacious strategy for promoting wound healing.

Keywords:
Wound healing, Hydrogel patch, Curcumin, Piperine, Anti-inflammatory.

PCG-08

Evaluation of prophylactic effect of Herbal Formulation (Lung Detox) against Cigarette smoke induced Lung Toxicities

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Background: Chronic Obstructive Pulmonary Disease (COPD) is a major respiratory disorder characterized by persistent limitation of expiratory airflow, mainly resulting from chronic bronchitis and emphysema. According to the World Health Organization, COPD is projected to become the third leading cause of mortality worldwide by 2030. *Lung Detox* tablets contain multiple bioactive herbal constituents, including *Trachyspermum ammi*, *Glycyrrhiza glabra*, *Adhatoda vasaca*, *Ocimum sanctum*, *Piper longum*, and *Zingiber officinale*, which are traditionally recognized for their lung-protective and anti-inflammatory properties. The present study was designed to evaluate the prophylactic effect of a herbal formulation (Lung Detox) against cigarette smoke–induced lung toxicity in Wistar rats. **Materials and Methods:** Wistar rats were acclimatized for 7 days (day 0-7) prior to experimentation. Lung toxicity was induced by exposing animals to cigarette smoke for 21 consecutive days, with two cigarettes administered per cage daily. The herbal formulation was given orally 2 hours before smoke exposure. Evaluation parameters included general parameters such as weekly body weight and food and water intake; immunological parameters including total white blood cell (WBC) count, T cells, and lymphocyte count; and inflammatory markers such as interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α), and interleukin-1β (IL-1β). **Results:** The in vivo study demonstrated that Lung Detox at a dose of 800 mg/kg significantly reduced inflammatory markers (TNF-α, IL-6, and IL-1β) and improved immunological parameters, including T cells, WBC count, and lymphocyte levels, in cigarette smoke–exposed Wistar rats. **Conclusion:** Oral administration of Lung Detox showed pronounced anti-inflammatory and immunomodulatory effects, leading to reduced lung inflammation and associated complications. Based on estimation techniques, the 800 mg/kg dose produced maximum drug concentration in lung homogenates and exhibited superior therapeutic efficacy.

Keywords: Lung Detox, Cigarette Smoke Exposure, Immunological Parameters.

PCG-09

Phytochemical Isolation, characterization and Anti-Inflammatory Assessment of Bioactive Flavonoids from *Clitoria ternatea* Flower Extract

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Clitoria ternatea Linn. (Fabaceae), commonly known as butterfly pea, is a medicinal plant traditionally used for the treatment of inflammation, pain, and various inflammatory disorders. The flowers of *Clitoria ternatea* are rich in flavonoids, among which clitorin (kaempferol-3- O-rutinoside) is a major bioactive glycoside. However, systematic isolation and evaluation of clitorin for anti-inflammatory activity remain limited. The present study aims to isolate clitorin from the flower extract of *Clitoria ternatea* , characterize it using modern analytical techniques, and evaluate its anti-inflammatory potential.

Fresh flowers of *Clitoria ternatea* will be shade-dried, powdered, and extracted using hydro-alcoholic solvent by Soxhlet or maceration method. Preliminary phytochemical screening will confirm the presence of flavonoids. The extract will be subjected to fractionation followed by isolation of clitorin using chromatographic techniques such as column chromatography and preparative TLC. The isolated compound will be characterized by UV-Visible spectroscopy, FTIR, NMR, and mass spectrometry to confirm its chemical structure.

The expected outcome of this study is the successful isolation of pharmacologically active

flavonoid(s) exhibiting significant anti-inflammatory activity with improved specificity compared to crude extracts. The findings may provide scientific validation for the traditional use of *Clitoria ternatea* flowers and contribute to the identification of natural lead compounds for the development of safer anti-inflammatory agents

PCG-10

Development and Evaluation of a Polyherbal Face Serum with Antioxidant and Moisturizing Properties

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The increasing demand for natural and herbal cosmetic products has encouraged the development of polyherbal formulations with improved safety and efficacy. The present study was undertaken to formulate and evaluate a polyherbal face serum using selected herbal ingredients including *Butea monosperma Lam*, *Aloe vera*, flaxseed oil, and olive oil, which are known for their antioxidant, anti-inflammatory, moisturizing, and skin-protective properties. The methanolic extract of *Butea monosperma* flowers was prepared using the Soxhlet extraction method to ensure efficient recovery of bioactive constituents. The face serum was prepared using suitable excipients to obtain a lightweight, non-greasy, and easily spreadable formulation with good aesthetic appeal.

The formulated polyherbal serum was evaluated for physicochemical parameters such as
appearance, pH, viscosity, spreadability, homogeneity, and stability under different storage conditions. The evaluation results demonstrated that the serum possessed acceptable pH compatible with skin application, uniform consistency, good spreadability, and stability without phase separation or physical instability. No signs of skin irritation or sensitivity were observed during safety evaluation.

The synergistic action of the incorporated herbal extracts and natural oils contributed to
enhanced skin hydration, nourishment, and protection against oxidative stress. The findings suggest that the developed polyherbal face serum is a safe, stable, and effective herbal cosmetic formulation with potential application in routine skincare. This study supports the use of polyherbal combinations as a promising approach for the development of natural cosmetic products.

PCG-11

Nutritional Profiling of Wood Apple: Ascorbic Acid Estimation by HPTLC

1. Madhura Ramdas kadam 2. Pradnya Anil Gore (co-author)

Wood apple (*Limonia acidissima* L.) is a nutritionally and medicinally important fruit. This study aimed to determine the ascorbic acid content in wood apple fruit pulp using a validated high-performance thin-layer chromatographic (HPTLC) method. Ethanolic extract of dried fruit pulp was prepared by maceration and analyzed on silica gel 60 F_{254} plates using toluene: ethyl acetate : methanol : formic acid (3:3:2:1 v/v) as the mobile phase. Ascorbic acid was identified with a characteristic Rf value of approximately 0.57–0.59, showing good specificity. UV–Visible spectrophotometric analysis showed a λmax at 264 nm, confirming the presence of ascorbic acid. FTIR analysis supported the presence of hydroxyl and C–O functional groups. Preliminary phytochemical screening was carried out to identify the presence of bioactive constituents in the given sample. Standard qualitative tests confirmed the presence of ascorbic acid, flavonoids, amino acids, alkaloids, steroids, reducing sugars. These phytochemicals indicate the potential nutritional and therapeutic value of the sample.The developed method is simple, reliable, and suitable for routine nutritional and quality control analysis of wood apple formulations.

Keywords: Wood apple (*Limonia acidissima L.*), HPTLC, UV–Visible spectrophotometry, FTIR analysis, Nutritional value, Routine analysis.

PCG-12

Phytochemical screening and HPTLC fingerprinting analysis of *Uraria picta* and *Nardostachys jatamansi* (d. Don) dc.

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The present study was undertaken to perform qualitative phytochemical screening and to develop High-Performance Thin-Layer Chromatography (HPTLC) fingerprint profiles of *Uraria picta* and *Nardostachys jatamansi*, two important medicinal plants widely used in traditional systems of medicine. The objective was to establish characteristic phytochemical markers that may be useful for authentication and quality control. Authenticated plant materials of *Uraria picta* (whole plant) and *Nardostachys jatamansi* (rhizomes) were shade-dried, powdered, and extracted using suitable solvents. Preliminary phytochemical screening of the extracts was carried out using standard qualitative tests to detect major secondary metabolites. Phytochemical screening revealed the presence of multiple bioactive constituents in both plants. *Uraria picta* showed a rich presence of flavonoids, phenolics, saponins, and tannins, while *Nardostachys jatamansi* exhibited terpenoids, flavonoids, tannins, phenolic compounds, and essential oil constituents. HPTLC analysis produced distinct and reproducible fingerprint profiles for each plant, with multiple well-resolved bands at characteristic Rf values, confirming their chemical diversity and uniqueness. The study confirms that *Uraria picta* and *Nardostachys jatamansi* possess diverse phytochemical constituents that support their traditional medicinal applications. The HPTLC fingerprints provide reliable and reproducible chemical profiles that can serve as reference standards for identification, authentication, and quality control of these medicinal plants and their herbal formulations and translational studies bridging traditional knowledge with evidence-based applications.

Keywords: Phytochemical screening, HPTLC fingerprinting, Secondary metabolites, Herbal authentication, Quality control, Medicinal plants.

PCG-13

Formulation Of Plant-Based Functional Gummies Incorporating *Feronia Limonia* For Lifestyle Disorder Prevention

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Lifestyle disorders, such as diabetes mellitus, are increasing globally due to sedentary lifestyles and unhealthy dietary habits, creating a growing demand for safe, natural, and patient-friendly nutraceutical formulations. *Feronia limonia* (wood apple) is a traditionally used medicinal fruit that is rich in bioactive phytoconstituents with antioxidant and metabolic regulatory properties. The present study aimed to formulate and evaluate gummies prepared from *Feronia limonia* fruit pulp and to conduct preliminary phytochemical screening.

Fresh fruit pulp was processed and incorporated into a gummy formulation using suitable pharmaceutical excipients. The formulated gummies were evaluated for physicochemical parameters, including appearance, texture, pH, and stability, to assess formulation quality and acceptability. Preliminary phytochemical screening of the fruit pulp extract was performed using standard qualitative tests. The results indicated the presence of flavonoids, phenolic compounds, tannins, alkaloids, carbohydrates, and glycosides, which are known to play a significant role in reducing oxidative stress and managing lifestyle-related disorders.

The developed gummies exhibited satisfactory physicochemical properties and good stability, indicating their suitability as a nutraceutical dosage form. This study highlights the potential of *Feronia limonia* fruit pulp–based gummies as a natural, convenient supplement for the management of lifestyle disorders. However, further pharmacological and clinical studies are required to confirm their therapeutic efficacy.

PCG-14

Phytochemical Screening, HPTLC Fingerprint Analysis and Antibacterial Activity of Diethyl Ether Extract of *Ambrosia artemisiifolia L.* Leaves.

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Department of Pharmacology

Ambrosia artemisiifolia L. Commonly known as Nivali belongs to family Asteraceae. *Ambrosia artemisiifolia L.* is a plant of Indian origin having tremendous therapeutic potential but is not fully utilized. The present study, primarily aims to carry out a preliminary phytochemical screening so as to detect the major class of compounds present in *Ambrosia artemisiifolia L.* leaves and to perform thin layer chromatography (TLC) profiling of all sequential extracts. Phytochemical analysis was performed by various qualitative methods and TLC profiling was carried out using diethyl ether extracts. The solvent system of varying polarity ethyl acetate: n-hexane (1:1) and ethyl acetate: chloroform (1:1) respectively. Qualitative phytochemical analysis reflects the presence of alkaloids, glycosides, saponins, phenolic compounds, tannins and terpenoids in the plant extract. TLC profiling of the *Ambrosia artemisiifolia L.*was constituted different colored phytochemical compounds with different Rf values. The present study provides evidence that solvent extract of *Ambrosia artemisiifolia L.* contains medicinally important bioactive compounds and this justifies the use of plant species as traditional medicine for treatment of various diseases. The present study was aimed to determine the antibacterial efficacy of *Ambrosia artemisiifolia L.* leaf extracts against secondary bacterial pathogens such as *Escherichia coli* and *Staphylococcus aureus* and to investigate the presence of phytocompounds through High Performance Thin Layer Chromatographic (HPTLC) method of the potential extract. The varying degree of extract concentrations has a greater influence in the inhibitory effect against test pathogens. The different Rf values, maximum percentage concentration, area percentage of polyvalent chemical constituents was recorded in HPTLC profiling of Diethyl ether leaf extract, where the maximum percentage concentration was found to be 14.07% at 0.09 Rf. The HPTLC studies has confirmed that the compounds present in the diethyl ether extract might be responsible for the inhibitory effect against the bacterial pathogens and are more soluble in semi-polar solvent. Therefore, the present investigation forms the basis as preliminary study of antibacterial efficacy of *Ambrosia artemisiifolia L.* leaf extracts and phytocompound HPTLC profiling of potential extract, which could be used for quality evaluation of compound and standardization of drug in future work.

Keywords: *Ambrosia Artemisiifolia L.*, Phytochemical Analysis, Thin Layer Chromatography, Diethyl Ether Extract, Ethyl Acetate, N-Hexane, Chloroform, High Performance Thin Layer Chromatography, Antibacterial Activity.

PCG-15

Development and evaluation of spill-proof syrup.

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Liquid syrups are normally used to treat cough, throat irritation, and reflux symptoms but conventional formulations have severe limitations such as easy spillage, lack of consistency regarding dosing and lack of patient compliance especially in paediatric, geriatric, and bedridden patients. To overcome these shortcomings, this research was dedicated to the formulation of a spill-proof, rheological optimized syrup of two natural therapeutic compounds, Rosmarinic Acid and Glycyrrhizin which were based on their anti-inflammatory, antioxidant, bronchodilatory and mucoprotective properties.

Aqueous extraction, rotary evaporation, and lyophilization were successful in extracting the Glycyrrhizin out of Glycyrrhiza glabra. Stability optimization trials revealed that 10% mannitol was able to aid granules formation that enhanced incorporation into the syrup matrix. The two (Rosmarinic Acid and Glycyrrhizin) were authenticated using UV analysis, FT-IR spectroscopy, solubility profiling, and determination of the melting point. The active constituents were correctly quantified by developing a sensitive and selective HPLC method. The focus in formulation development was on developing a gel-at-rest liquid-on-shear behavior with hydrocolloids, including xanthan gum, HPMC and HPC. This pseudoplastic flow gave good resistance to spillage and easy pouring and swallowing. PH, sweetener concentration, and viscosity adjustments provided adequate palatability and patient acceptability. The optimized formulation was also found to have uniformity, stability, and desirable rheological properties as measured through Brookfield viscometry.

The spill-free syrup enhanced the accuracy of dosage, reduced wastage, and increased mucosal retention, which is a safe and patient-friendly choice to manage coughs and reflux better.

Keywords: Spill-proof syrup; Rosmarinic Acid; Glycyrrhizin; Mucoprotective formulation; HPLC analysis; Stability optimization.

PCG-16

Phytochemical Profiling and Antioxidant Capacity of Unifloral Brassica juncea Bee Pollen from India

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This study was designed to study phytochemical profiling and antioxidant capacity of unifloral brassica juncia bee pollen from India. In terms of proteins, lipids, carbs, and energy content, the nutritional value of Unifloral Indian Mustard Bee Pollen (UIMBP) was investigated. The entire polyphenol and flavonoid content of its chemical composition were ascertained. The *in vitro* antioxidant effect of UIMBP was evaluated using the DPPH radical-scavenging activity.

UIMBP was found to be comprised of proteins ((167.9±0.624) g/kg), fats ((50±0.60) g/kg) & carbohydrates ((722.4±0.72) g/kg), which result in its high energy value ((16784.9±1.527) kJ/kg). UIMBP was found to contain polyphenols ((1892±0.1623) mg gallic acid equ./kg) & flavonoids ((355.68±0.15) mg quercetin equ./kg). The LC-MS analysis revealed the presence of gallic acid ((3.749 mg/kg) & quercetin (0.245 mg/kg) in UIMBP, which can be used as markers for determining the quality of bee pollen. The UIMBP extract showed DPPH free radical-scavenging activity with a half maximal inhibitory concentration of 51.81 µg/ml.

The UIMBP is a possible nutraceutical agent as it was discovered to be a rich source of nutrients with a high caloric value. The study also demonstrated UIMBP's significant antioxidant content, particularly in the main polyphenols and flavonoids, which raises the possibility of its use in preventing illnesses linked to free radicals. UIMBP's ability to scavenge DPPH further demonstrated its antioxidant capacity. We have created a precise & accurate method. This can be used in subsequent assessments of the quality of pollen that honeybees gather.

PCG-17

Formulaton and Evaluaton of herbal toothpaste for diabetics using black plum and Tulsi

Author- MR. Sanchit Santosh Gaikwad. Co-Author – Miss. Saee Aviraj Salvi.

Diabetes mellitus has emerged as a global health challenge, affecting millions of individuals worldwide. Diabetes mellitus is associated with an increased risk of oral diseases, including gingivitis and periodontitis, due to impaired immune response, high salivary glucose levels, and reduced wound healing capacity. Traditional oral care products do not specifically address the unique oral health challenges faced by diabetic individuals. This study aims to formulate and evaluate a novel antidiabetic herbal toothpaste incorporating Jamun (Syzygium cumini) leaf extract, known for its antimicrobial, anti-inflammatory, and hypoglycemic properties along with Tulsi extract is a natural and effective mouth cleanser, especially beneficial for diabetics and those with gum disease. It can be use for to maintain healthy gums, fresh breath, and strong teeth. The developed antidiabetic herbal toothpaste offers a promising natural solution for managing diabetes-related oral complications. By leveraging the medicinal properties of Jamun and other herbal extracts, this formulation addresses both oral hygiene and glycemic control, making it a suitable adjunctive therapy for diabetic individuals.

Keywords- Diabetes mellitus, oral health, herbal toothpaste, black plum, tulsi, traditional medicine.

PCG-18

"Extraction and Evaluation of Red rice bran and its formulation for therapeutic use"

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Red rice bran, a nutrient-rich byproduct of rice milling, is a promising source of bioactive compounds such as proanthocyanidins, flavonoids, phenolic acids, and anthocyanins, which are reported to exert antioxidant, anti-inflammatory, and antidiabetic effects. The present study aimed to extract, quantify, and evaluate the phytoconstituents of red rice bran extract (RRBE) and to develop microbeads for potential therapeutic applications. The RRBE was prepared using solvent (70% ethanol and 70% methanol) extraction, followed by phytochemical analysis to determine total phenolic content (158.64 ± 14.21 mg GAE/g), flavonoid content (190.09 ± 6.01 mg Rutin trihydrate/g), and proanthocyanidin content (134.34 ± 6.98 mg CE/g). Antioxidant capacity was confirmed by DPPH assay (IC_{50}: 777.01 µg/mL) and FRAP assay, demonstrating strong reducing power. The extract exhibited significant α-amylase inhibitory activity (34.23–70.99% across 50–600 µg/mL), comparable to standard acarbose, supporting its potential role in glucose regulation. Microbeads were formulated via ionotropic gelation using sodium alginate and calcium chloride, achieving spherical beads with optimal entrapment efficiency (63.03%) and favourable micromeritic properties. Swelling behaviour studies indicated pH-dependent release, with minimal swelling in acidic medium and higher swelling in alkaline buffer. Characterization by HPLC confirmed the presence of gallic acid, while FTIR and DSC analyses revealed stable incorporation of bioactives within the microbeads. Acute toxicity studies in rats indicated no significant adverse effects on body weight, food and water intake, or organ morphology, confirming safety up to 2000 mg/kg. Overall, red rice bran extract and its microbead formulation show strong potential as a safe and effective natural therapeutic agent for diabetes management and oxidative stress-related disorders.

Keywords: Proanthocyanidin; Amylase; Red rice bran; Microbeads

PCG-19

Anti-arthritic potential of Grewia hirsuta Vahl from the Western Ghats Forest of Indian province

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For the treatment of chronic diseases, medicinal plants are being gradually tested. Rheumatoid arthritis (RA) is an inflammatory condition that is chronic, systemic, immune-mediated and associated with reduced life expectancy and quality of life. The goal of this study was to evaluate the anti-arthritic potential of *Grewia hirsuta* (HAGH) hydro-alcoholic leaf extract obtained from the Western Ghats Forest of the Indian province. Plant leaf extract evaluated for in-vitro protein denaturation and membrane stabilization method followed by the In-vivo Freund adjuvant-induced arthritis model in rats. Chemical analysis of hydroalcoholic leaf extract of *Grewia hirsuta* indicated that the extract had the highest phenolic and flavonoid value. It was found that the dose-dependent anti-arthritic effect was noticeable at 100 mg and 200 mg/kg oral doses, with a decrease in paw volume relative to the arthritis control group. HAGH (100 and 200 mg/kg) exhibits substantial anti-arthritic activity by increasing levels of RBC, Hb, and decreasing levels of total WBCs and differential leukocytes. Biochemical analysis confirmed that the function of the SGOT & SGPT enzyme was altered compared to arthritis control rats. The results of this study suggest that *Grewia hirsuta* hydro-alcoholic leaf extract exhibits significant anti-arthritic activity due to its phenolic and flavonoid content, supporting its traditional use in rheumatoid arthritis.

Keywords: Arthritic, Freund's adjuvant-induced arthritic, *Grewia hirsuta.*

PCG-20

Design, formulation and evaluation of herbal eco-friendly medicated chewing gum for oral submucous fibrosis

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In an effort to prevent Oral Submucous Fibrosis (OSF), a severe health problem affecting 2.5 million Indians under 40, biodegradable medicinal chewing gum is being developed using natural basis of gum. Due to its biocompatibility and casy availability, the natural gum base of Triticumaestivum (wheat grain) was investigated as a potential solution to the gum cud disposal problem. The in-vitro drug release study, stickiness, physical appearance, weight consistency, and content uniformity were all assessed for each batch. Curcumin and aloe vera are essential for treating OSF. Curcumin and aloe vera have anti-oxidant, anti-bacterial, anti-cancer, anti- inflammatory, chemotherapeutic, and radioprotective qualities. The medicated chewing gum with 90 mg of calcium carbonate and 550 g of gum base demonstrated good flexibility and good drug release within 30 minutes, according to the results. Thus, this study suggests that wheat grain, which is readily available and has good flexibility and chewability, could serve as a possible gum base for therapeutic chewing gum. Additionally, curcumin and aloe vera have a synergistic effect on submucous membranes.

Keyword - Oral Submucous Fibrosis (OSF), Biodegradable Gum Base, Curcumin, Aloe vera, anti-oxidant

PCG-21

Effervescence-Assisted Dispersive Liquid–Liquid Microextraction: A Green, Automated Technique for pesticide residue analysis

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This study presents the development of a green, rapid, and automated extraction technique termed Effervescence-Assisted Dispersive Liquid–Liquid Microextraction (EA-DLLME), designed as a sustainable alternative to conventional DLLME and QuEChERS methods. Traditional DLLME techniques rely on toxic dispersive solvents and centrifugation, leading to increased operational cost, time, and environmental impact. In contrast, EA-DLLME employs an *in-situ* hydrogen effervescence system generated from the reaction between magnesium nanoparticles (Mg NPs) and sodium bicarbonate ($NaHCO_3$). The resulting hydrogen bubbles serve as a natural dispersing agent, facilitating efficient mixing of the low-toxicity extractant 1-undecanol with the aqueous sample eliminating the need for external dispersants or centrifugation. Under optimized conditions, the method achieved extraction recoveries between 91–100%, with limits of detection (LOD) ranging from 0.037–0.146 µg/mL and limits of quantification (LOQ) up to 0.446 µg/mL. The total extraction time was less than five minutes, demonstrating the method's suitability for high-throughput analytical workflows. EA-DLLME exhibited excellent precision, reproducibility, and sensitivity across multiple matrices including pharmaceutical formulations, biological fluids, environmental water, and food samples. A key application of the developed EA-DLLME system is in the determination of pesticide residues in food samples, where its rapid performance and eco-friendly nature make it ideal for routine quality control and safety assessment under FSSAI, FDA, and ISO 14001 frameworks. The method aligns closely with the principles of Green Analytical Chemistry (GAC) by minimizing solvent use, reducing hazardous waste, and improving energy efficiency.

PCG-23

Standardization of Asthiposhak Vati – an ayurvedic herbomineral formulation

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Calcium plays a crucial role in bone mineralization, muscle function, neuromuscular transmission, and overall human metabolism. This leads to prevalent disorders including osteoporosis, rickets, epilepsy, anemia, and other metabolic bone diseases affecting millions worldwide.

One of the herbal-mineral medications used frequently by Ayurvedic doctors to treat calcium deficiency is Asthiposhak Vati. Where "Asthi" refers to the bone and "Poshak" to nutrition It refers to a substance that provides the bones nutrition. As this is Herbo mineral formulation which contains many herbals as well as minerals. The chief ingredient of this formulation is Kukkutanda Bhasma (Egg Hen Shell) is one of the calcium-rich mineral medicinal formulations mentioned in Ayurveda.It is included under Sudha Varga as it contains Calcium compound.

Lack of methods for standardization and quality control of raw materials and formulations, as well as safety and toxicity problems caused by the presence of heavy metals and minerals, are key barriers to the success of Ayurvedic medicines. Due to a lack of reference standards, standardization of Ayurvedic formulations is lagging behind. To achieve global harmonization, the WHO has established standards for evaluating the efficacy and safety of herbal medicines. The objective of the current research was to establish a methodology for standardization of Asthiposhak Vati and its raw materials. As per WHO guidelines, standardization was done using systematic Pharmacognostical and physicochemical characteristics. The set standards were considered to be adequate for evaluating the Asthiposhak Vati and can be utilized as reference standards for forward for quality control and quality assurance in future.

PCG-24

Pharmacognostic, Phytochemical, and Pharmacological Evaluation of *Cipadessa baccifera* (Roth.) Miq. for Diabetic Wound Healing

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The increasing prevalence of degenerative metabolic disorders can be effectively managed through traditional and folkloric medicinal approaches. The present study aims to assess the anti-diabetic wound healing potential of an ethanolic defatted extract (EDE) of *Cipadessa baccifera* (CB) leaves in male albino Wistar rats. Defatted and non-defatted extracts were prepared using aqueous and ethanolic solvent systems. These extracts were subjected to pharmacognostic evaluation and assessed for wound healing activity employing excision and incision wound models in experimental animals. Antioxidant activity was evaluated using the DPPH radical scavenging assay, with ascorbic acid serving as the reference standard. Antimicrobial activity was determined by disc diffusion and well diffusion methods using chloramphenicol as the standard drug.

The ethanolic defatted leaf extract exhibited a high total phenolic content of 389.2 mg gal/L and demonstrated significant DPPH radical scavenging activity (68.75%) when compared with ascorbic acid. Additionally, the extract showed notable antimicrobial activity, evidenced by a clear zone of inhibition in both diffusion methods. On the 16th day of treatment, the group receiving 200 mg/kg of EDE achieved 95% wound closure, whereas the 100 mg/kg treated group showed 75% wound contraction. Overall, the EDE of *Cipadessa baccifera* leaves displayed pronounced antioxidant and antimicrobial properties along with significant wound healing activity.

Keywords: Diabetic wound healing, Cipadessa baccifera, Anti-bacterial, Anti-oxidant, Phenolic constituents, Excision and incision wound

PCG-26

Phytochemical Profiling and Evaluation of Antioxidant and Anti-Thyroid Activities of *Tribulus terrestris* Linn. Fruit Extract

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Tribulus terrestris Linn. (Zygophyllaceae), a medicinal plant native to India, is widely used in traditional medicine, with its fruit considered the most therapeutically valuable part. The present study aimed to investigate the phytochemical profile, antioxidant activity, and anti- thyroid potential of the ethanolic extract of *T. terrestris* using integrated in-vitro and in-silico approaches. Phytochemical characterization of the ethanolic extract was carried out using TLC, FT-IR, and GC-MS analysis. GC-MS revealed the presence of 14 bioactive compounds, including pyrazine derivatives, terpenoids, and sesquiterpenes such as γ-terpinene, camphor, citronellal, copaene, caryophyllene, and bergamotene, which are known for their biological activities. Antioxidant activity was evaluated using the DPPH free radical scavenging assay, with ascorbic acid as the standard. The extract exhibited significant antioxidant potential with an IC_{50} value of 42.17 µg/ml. Anti-thyroid activity was assessed in vitro using the CHO (Chinese Hamster Ovary) cell line, with methimazole as the standard drug. The ethanolic extract showed notable anti-thyroid activity, with IC_{50} values of 620.85 µg/ml for hyperthyroidism and >302.15 µg/ml for hypothyroidism. Furthermore, in-silico molecular docking studies demonstrated strong binding affinities of major phytoconstituents with thyroid- related target proteins (2J4A and 2XWT), supporting the experimental findings. Overall, the results suggest that the ethanolic fruit extract of *T. terrestris* possesses promising antioxidant and anti-thyroid activities, warranting further investigation for the development of novel therapeutic agents.

Keywords: *Tribulus terrestris* Linn. Antioxidant activity, Anti-thyroid activity, DPPH assay, CHO cell line, Molecular docking, and *In-vitro* studies.

PCG-27

Formulation and Evaluation Of a Herbal Antimicrobial Cream With Optimized Topical Properties and Therapeutic Potential

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This study focused on formulating and evaluating a herbal antimicrobial cream containing ethanolic extracts of *Curcuma longa* (Curcumin) and *Glycyrrhiza glabra* (Glycyrrhizin). Three optimized batches (F1, F2, F3) were prepared with excipients including sesame oil, coconut oil, white beeswax, and linoleic acid. Among these, batch F3 showed superior physicochemical properties and was selected as the most effective. The prepared cream exhibited desirable characteristics, including a smooth, non-greasy appearance, homogeneity, skin-compatible pH (6.21), suitable spreadability (9.33 g-cm/sec), and viscosity with pseudoplastic rheology, ensuring ease of topical application and skin compatibility. Permeation of actives was confirmed by Franz diffusion studies. Antimicrobial efficacy was assessed by the disc diffusion method, where filter paper discs impregnated with the formulation were placed on agar plates inoculated with standardized microbial cultures; zones of inhibition measured 20 mm against Escherichia coli, 18 mm against Staphylococcus aureus, and 15 mm against Candida albicans, demonstrating broad-spectrum activity. The formulation remained stable without phase separation during evaluation. This synergistic cream, enhanced by functional excipients like sesame oil, offers a promising natural alternative for microbial skin infections. Future studies may explore its potential anticancer activity to broaden therapeutic applications.

Keywords: Herbal antimicrobial cream; Curcuma longa; *Glycyrrhiza glabra*; Curcumin; Glycyrrhizin; Topical formulation; Franz diffusion study; Physicochemical evaluation; Natural excipients; Skin infections

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