

ABSTRACT BOOK

**International Conference on
INNOVATIONS IN SCIENCE AND
TECHNOLOGY FOR A RESILIENT
FUTURE**

04 - 05 JULY, 2025

Organized by

**SOCIETY FOR PROGRESSIVE LEARNING AND RESEARCH
DEPARTMENT OF BIOCHEMICAL ENGINEERING HBTU, KANPUR
ATMOHIVE BIOTECH PVT. LTD.**



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***Society for Progressive Learning and Research
(SPLR)
In Collaboration
with
Department of Biochemical Engineering, HBTU,
Kanpur
and
Atmohive Biotech Pvt. Ltd.***

**ORGANISES
INTERNATIONAL CONFERENCE**

**ON
INNOVATIONS IN SCIENCE AND TECHNOLOGY
FOR A RESILIENT FUTURE
(ICISTRF 2025)**

**ABSTRACT BOOK
04 – 05 July, 2025**



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MESSAGES



हरकोर्ट बटलर प्राविधिक विश्वविद्यालय
नवाबगंज, कानपुर – 208002, उ.प्र., भारत
HARCOURT BUTLER TECHNICAL UNIVERSITY
NAWABGANJ, KANPUR - 208002, U.P., INDIA
(Formerly Harcourt Butler Technological Institute, Kanpur)

Phone : +91-0512-2534001-5, 2533812, website : <http://www.hbtu.ac.in>, Email : vc@hbtu.ac.in



DEPARTMENT OF BIOCHEMICAL ENGINEERING,
SCHOOL OF CHEMICAL TECHNOLOGY



Message

It is a great honor and privilege to address all the distinguished participants of the International Conference on Innovation in Science & Technology for a Resilient Future (ICIST-RF 2025). This conference, organized by the Society for Progressive Learning and Research, in collaboration with Harcourt Butler Technical University, Kanpur and Atmohive Biotech Pvt. Ltd., brings together a diverse group of researchers, scientists, academicians, and industry professionals, providing a robust platform for collaboration and the sharing of innovative ideas.

In today's rapidly changing world, the role of science and technology has become even more critical in addressing global challenges. Conferences like ICIST-RF 2025 serve as catalysts for innovation, offering an opportunity to connect academia with industry, fostering new solutions that can have a lasting impact on society. The integration of science with industrial applications has the potential to revolutionize various fields, particularly in biotechnology, biochemical engineering, and applied sciences.

I am particularly impressed by the scope of ICIST-RF 2025, which encompasses a wide range of topics including biotechnology, biological sciences, and engineering. The emphasis on bridging the gap between theoretical knowledge and practical applications is commendable, and I am confident that this event will lead to new collaborations and breakthroughs that will drive scientific and industrial advancements.

To the participants, I encourage you to make the most of this opportunity, engage in meaningful discussions, and explore innovative ideas that can shape the future of science and technology. This is an exciting time for researchers and professionals in these fields, and your contributions will be instrumental in paving the way for future innovations.

I extend my heartfelt congratulations to the organizers for their effort in making this conference a reality and for providing such an enriching platform. I wish all the participants and speakers success in their presentations and deliberations. I believe, ICIST-RF 2025 be a truly transformative experience for everyone involved.

Warm regards,

Prof. Lalit Kumar Singh
Head of Department, Biochemical Engineering &
Dean of Academic Affairs
Harcourt Butler Technical University (HBTU), Kanpur

Message from Dr. Ajai Singh

Head Zonal Operation & Client Partner - CE NAB

Tata Consultancy Services

Honorary Professor of Practice- Innovation and Entrepreneurship

Ex. Chairman - Computer Society of India



I am delighted to extend my warm wishes to the organizers and participants of the International Conference on Innovation in Science & Technology for a Resilient Future (ICISTRF 2025). It is an honor to be associated with a prestigious forum that brings together researchers, industry experts, and academicians to exchange knowledge and drive innovation across disciplines.

At TCS Lucknow, we continuously strive to bridge the gap between research and real-world applications by promoting collaborative innovation and transformative solutions. Events like ICISTRF 2025 serve as crucial enablers in this journey by providing a vibrant platform to discuss technological trends, share successful models, and inspire forward-thinking strategies across industrial domains.

The convergence of academia, research institutions, and industry at this conference will undoubtedly lead to impactful ideas and solutions that foster industrial growth, digital transformation, and societal advancement. I am confident that ICISTRF 2025 will play a pivotal role in shaping the future of applied science and technology.

I extend my best wishes to all the delegates for engaging discussions, valuable networking, and meaningful collaborations throughout the event.

With warm regards,

Dr. Ajai Singh

Programme Director – CE NAB

TCS Lucknow

About International Conference on Innovation in Science and Technology for Resilient Future (ICISTRF 2025)

The Society for Progressive Learning and Research (SPLR) organized a two-day International Conference on “Innovation in Science and Technology for Resilient Future (ICISTRF-2025)” on July 4th & 5th, 2025, in collaboration with the Department of Biochemical Engineering, Harcourt Butler Technical University, Kanpur and Atmohive Biotech Pvt. Ltd. The primary aim of this conference is to foster interdisciplinary exchange of ideas, innovations, and research findings.

The International Conference on Innovation in Science and Technology for Resilient Future (ICISTRF 2025) convenes researchers, academicians, scientists, industry professionals, and innovators from across the globe to share insights and advancements that can help shape a more resilient and sustainable future through science and technology.

This conference proudly features contributions from 53 registered participants presenting original research and novel ideas through oral presentations. These abstracts span a wide array of disciplines and represent the latest work being undertaken by early-career researchers, doctoral scholars, and students. In addition, the conference is honored to host 16 senior academicians and scientists who bring with them a wealth of experience and scholarly depth, enriching the discussions through high-impact presentations and technical sessions. A major highlight of ICISTRF 2025 is the inclusion of 25 keynote and invited speakers, comprising international experts, corporate leaders, technology innovators, and senior scientists from India, the USA, Spain, Malaysia, and other countries. Their presence and talks are instrumental in bridging academic research with real-world industrial and societal applications.

The conference aims not only to foster academic exchange but also to celebrate innovation and contribution through various award categories, including those recognizing excellence among women researchers, young scientists, entrepreneurs, and industry achievers.

This abstract book is a testimony to the intellectual richness of the conference and provides a permanent record of the diverse ideas and collaborative spirit fostered through ICISTRF 2025. We extend our gratitude to all contributors and look forward to the discussions and partnerships that will emerge from this vibrant gathering.



SOCIETY FOR PROGRESSIVE LEARNING AND RESEARCH

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sforplar@gmail.com
<https://splrs.com/>
Lucknow, India

About Society for Progressive Learning and Research (SPLR)

Society for Progressive Learning and Research (SPLR) stands as a foremost non-profit professional association, operating under the India Trust Act (1882), dedicated to fostering research, development, and the advancement of life sciences, social sciences, engineering and technology. Our organization's primary focus is to promote and facilitate research progress, prioritizing innovation, and nurturing a platform that supports the growth and evolution of these fields.

As one of the most promising and upcoming societies, we boast a global membership drawn from universities, industries, hospitals, research institutes, and educational institutions, positioning us as a diverse hub for professional expertise and collaborations worldwide. The Society serves as a charitable membership organization catering to researchers passionate about exploring new horizons in the form of collaborations and research.

Feel free to write back to join or to give your valuable suggestions, on sforplar@gmail.com.



About Atmohive Biotech Private Limited, Kanpur

Atmohive Biotech Private Limited, founded in 2023, and headquartered in Kanpur, Uttar Pradesh, is an innovation-driven startup dedicated to transforming science into impactful solutions. Atmohive aims to bridge the gap between academic knowledge and practical expertise in biotechnology and life sciences. The company is recognized not only for its research-driven approach but also for its hands-on training programs that empower professionals and students alike.

At the heart of Atmohive's innovation is its algal-based air purification system, a novel solution that leverages microalgal technology to reduce indoor CO₂ levels and improve air quality sustainably. Acting as a natural CO₂ quencher, the system embodies eco-conscious design and bioengineered efficiency, offering a greener approach to air purification backed by scientific principles.

Beyond product development, Atmohive serves as a dynamic biotech training hub, offering practical programs in biotechnological methods, industrial processes, and bioengineering tools. Through tailored workshops, live projects, and expert mentorship, trainees are equipped with real-world skills for roles in research labs, biomanufacturing, and sustainable product design. The training programs are designed to align with current industry demands and foster future-ready biotech talent.

Atmohive's core philosophy centers around four pillars: innovation, education, sustainability, and collaboration. The company believes in using cutting-edge science to address societal needs, from clean air to career development. Its collaborative network includes academic institutions, research bodies, and industry leaders, all working together to drive progress in applied biotechnology.

Whether you are a health-conscious individual seeking natural air quality solutions or a student aspiring to build a future in biotech, Atmohive Biotech welcomes you to be part of its journey. Connect with the team at atmohivebiotech@gmail.com or visit www.atmohivebiotech.com to explore solutions and opportunities that transform knowledge into lasting impact.



International & National Scientific Advisory Committee

1. Prof. (Dr.) Santiago Gómez-Ruiz, Universidad Rey Juan Carlos, Madrid, Spain
2. Prof. (Dr.) Irena Kostova, Sofia, Bulgaria
3. Prof. (Dr.) Lalit Kumar Singh, HBTU, Kanpur, India
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7. Dr. Diana Díaz-García, Universidad Rey Juan Carlos, Madrid, Spain
8. Dr. Travers K. Chirova, Harare Institute of Technology, Harare, Zimbabwe
9. Dr. Lavanya Yaidikar, Krishna Teja Pharmacy College, Tirupati, India
10. Dr. Imran Hussain, Integral University, Lucknow, India
11. Dr. Shakti Kumar Shukla, Fragrance & Flavour Development Centre, Kannauj, India
12. Dr. V. Praveen Kumar, KL University, Guntur, India
13. Dr. Sheeba Rizvi, Era University, Lucknow, India
14. Dr. G. Gowri, Sri Vijay Vidyalaya College of Arts and Science, Periyar University, Nallampalli, Dharmapuri, India
15. Dr. Ravi K. Deshwal, Shri Ramswaroop Memorial University, Lucknow, India

Organizing Team

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Dr. Raj Kamal Kushwaha, HBTU Kanpur, UP, India

Dr. Manish Dwivedi, Amity University Uttar Pradesh, Lucknow, India

Mr. Mohit Nigam, Atmohive Biotech Pvt. Ltd., Kanpur, India

Inaugural Keynote

Dr Lalit Kumar Singh, HOI, Biochemical Engineering and Dean Academic Affairs, HBTU Kanpur, UP, India

Keynote Speakers of Technical Session

Keynote Lecture 1

Mr. Kawaljeet Singh Chadha, University of the Cumberlands, Williamsburg, KY, USA

Keynote Lecture 2

Mr. Abhishek Siriya, Staff Software Engineer, CA, USA

Keynote Lecture 3

Mr. Ashutosh Chandra Jha, Network Security Engineer, New York, USA

Keynote Lecture 4

Ms. Srilatha Samala, Jira Reporting Lead, Princeton, NJ, USA

Keynote Lecture 5

Mr. Rahul Brahmabhatt, President, SSR Group, Tempe, Arizona, USA

Keynote Lecture 6

Mr. Saketh Kumar Vishwakarma, Advanced Supplier Management-Manufacturing Agent, Bombardier, Kansas, USA

Keynote Lecture 7

Mr. Ramanan Hariharan, Principal Engineering Manager, Security and Resiliency, Microsoft, Mountain View, USA

Keynote Lecture 8

Mr. Ashwin Chavan, Software Architect and Technical Product Owner, Pitney Bowes, Austin TX, USA

Keynote Lecture 9

Mr. Wazahat Chowdhury, Supply Chain Analyst and Agile Scrum Master, University of Michigan, Ann Arbor, Michigan, USA

Keynote Lecture 10

Mr. Bhargav Vadgama, Staff Data Engineer, Austin, Texas, USA

Keynote Lecture 11

Mr. Nishanth Reddy Pinnapareddy, Senior Software Engineer, Doordash Inc, San Jose, California, USA

Keynote Lecture 12

Mr. Vinod Kumar Enugala, Construction Inspector & Project Management, Connecticut, USA

Keynote Lecture 13

Mr. Jaya Krishna Modadugu, IT professional (with a strong background in Java and fintech systems), USA

Keynote Lecture 14

Mr. Ravi Teja Prabhala Venkata, Senior Manager, Software Engineering, USA



International Conference - ICISTRF 2025

International Conference

On

Innovations in Science and Technology for a Resilient Future

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PROGRAMME SCHEDULE

Mode: ZOOM

Link: <https://zoom.us/j/95071381994?pwd=dLvkrHpdv1eFtyMoCTVPjbKdlMrg83.1>

Meeting ID: 950 7138 1994

Passcode: 996373

Day 1: July 4th, 2025

09:15 AM – 09:50 AM	Inaugural
09:15 AM – 09:30 AM	Online connecting of Speakers and Delegates
09:30 AM – 09:35 AM	Lighting of Lamp, and Maa Saraswati Vandana
09:35 AM – 09:45 AM	Inaugural Address and About ICISTRF 2025 Dr Lalit Kumar Singh , HOD, Biochemical Engineering and Dean Academic Affairs, HBTU Kanpur, UP, India
09:45 AM – 11:30 AM	Technical Session I
Session Chair - Dr Lalit Kumar Singh , HOD, Biochemical Engineering and Dean Academic Affairs, HBTU Kanpur, UP, India	
09:45 AM – 09:52 AM	Keynote Lecture 1 Mr. Kawaljeet Singh Chadha , University of the Cumberlands, Williamsburg, KY, USA Topic: “ Building a flexible Future with Data: Practical Lessons from Business Intelligence and Data Governance ”
09:52 AM – 09:59 AM	Keynote Lecture 2 Mr. Ramanan Hariharan , Principal Engineering Manager, Security and Resiliency, Microsoft, Mountain View, USA Topic: “ Architecting the Future: AI-Driven Cyber Resilience in Biochemical Systems ”
10:00AM – 10:07 AM	Keynote Lecture 3

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	<p>Mr. Ashutosh Chandra Jha, Network Security Engineer, New York, USA Topic: “Evolving Firewall Architectures: Hardware-Centric Designs and Dynamic Policy Control”</p>
10:07 AM – 10:14 AM	<p>Keynote Lecture 4 Ms. Srilatha Samala, Jira Reporting Lead, Princeton, NJ, USA Topic: “Architecting Enterprise Agility with JIRA: Governance, Scalability, and Integrated Reporting Frameworks”</p>
10:14 AM – 10:21 AM	<p>Keynote Lecture 5 Mr. Rahul Brahmabhatt, President, SSR Group, Tempe, Arizona, USA Topic: “The Future of Smart Retail: How AI is transforming the Shopping Experience”</p>
10:21 AM – 10:28 AM	<p>Keynote Lecture 6 Mr. Saketh Kumar Vishwakarma, Advanced Supplier Management-Manufacturing Agent, Bombardier., Kansas, USA Topic: “Integrating Risk Management into Supplier Performance Management: A Resilience-Driven Approach”</p>
10:28 AM – 10:35 AM	<p>Keynote Lecture 7 Mr. Pramod Gannavarapu, Infrastructure Architect, Compunnel, Georgia, USA Topic: “Ransomware Defense for Sysadmins: Real-World Scenarios and Mitigations”</p>
10:35 AM – 11:10 AM	<p>Invited Lecture 1 Dr. Vinod Tiwari, Dept. of Pharmaceutical Eng. & Tech., IIT, B.H.U. (India) Topic: “When the Gut Talks, the Nerves Listen: Microbiome and Neuropathic Pain”</p>
11:10 AM – 11:16 AM	<p>Flash Talk 01: Investigating the Drivers Behind the Surge in Adult Obesity Dr. Anitha C* and Sheela. S *Associate Professor, Karnataka State Open University, Mysuru, Karnataka, India Student, Karnataka State Open University, Mysuru, Karnataka, India</p>
11:17 AM – 11:23 AM	<p>Flash Talk 02: Exploring the Neurotherapeutic Potential of <i>Viburnum opulus</i> Solid Lipid Nanoparticles in a Tetrabenazine-induced Rat Model of Parkinson’s Disease M.G. Reshma, Dr. Lavanya Yaidikar* Krishna Teja Pharmacy College, Tirupati, Andhra Pradesh – 517501</p>
11:24 AM – 11:30 AM	<p>Flash Talk 03: Amino Acid-Derived Porous Polymer Nanocapsules for Targeted Cancer Therapy Dr. Chander Amgoth Pawar^{1,3*}, Likha Chandran¹, Koduru Mallikarjuna², Jyotsna Cherukuri¹, David Xu Luo³ ¹Department of Chemistry, Vallurupalli Nageswara Rao Vignana Jyothi Institute of Engineering and Technology, Hyderabad-500090, India ²Department of Physics, Marri Laxman Reddy Institute of Technology and Management, Dundigal, Hyderabad 500043, India. ³Department of Biomedical Engineering, Texas A&M University, College Station, TX-77840, United States</p>
11:30 AM – 01:30 PM	Technical Session II
Session Chair – Dr. Manish Dwivedi , Asso. Prof., Amity Institute of Biotechnology, Amity University, Lucknow, UP,	

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India	
11:30 AM – 11:40AM	<p>Invited Lecture 2 Dr. Diana Díaz-García, Universidad Rey Juan Carlos, Spain Topic: “Advancing Neurodegenerative Diseases Treatment with Nanomaterials”</p>
11:40 AM – 11:50AM	<p>Invited Lecture 3 Dr. Aditi Singh, Amity Institute of Biotechnology, Amity University Lucknow, India Topic: “Smart Viruses, Stronger Solutions: Bacteriophages in Biofilm Disruption”</p>
11:50 AM – 12:00PM	<p>Invited Lecture 6 Dr. Manish Diwevdi, Amity Institute of Biotechnology, Amity University Lucknow, India Topic: “Unveiling the Gaucher Disease: Causes, Diagnosis, and Treatment Options”</p>
12:00PM – 12:06PM	<p>Flash Talk 04: Impact assessment of coal mining activity on soil quality around Samleshwari OCP Mines Jharsuguda, Orissa Vishnu Mukhi¹, Dr. Neeta Kumari² ¹M. Tech Student, Department of Civil and Environmental Engineering, Birla Institute of Technology, Mesra, Ranchi, Jharkhand, India, 835215 ²Assistant Professor, Department of Civil and Environmental Engineering, Birla Institute of Technology, Mesra, Ranchi, Jharkhand, India, 835215</p>
12:07PM – 12:13PM	<p>Flash Talk 05: Assessment and Monitoring of Paediatric Radiation Dose in Computed Tomography Brain and Pulmonary Angiogram Dr. Thanga Kumaran R, Assistant Professor School of Allied Health Sciences, Vinayaka Mission’s Research Foundation (Deemed to be University) – Salem</p>
12:14PM – 12:20PM	<p>Flash Talk 06: Chemical Composition and Antibacterial Activity of the Essential Oil Extracted from Peels of Citrus species against selected Food borne Pathogens Dr. Richa Sharma* Department of Microbiology, Mahatma Gandhi University of Medical Sciences & Technology, Jaipur, Rajasthan (India)</p>
12:21PM – 12:27PM	<p>Flash Talk 07: Nanotechnology: Bridging Environmental Safety and Medical Breakthroughs Dr. Ranjitha.R School of Allied Health Sciences, Vinayaka Missions Research Foundation Deemed to be University, Salem</p>
12:28PM – 12:34PM	<p>Flash Talk 08: The Role of Robotics in Hospital Care: Advancing Efficiency and Safety Ms. Pratibha Thakur, Sr. Tutor, St. Stephen Hospital, College of Nursing, New Delhi</p>
12:35PM – 12:41PM	<p>Flash Talk 09: Catalyzing Resilience: Strategic Innovation in Science and Technology for an AI Driven Future Dr. Anshu Arora, Associate Professor Amity University Uttar Pradesh, Noida</p>
12:42PM – 12:48PM	<p>Flash Talk 10: Role of Innovation in Science and Technology in Building a Resilient Future Ms. Abida Khanam, Asst. Prof. Shikaripara College, Shikaripara, Dumka</p>

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12:49PM – 12:54PM	Flash Talk 11: Endocarditis: Host-Pathogen Interactions and Advances in Diagnostic Microbiology Ms. Faiza Fatima^{1*} , Asst. prof. Saraswati Dental College, Tiwari Ganj, Lucknow Uttar Pradesh, India
12:55PM – 01:00 PM	Flash Talk 12: Bioinformatics tools in Biology – An overview D. Herin Sheeba Gracelin* and P. Benjamin Jeya Rathna Kumar *Assistant Professor, Department of Botany, Sarah Tucker College (Autonomous), Tirunelveli - 627 007, Tamil Nadu, India. Assistant Professor, Department of Botany, Kamaraj College - 628003, Tamil Nadu, India
01:00 PM – 01:05PM	Flash Talk 13: Computational Assessment of SNPs in Key Genes Linked to Neurological Disorders Ruchi Yadav* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, UP, India
01:05PM – 01:10 PM	Flash Talk 14: GIMAPS: A Sustained-Release Approach for Ulcerative Colitis Pranati Srivastava^{1*} and Ved Prakash Tripathi ² ¹ Assistant Professor, Institute of Pharmaceutical Sciences, University of Lucknow ² Assistant Professor, Goel Institute of Pharmacy, Lucknow
01:10 PM – 01:15PM	Flash Talk 15: Ancient Grains, Modern Health: Unlocking the Power of Nutri-Cereals Dr. Gazala Nisar* Assistant Professor, Institute of Home Science, University of Kashmir, Hazratbal Srinagar
01:15PM – 01:20PM	Flash Talk 16: Future Innovation for Waste Management in Healthcare System Dr. Rachna Chaturvedi Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow
01:20 PM – 01:25PM	OP01: Sustainable Adsorbents from Cow Dung for Wastewater Treatment: Experimental Optimization and Mechanistic Study of Safranin O Removal Heer V. Batavia¹ , Mital R. Soni ^{1*} ^{1*} Department of Chemistry, Marwadi University, Rajkot, Gujarat, India
01:25PM – 01:30PM	OP02: Effectiveness of Progressive Muscle Relaxation Therapy for Stress Reduction in Patients with Coronary Artery Disease. Chinju Verghese Kannanaickal B. , Ph. D. Scholar, Bharat Institute of Higher Education and Research (BIHER), Chennai, Tamil Nadu, India.
01:30 PM – 02:00 PM	Lunch Break
02:00 PM – 03:30 PM	Technical Session III
Session Chair – Dr. Garima Awasthi , A.P., Amity Institute of Biotechnology, Amity University, Lucknow, UP, India	
Oral Session Judge – Dr. T. S. Harsha , Director (Research and Development Cell), Department of Studies and Research in Environmental Science, Karnataka State Open University, Mysore, India	
02:00 PM – 02:05 PM	OP03: Harnessing Technological Innovation for a Resilient, Sustainable, and Inclusive Future: A Comprehensive Analysis Ar. Akshay Sanyal^{1*} , Dr. Nirmita Mehrotra ² ¹ Research Scholar, ² Head of Department, Department of Urban & Regional Planning, Gautam Buddha University, Greater Noida, Uttar Pradesh, India

02:05 PM – 02:10 PM	<p>OP04: Capillaries of the Western Ghats, Unveiling the Role of Freshwater Creeks in a Biodiversity Hotspot: A review S. Raksha¹ and T.S. Harsha^{2*} ¹Research Student, Department of Environmental Science, KSOU Mysore ²Chairman, Department of Studies and Research in Environmental Science, KSOU Mysore</p>
02:10 PM – 02:15 PM	<p>OP05: Microbial Decomposers as a Sustainable Strategy for Enhancing Enzymatic Activity and Nutrient Release in Wheat Straw Decomposition Poonam Yadav^{1,2*}, Mala Trivedi¹ and S.R. Singh² ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus ²ICAR-Indian Institute of Sugarcane Research, Lucknow, U.P., India</p>
02:15 PM – 02:20 PM	<p>OP06: Compare the thermal performance, energy efficiency, and sustainability aspects of bio-PCMs against conventional materials in high-rise building applications. Ar. Aditya Sanyal¹, Dr. (Ar.) Nirmita Mehrotra^{2*}, ¹Ph.D. Research Scholar, Department of Architecture & Regional Planning, Gautam Buddha University, Greater Noida (U.P.) ²Head, Department of Urban & Regional Planning, Gautam Buddha University, Greater Noida (U.P.)</p>
02:25 PM – 02:30 PM	<p>OP07: Host Range Determination of Isolated Bacteriophages Against Multi-Drug Resistant <i>Pseudomonas aeruginosa</i> Nidhi Rai^{1,2}, Aditi Singh^{*1}, Anupam Das² ¹Amity Institute of Biotechnology, Amity University, Lucknow, Uttar Pradesh ²Department of Microbiology, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow Uttar Pradesh</p>
02:35 PM – 02:40 PM	<p>OP08: Revitalizing Soil Quality Using Vermicompost at St. Philomena's (Autonomous) College Campus, Bannimantap, Mysore, Karnataka Milagris Antonius¹, Dr. Vadiraj K T², Dr. T S Harsha³ ¹Department of Environmental Science St. Philomena's College (Autonomous) Mysore 570015, India ²Department of Environmental Science, JSS Academy of Higher Education & Research, Mysore- 570015, India ³Department of Environmental Science, Karnataka State Open University, Muktagangotri, Mysore 570015, India</p>
02:45 PM – 02:50 PM	<p>OP09: Systems and Structural Insights into ECM Remodeling in Pulmonary Fibrosis Sakshi Soni and Ruchi Yadav[*] Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus Lucknow, UP, India.</p>
02:50 PM – 02:55 PM	<p>OP10: Sustainable Remediation of Cr (VI) Using Phyto-Synthesized Zerovalent Iron Nanoparticles: An RSM-Based Approach Vartika Nishad¹, Shravan Kumar^{1*}, S.V.A.R Sastry² ¹Department of Biochemical Engineering, School of Chemical Technology, Harcourt Butler Technical University, Kanpur, Uttar Pradesh, India ²Department of Chemical Engineering, School of Chemical Technology, Harcourt Butler Technical University, Kanpur, Uttar Pradesh, India</p>

02:55 PM – 03:00 PM	<p>OP11: Fermentative Cellulase Production from Agro-Waste Using <i>Bacillus subtilis</i> and Substrate Interaction Analysis via Molecular Docking Shreya Chauhan^{1*} and Mohit Nigam² ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
03:00 PM – 03:05 PM	<p>OP12: Long non-coding RNAs (lncRNAs) as biomarkers to predict the severity of ischemic stroke patients Akanksha Gupta¹, Dr. Suchit Swaroop¹, Dr. Vandana Tiwari² ¹Experimental & Public Health Laboratory, Department of Zoology, University of Lucknow, ²Department of Biochemistry, Dr. RMLIMS, Lucknow, 226010</p>
03:05 PM – 03:10 PM	<p>OP13: Wearable Health Devices for Early Warning and Detection of Cervical Cancer Akanksha Pandey Senior Resident, Queen Mary Hospital, KGMU, Lucknow, India</p>
03:10 PM – 03:15 PM	<p>OP14: Studies on Industrial Production of Ethanol to Optimize the Existing Fermentation Parameters for Maximizing Yield & Productivity Akash Sahu^{1*}, Brajesh Singh² ¹Department of Biochemical Engineering, Harcourt Butler Technical University, Uttar Pradesh - 208002, India. ²Department of Biochemical Engineering, Harcourt Butler Technical University, Uttar Pradesh - 208002, India</p>
03:15 PM – 03:20 PM	<p>OP15: Computational Drug Repurposing Study Targeting Key Proteins in Alzheimer's Disease Using Molecular Docking Approaches Aishwarya Shukla¹ and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
03:20 PM – 03:25 PM	<p>OP16: A Study on the Bioaccumulation of pesticides in <i>Catlacatla</i> from selected taluks of Mysore District, Karnataka Vidya K., Vijayalaxmi Parichannagoudar, Suhas M., Chandan D. and Ramyashree M.* ^{1*}Post Graduate Department of Zoology, JSS College of Arts, Commerce and Science, Ooty road, Mysore ²JSS Academy of Higher Education and Research, Bannimantap, Mysore</p>

Day 2: July 5th, 2025

Mode: ZOOM

Link: <https://zoom.us/j/95071381994?pwd=dLvkrHpdv1eFtvMoCTVPjbKdlMrg83.1>

Meeting ID: 950 7138 1994

Passcode: 996373

09:15 AM – 09:30 AM	Online connecting of Speakers and Delegates
09:30 AM – 11:00 AM	Technical Session I

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Innovations in Science and Technology for a Resilient Future (ICISTRF 2025)
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Session Chair –Dr. S. P. Singh, A.P., Amity Institute of Biotechnology, Amity University, Lucknow, UP, India	
09:30 AM – 09:37 AM	Keynote Lecture 1 Mr. Santosh Durgam , Manager of Software Engineering, Morningstar Investments LLC, Chicago, Illinois, USA Topic: “Synthetic Data for Scientific Innovation: Accelerating Discovery While Preserving Privacy”
09:38AM – 09:45AM	Keynote Lecture 2 Mr. Wazahat Chowdhury , Supply Chain Analyst and Agile Scrum Master, University of Michigan, Ann Arbor, Michigan, USA Topic: “Driving Operational Efficiency Through Intelligent Supply Chain Orchestration – Strategies and Insights”
09:46 AM – 09:53 AM	Keynote Lecture 3 Mr. Bhargav Vadgama , Staff Data Engineer, Austin, Texas, USA Topic: “Turbocharging Fraud Detection: A Data Engineering Breakthrough at Visa”
09:53AM – 10:00AM	Keynote Lecture 4 Mr. Nishanth Reddy Pinnapareddy , Senior Software Engineer, Doordash Inc, San Jose, California, USA Topic: “Building Resilient Infrastructure: Lessons from Cloud-Native Innovation and Virtualization”
10:01AM – 10:08 AM	Keynote Lecture 5 Mr. Vinod Kumar Enugala , Construction Inspector & Project Management, Connecticut, USA Topic: “AI-Powered Infrastructure Monitoring: Transforming Structural Health Assessment Through Intelligent Drone Systems”
10:09 AM – 10:16 AM	Keynote Lecture 6 Mr. Jaya Krishna Modadugu , IT professional (with a strong background in Java and fintech systems), USA Topic: “Bridging Cloud Architecture and Deep Learning: A New Frontier in Financial Data Security”
10:17 AM – 10:24 AM	Keynote Lecture 7 Mr. Ravi Teja Prabhala Venkata , Senior Manager, Software Engineering, USA Topic: “Autonomous AI Agents: Bridging the Gap Between Intelligence and Action”
10:25 AM – 10:40 AM	Invited Lecture 1 Dr. Mohd. Asyraf Kassim , School of Industrial Technology, Universiti Sains Malaysia, (Malaysia) Topic: “Microbial Synergies in Phycoremediation and Carbon Sequestration: Pathways to Environmental Sustainability”
10:40 AM – 10:50 AM	Invited Lecture 2 Dr. Garima Awasthi , Amity Institute of Biotechnology, Amity University Lucknow, India Topic: “Quality Control and Quality Assurance in Research and Innovations”

10:50 AM – 11:00 AM	<p>Invited Lecture 3 Dr. Sujeet Pratap Singh, Amity Institute of Biotechnology, Amity University Lucknow, India Topic: “Life Cycle Assessment (LCA) of Microbial Production of Glucose Oxidase Enzyme: A Sustainability Perspective”</p>
11:00 AM – 01:30 PM	Technical Session II
<p>Session Chair – Dr. Aditi Singh, Professor, Amity Institute of Biotechnology, Amity University, Lucknow, UP, India</p>	
<p>Oral Session Judges – Dr.G. Gowri, Head, PG and Research Department of Zoology, Sri Vijay Vidyalaya College of Arts and Sciences, Nallampalli, Dharmapuri (Tamil Nadu), India Dr. Devlina Ghosh, A.P., Department of Biochemistry, Saraswati Dental College & Hospitals, Tiwariganj, Lucknow, UP, India</p>	
11:00 AM – 11:05AM	<p>OP17: Circadian Abnormalities, Molecular Clock Genes, and Chronobiological Treatment of Psychiatric Disorders Suman Chakraborty, Vivek Srivastava* Amity University, Malhaur Railway Station Road, Gomti Nagar, Lucknow, NijampurMalhaur, Uttar Pradesh 226010</p>
11:05AM – 11:10AM	<p>OP18: Valorization of Rice and Paper Waste for Sustainable Bioethanol Production Harsh Bhadauria and Garima Awasthi* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow – 227105, Uttar Pradesh, India</p>
11:10AM – 11:15AM	<p>OP19: Strategic Research Directions to Address Critical Gaps in Agricultural Nanotechnology: A Roadmap from Lab to Field ¹Aryan Shukla and ²Abhishek Kumar Mishra* ¹Department of Microbiology and Biotechnology Centre, Faculty of Science, Maharaja Sayajirao University of Baroda, Pratapgunj, Vadodara - 390002, Gujarat, India ²Department of Biotechnology, School of Biosciences and Technology (SBST), Vellore Institute of Technology (VIT), Vellore 632014, TamilNadu, India</p>
11:15AM – 11:20AM	<p>OP20: Banana Pseudostem as a Bioactive Coating Agent: A Multifunctional Approach to Food Shelf-Life Extension Shreetama Bhattacharjee* & Aditi Singh Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Gomti Nagar Extension, Lucknow.</p>
11:20AM – 11:25AM	<p>OP21: Bioconversion of Alkaline-Pretreated Sugarcane Bagasse into Purified Cellulase Using <i>Aspergillus niger</i>: A Sequential Fermentation and Chromatographic Purification Strategy Tripti Tripathi¹, Shravan Kumar^{1*}, and S.V.A.R. Sastry² ¹Department of Biochemical Engineering, School of Chemical Technology, Harcourt Butler Technical University, Kanpur, U.P., India. Pin-208002 ²Department of Chemical Engineering, School of Chemical Technology, Harcourt Butler Technical University, Kanpur, U.P., India. Pin-208002</p>
11:25AM – 11:30AM	<p>OP22: In Silico Screening and Identification of Genes and Proteins for Plastic Biodegradation: A Computational Approach to Environmental Sustainability</p>

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	<p>Ishita Singh, and Garima Awasthi* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow – 227105, Uttar Pradesh, India</p>
11:30AM – 11:35AM	<p>OP23: Biofunctional Zinc Nanoparticles from <i>Butea monosperma</i> Root Extract: A Green Approach to Antimicrobial Wound Healing Rajeshreeba A. Jadeja¹, Suranjana V. Mayani^{1*} ¹Department of Chemistry, Marwadi University, Rajkot, Gujarat, India</p>
11:35AM – 11:40AM	<p>OP24: Evaluation of Antibacterial Activity of Herbal Extracts Against Antibiotic-Resistant <i>Escherichia coli</i> Ratnpriya¹, and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
11:40AM – 11:45AM	<p>OP25: Performance auditing of lakes of Bangalore Basavaraja Huliappagala¹, Pallavi Nagaraju^{2*}, Kalya Tulasidas Vadiraj^{3*} Tondoti Satyanarana Rao Harsha^{4*} ¹Part time Research Scholar JSSAHR Mysore & Head-Civil, National Centre for Biological Sciences (NCBS/TIFR), UAS, GKVK Campus, Bellary Road, Bengaluru; ^{2,3}Department of Environmental Sciences, School of Life Sciences, JSS Academy of Higher Education & Research, Sri Shivarathreeshwara Nagar, Bannimantap, Mysuru, Karnataka-570015; ⁴Chairman, Department of Environmental Sciences, KSOU, Mysuru, Karnataka570006</p>
11:45AM – 11:50AM	<p>OP26: In Silico Molecular Docking of Herbal Bioactive Compounds Against Parkinson's Disease-Associated Target Proteins for Novel Drug Discovery Yashvardhan Singh¹, Mohit Nigam², and Aditi Singh^{1*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
11:50AM – 11:55AM	<p>OP27: Kinetic Study for Biodegradation of Reactive Red Dye Riddhima Giri and Garima Awasthi* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow – 227105, Uttar Pradesh, India</p>
11:55AM – 12:00PM	<p>OP28: Data-Driven Drug Repurposing and Biomarker Discovery in Colorectal Cancer Using Transcriptomics and Machine Learning Sakshi Mishra¹, AmpasalaDinakara Rao^{2*} ¹Indian Institute of Pulses Research, Kanpur, India. ²Department of Bioinformatics, Pondicherry University, Puduchery-605014, India</p>
12:00PM – 12:05PM	<p>OP29: Next-Generation DNA Technologies in Forensic Applications Dhruv Sinha* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Gomti Nagar Extension, Lucknow - 226028 (India)</p>
12:05PM – 12:10PM	<p>OP30: Development, Design, and Characterization of Bismuth and Titanium Nanoparticle-Enhanced Silk Fibroin Composites for Biomedical Applications</p>

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	<p>Priya Bhut¹, Suranjana V Mayani^{1*} ¹Department of Chemistry, Marwadi University, Rajkot-Morbi Road, P.O. Gauridad, Rajkot, 360003, Gujarat, India</p>
12:10PM – 12:15PM	<p>OP31: Utilization of Kitchen Waste for the Production of Acid Sudeep Kumar Tiwari^{1*}, Dr. Raj Kamal Kushwaha¹ ¹Harcourt Butler Technical University, Kanpur (UP)</p>
12:15PM – 12:20PM	<p>OP32: Development of A Novel Cattle Feed Nandana Mishra*, Priyanka Agrawal Department of Biotechnology, Institute of Engineering and Technology, India</p>
12:20PM – 12:25PM	<p>OP33: Precision Medicine and Diagnostics: Transforming Global Healthcare through Individualized Therapies Shreya Singh*, and Lalit Kumar Singh Department of Biotechnology, School of Pharmaceutical and Biological Sciences, Harcourt Butler Technical University, Kanpur, U.P., India. Pin-208002</p>
12:25PM – 12:30PM	<p>OP34: In Vitro Evaluation of Probiotic Properties of Lactobacillus Isolates under Stimulated Gastrointestinal Conditions Palak Khattri¹, and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
12:30PM – 12:35PM	<p>OP35: Dielectric Conductivity and Dielectric Properties of Co-doped NiFe₂O₄ at Room Temperature Jyothi A. Goudar^{1,2}, Thrinethra S.N.^{1,3}, Sharanappa Chapia, Murugendrappa M.V.¹ ¹Department of Physics, B.M.S. College of Engineering, Bengaluru, Karnataka – 560 019, India; ²Department of Physics, Mangalore University, Mangalagangothri, Karnataka – 574 199, India; ³Department of Physics, B.M.S. College of Engineering (Affiliated to VTU, Belagavi), Bengaluru – 560019, Karnataka, India</p>
12:35PM – 12:40PM	<p>OP36: Skin Disease Prediction using Artificial Intelligence Anshi Saini*, Priyanka Agarwal# Department of Biotechnology, Institute of Engineering and Technology, Lucknow</p>
12:40PM – 12:45PM	<p>OP37: Morphomolecular Identification and Characterization of Sporidia Cultures Associated with <i>Sporisorium scitamineum</i> Infecting Sugarcane Ananya Sarkar Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Gomti Nagar Extension, Lucknow, India.</p>
12:45PM – 12:50PM	<p>OP38: Microbial Solutions to Plastic Waste: Enzyme and Bacteria-based Degradation Divyansh Verma Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, UP, India</p>
12:50PM – 12:55PM	<p>OP39: AI-Driven Agriculture: Transforming Food Security and the Blue Economy</p>

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	<p>Kevin Ochieng Kibabii University, Nairobi, Kenya</p>
12:55PM – 01:00PM	<p>OP40: Screening of Indigenous Plant Extracts for Alpha-Amylase Inhibition: A Preliminary Study towards Natural Antidiabetic Agents Adya Agnihotri¹, and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India; ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
01:00PM – 01:05PM	<p>OP41: Revolutionizing Pharmacovigilance through Artificial Intelligence and Machine Learning: A Global Scientific Outlook Pradhuman Dubey*, and Lalit Kumar Singh Department of Biotechnology, School of Pharmaceutical and Biological Sciences, Harcourt Butler Technical University, Kanpur, U.P., India. Pin-208002</p>
01:05PM – 01:10PM	<p>OP42: Raman Spectroscopic Analysis of the Medicinal Plant <i>Vitex negundo</i>: Investigation of Anti-Arthritic Potential in a Complete Freund's Adjuvant-Induced Murine Model of Rheumatoid Arthritis and Study of Antimicrobial Efficacy of Methanolic Leaf Extract of <i>Vitex negundo</i> Anshi gupta¹, Rajkamal kushwaha¹ Harcourt Butler Technical University Kanpur, India</p>
01:10PM – 01:15PM	<p>OP43: Production and Purification of Antimicrobial Compound through Bacterial Strain. Khushi Yadav and Aditi Singh* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India</p>
	<p>OP44: Microbial production of Bioethanol using Sugarcane bagasse Sanchita Singh, and Garima Awasthi* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow – 227105, Uttar Pradesh, India</p>
01:15PM – 01:20PM	<p>OP45: The Impact of DNA Fingerprinting in Forensics Harshit Vaish* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Gomti Nagar Extension, Lucknow - 226028 (India)</p>
01:20PM – 01:25PM	<p>OP46: Proteogenomic Analysis of Breast Cancer Markers for Targeting with Natural Phytocompounds via Molecular Docking Srishti Singh¹, and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
01:25PM – 01:30PM	<p>OP47: Exploring the Impact of Methicillin-Resistant Staphylococcus aureus (MRSA) on Cancer Cell Behavior in a Co-culture Model Anupriya Kushwaha, Rajkamal Kushwaha* Harcourt Butler Technical University, Kanpur, India</p>
01:30 PM – 02:00 PM	Lunch Break

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02:00 PM – 02:05 PM	<p>OP48: Gene Expression Profiling to Identify Biomarkers in Oral Squamous Cell Carcinoma (OSCC) Shristi Gupta¹ and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
02:05 PM – 02:10 PM	<p>OP49: Advanced AI Model for Predictive Modelling of Wound Healing Using Wound Image Datasets Pratyaksha Srivastava*, Wareesha, Md. Arman, Priya Mishra, Shreya Arora*, Dr. Manish Singh Rajput, Dr. Parul Johri Affiliation: Department of Biotechnology, Dr. Ambedkar Institute of Technology for Divyangjan, Kanpur, Uttar Pradesh, 208024.</p>
02:10 PM – 02:15 PM	<p>OP50: Bioactive Compounds and Medicinal Applications of Centella asiatica Pratibha Ranjan* & Aditi Singh# Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Gomti Nagar Extension, Lucknow</p>
02:15 PM – 02:20 PM	<p>OP51: Targeting Throat Cancer Biomarkers Identified via Proteogenomics Using Natural Phytochemicals: A Molecular Docking Approach Yadvendra Singh¹ and Mohit Nigam^{2*} ¹Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow, Uttar Pradesh, India ²Atmohive Biotech Private Limited, Kanpur, Uttar Pradesh, India</p>
02:20 PM – 02:25 PM	<p>OP52: Nanotechnology for Environmental and Medical Application Smita Manish Kamble Sabarmati University, Ahmedabad, Gujarat, India</p>
02:25 PM – 02:30 PM	<p>FT 18: Identification of potential hub genes for the diagnosis and therapy of Myositis Somali Sanyal* Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India</p>
02:30 PM – 03:30 PM	Valedictory Session and Award Announcement
02:30 PM – 02:35 PM	Unveiling of E-Abstract Book of ICISTRF 2025
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02:45 PM – 02:55 PM	Experience Sharing by Participants
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03:05 PM – 03:15 PM	Results Announcement of Oral Presentation
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KEYNOTE LECTURES



Keynote Lecture: 01

**Building a Flexible Future with Data: Practical Lessons from Business
Intelligence and Data Governance**

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Abstract

I have directly observed how powerful data can be when used in the right direction. In this talk, I'll share some real-world examples of how Business Intelligence and Data Governance help organizations make better decisions, stay agile during crises, and continuous improvements in innovation. I'll also discuss problems and issues around managing data and how to conquer them. My goal is to illustrate how smart, responsible use of data can make possible a more robust, resilient future for industry and science. This session should be very useful, relevant, and visionary.

Keynote Lecture: 02

Architecting the Future: AI-Driven Cyber Resilience in Biochemical Systems

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Abstract

In a future defined by the fusion of biology and computation, biochemical systems will become intelligent, interconnected, and increasingly autonomous. As synthetic biology and molecular manufacturing evolve, so too will the sophistication of threats. This keynote explores how AI will serve as both sentinel and strategist in shaping the next frontier of cyber resilience for biochemical engineering.

We will look beyond today's security paradigms, delving into how AI agents—powered by advanced transformers, graph neural networks, and reinforcement learning—will predict, preempt, and autonomously respond to threats across lab-to-cloud ecosystems. Identity systems will no longer authenticate users; they will interpret behavioral genomics, context-aware trust signals, and molecular-level data flows.

Real-world and speculative scenarios will illustrate how resilience engineering must evolve—shifting from reactive hardening to adaptive co-design with intelligent systems. From zero-trust biology to self-healing supply chains, this keynote offers a future-ready blueprint for those pioneering at the edge of science and security.

Keynote Lecture: 03

Evolving Firewall Architectures: Hardware-Centric Designs and Dynamic Policy Control

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Abstract

Modern firewall systems must adapt not only to rising traffic volumes but also to increasing complexity in network environments. This talk examines the evolution of firewall architectures from general-purpose software appliances to hardware-accelerated, high-throughput systems optimized for low-latency networks. We'll explore design shifts including ASIC-based enforcement, FPGA acceleration, and the integration of firewall logic into network interface cards. Additionally, the session covers dynamic policy generation mechanisms that enable real-time adaptability without sacrificing performance. Emphasis will be placed on architectural trade-offs, deployment models, and lessons learned from implementing scalable firewalls in latency-sensitive trading environments.

Keynote Lecture: 04

Architecting Enterprise Agility with JIRA: Governance, Scalability, and Integrated Reporting Frameworks

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Abstract

This keynote explores JIRA from an enterprise architecture perspective, focusing on how it can be strategically designed to support large-scale agile transformations. I will discuss governance models, cross-team standardization, and integration patterns that align JIRA with CI/CD pipelines, ITSM platforms, and data analytics tools. Emphasis will be placed on designing scalable workflows, establishing traceability across systems, and enabling executive-level reporting through custom dashboards and APIs. Attendees will gain insights into architecting JIRA as a central nervous system for project governance, compliance, and delivery excellence in complex, multi-team environments. This session is ideal for senior architects and enterprise leaders.

Keynote Lecture: 05

The Future of Smart Retail: How AI is transforming the Shopping Experience

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Abstract

Artificial Intelligence (AI) has immensely flourished throughout the entire retail domain, transforming it into a more vibrant, personalized, and productive shopping option available today. AI has changed the game for 'Smart retail' through personalization of product recommendations, automation of customer interactions, and inventory management. AI allows retailers to use vast amounts of data available on digital and physical touchpoints to project behavior, fine-tune experience and streamline processes. The essence of this paper is about what AI adds to the picture of a retail context, ranging from the application of machine learning, natural language processing and computer vision to enhance customer experience and operational efficiency. It also details how retailers face problems of systems incompatibility, earning the customer's trust, and why they do the cost-benefit analysis of the investment into AI. The paper also discusses how the future of retail is shifting from automated checkouts to mid-transaction real-time inventory tracking and augmented reality with the help of AI. It deals with the ethical implications of AI regarding data privacy, transparency, and the possibility of biases. This research finds that AI has the potential to transform retail, as well as insights into the future of retail and what retailers must do to remain competitive in a hyper-competitive industry. By adopting AI strategically, transparently, and continuously through innovation, AI can contribute significantly to customer satisfaction, business efficiency, and profitability.

Keynote Lecture: 06

Integrating Risk Management into Supplier Performance Management: A Resilience-Driven Approach

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Abstract

In today's volatile global supply chain environment, effective Supplier Performance Management (SPM) must go beyond traditional metrics and incorporate robust risk management frameworks. This paper explores a resilience-oriented approach to SPM by integrating both dependent and independent risk factors into performance evaluation and monitoring systems. Independent risk factors such as geopolitical instability, natural disasters, and macroeconomic shifts are external and largely uncontrollable, yet they significantly impact supplier reliability. Dependent risk factors, including supplier financial health, quality compliance, and delivery performance, are internal and can be influenced through strategic collaboration and oversight.

We propose a dual-layered risk tracking model that leverages real-time data analytics, predictive modeling, and key risk indicators (KRIs) to continuously assess supplier vulnerabilities. By mapping these risk factors to performance metrics, organizations can proactively identify potential disruptions and implement mitigation strategies. The model emphasizes the importance of dynamic risk scoring, scenario planning, and supplier segmentation to prioritize risk response efforts.

This integrated approach not only enhances visibility in supplier operations but also strengthens the organization's ability to adapt and recover from disruptions. Ultimately, embedding risk management into SPM fosters a more resilient, agile, and sustainable supply chain ecosystem.



Keynote Lecture: 07

Ransomware Defense for Sysadmins: Real-World Scenarios and Mitigations

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Abstract

Ransomware remains one of the most severe threats to modern IT environments, with attacks growing in sophistication and impact. This presentation, designed for system administrators, explores real-world ransomware attack vectors and the practical steps needed to defend against them. We'll cover critical prevention tactics such as patching, MFA, and service hardening, alongside robust backup and recovery strategies. The session also emphasizes detection and rapid response measures to minimize damage. Whether you're managing on-premise or hybrid systems, this talk offers actionable insights to strengthen your infrastructure and ensure resilience against one of today's most dangerous cyber threats

Keynote Lecture: 08

Synthetic Data for Scientific Innovation: Accelerating Discovery While Preserving Privacy

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Abstract

In the age of data-driven science, access to high-quality data is pivotal for accelerating innovation across domains from healthcare and climate science to materials engineering and behavioral research. However, scientific progress is often hindered by data scarcity, privacy concerns, regulatory constraints, and high acquisition costs. Synthetic data, generated using advanced statistical models and machine learning techniques, offers a promising pathway to overcome these barriers while enabling resilient, scalable innovation.

This talk explores the emerging role of synthetic data as a catalyst for scientific discovery. We will highlight how synthetic datasets—designed to mimic the statistical properties of real-world data without exposing sensitive or proprietary information can be used for model training, simulation, and hypothesis testing. Whether it's creating diverse patient cohorts for medical research, simulating rare weather events for climate models, or generating training data for AI systems in robotics and physics, synthetic data opens doors that were previously locked by ethical, legal, or practical limitations.

We will delve into recent advancements in generative models such as GANs (Generative Adversarial Networks), variational autoencoders, and transformer-based architectures that have significantly improved the realism and utility of synthetic data. Real-world case studies will illustrate how research institutions and technology companies are deploying synthetic data to fill critical gaps, accelerate validation cycles, and increase reproducibility in scientific experiments. Finally, we will address the key challenges including bias replication, validation frameworks, and regulatory acceptance and propose governance strategies to ensure synthetic data contributes to a trustworthy and resilient scientific ecosystem.

By harnessing synthetic data, we unlock a powerful tool that enhances innovation, democratizes access to research, and builds more adaptable and privacy-respecting scientific infrastructures for the future.

Keynote Lecture: 09

Driving Operational Efficiency Through Intelligent Supply Chain Orchestration – Strategies and Insights

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Abstract

In today's fast-moving world, supply chains need to be smart, flexible, and cost-effective. This talk focuses on simple and effective ways to improve supply chain operations using clear strategies, practical tools, and real examples.

We'll explore how to use data to forecast demand better, manage inventory more efficiently, and improve coordination with suppliers and logistics partners. The session will show how technologies like cloud platforms and real-time tracking are helping companies respond faster and avoid delays or shortages.

Based on real experiences in healthcare distribution and warehouse management, the talk will highlight ways to remove slow, manual steps, reduce waste, and improve overall service levels.

We'll also discuss how to fix common problems like scattered data, supplier delays, and poor communication by building connected systems and clear processes.

Attendees will leave with practical ideas they can apply right away to make their supply chains run more smoothly, save costs, and handle changes more easily.

Keynote Lecture: 10

Turbocharging Fraud Detection: A Data Engineering Breakthrough at Visa

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Abstract

In today's digital economy, fast fraud detection isn't just important—it's essential. At Visa, I led a data orchestration overhaul that dramatically accelerated fraud signal processing by over 50%. Leveraging Apache Spark, Hive, and Airflow, I redesigned legacy pipelines to detect threats in real time, cutting runtimes and boosting system reliability. This transformation not only safeguarded transactions across North America and Southeast Asia but also protected small businesses and financial institutions from millions in losses. This talk will explore how smart engineering, real-time data, and scalable design can keep our payment systems safe and trusted.

Keynote Lecture: 11

Building Resilient Infrastructure: Lessons from Cloud-Native Innovation and Virtualization

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Abstract

Resilience in modern science and technology is not just about recovery it's about adaptability, scalability, and sustained performance in dynamic environments. Drawing from real-world experience in cloud-native systems, CI/CD pipelines, and distributed Kubernetes-based architectures, this keynote explores how infrastructure innovation can lay the foundation for a resilient future. As organizations increasingly depend on complex, multi-cluster Kubernetes deployments, the ability to build, test, and scale reliable systems becomes critical. From automating cluster provisioning in CI environments to creating robust service account workflows and tokenized deployments, I will share lessons from designing systems that prioritize repeatability, fault tolerance, and transparency. Particular focus will be given to developing a Virtual Kubelet provider for a novel system Graph Runner that bridges the gap between abstract resource modeling and practical orchestration.

Three pillars underpin this approach:

Automation for Resilience – Leveraging Go-based testing frameworks, GitOps workflows, and tokenized deployments to create environments that recover and reconfigure autonomously.

Virtualization and Abstraction – Extending Kubernetes through Virtual Kubelet to support non-traditional compute backends, unlocking innovation without sacrificing control.

Pragmatic Systems Thinking – Balancing engineering rigor with agility, ensuring systems are testable, observable, and maintainable across diverse conditions.

Keynote Lecture: 12

AI-Powered Infrastructure Monitoring: Transforming Structural Health Assessment through Intelligent Drone Systems

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Abstract

The integration of artificial intelligence with unmanned aerial vehicle technology represents a paradigm shift in infrastructure monitoring and maintenance. This presentation explores cutting-edge AI-assisted crack detection methodologies utilizing drone imagery for comprehensive structural health assessment. We examine how machine learning algorithms, particularly computer vision and deep learning models, can automatically identify, classify, and quantify structural defects with unprecedented accuracy and efficiency. The discussion covers real-world implementations of Infrastructure Compliance Sentinel Systems that enable continuous monitoring of critical infrastructure including bridges, buildings, and industrial facilities. Through case studies and practical demonstrations, we will showcase how these intelligent systems reduce inspection costs by 60%, improve safety protocols, and enable predictive maintenance strategies. The presentation concludes with emerging trends in autonomous infrastructure monitoring and the potential for creating truly resilient, self-monitoring-built environments.

Keynote Lecture: 13

Bridging Cloud Architecture and Deep Learning: A New Frontier in Financial Data Security

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Abstract

Micro services represent an architectural paradigm where an application is decomposed into loosely coupled, independently deployable services aligned with specific business capabilities, enabling greater scalability, flexibility, and ease of maintenance. To overcome this problem, micro services are applied to financial data processing using a Multi-Component Attention Graph Convolutional Neural Network (MFD-MCAGCNN) is proposed; the input data are initially collected from the Greedy Cloud Selection Deployment on Micro services dataset and then the collected data fed to the pre-processing segment using the Robust Maximum Correntropy Kalman Filter (RMCKF) is used for data normalization. The pre-processed data is fed to the detection segment using Multi-Component Attention Graph Convolutional Neural Network (MCAGCNN). The pre-processing is fed to predict anomalous payment behavior, enabling a Micro service that flags suspicious transactions based on historical transaction data. The proposed MFD-MCAGCNN method excluded on the Python platform, and performance metrics such as accuracy, precision, sensitivity evaluated. The proposed MFD-MCAGCNN method achieves an accuracy of 98.9%, surpassing existing methods such as CAM-MAFSD 75.4%, CFFD-FSAI-MS 78.7%, and READ-IMCCS-VPN 85.2%. Lastly, the performance of the proposed technique contrasted with various existing methods such as Revolutionizing Enterprise Application Design: Integrating Micro services with Cloud Computing for Scalable Solutions (READ-IMCCS-VPN), Comparative Analysis of Monolithic and Micro services Architectures in Financial Software Development (CAM-MAFSD), A Cyber security framework for fraud detection in financial systems using AI and Micro services (CFFD-FSAI-MS).

Keynote Lecture: 14

Autonomous AI Agents: Bridging the Gap between Intelligence and Action

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Abstract

Imagine an AI that can schedule meetings, write and test code, analyze market trends, or manage workflows autonomously. We are entering a new era of AI, where intelligent agents can go far beyond static prompt-response interactions. This keynote explores the rapidly emerging field of autonomous AI agents: LLM-powered systems that can plan, reason, invoke tools, and execute multi-step objectives with minimal human intervention. We'll walk through leading architectures like AutoGPT, ReAct, and function-calling agents, and reveal their practical strengths and limitations. Real-world use cases from customer support and research assistants to product automation and enterprise co-pilots will be dissected for insights. You'll leave with an understanding of how to design agentic systems that are powerful, safe, and production-ready.



INVITED LECTURES

Invited Lecture 01:

When the Gut Talks, the Nerves Listen: Microbiome and Neuropathic Pain

Dr. Vinod Tiwari

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Abstract

Neuropathic pain, resulting from somatosensory nervous system damage, poses treatment challenges due to the limited efficacy and side effects of existing therapies. Recent studies suggest the gut microbiome's role in pain modulation, but the specific species and mechanisms involved in chronic neuropathic pain remain poorly understood. In this study, Chronic Constriction Injury (CCI) was used to investigate the relationship between gut microbiota and neuropathic pain using fecal microbiota transplantation (FMT) in wild type and antibiotic-treated pseudo-germ-free (PGF) rats. Our results showed that CCI led to a significant loss of microbial diversity, with an increased abundance of *Proteobacteria* and *Fusobacteriota*, and a reduction in *Actinobacteria* at the phylum level. Fecal microbiota transplants from healthy rats (hFMT) alleviated mechanical, thermal and cold hyperalgesia but did not reverse mechanical allodynia in CCI rats. In contrast, transplanting dysbiotic fecal slurry (dFMT) from CCI rats induced pain-like hypersensitivity, mimicking the nerve injury-like effects in healthy rats. Further correlation analysis revealed distinct shifts in microbiota composition linked to nerve injury and FMT intervention. We identified species associated to pain modulation, such as *Pasturellaceae _bacertium*, *Bacillus sp*, and *Staphylococcus ariettae*, which were linked to the dysbiosis induced by nerve injury. *Bifidobacterium animalis*, *Cornybacterium urealyticum* and *Desulfovibrio piger*, were associated with reduced pain behaviors. Fecal transplants from healthy rats restored *claudin-5* and anti-inflammatory TGF- β and IL10 mRNA levels in the spinal cord tissues & also downregulated pain-associated TRPM8, Nav 1.8, Nav 1.7, and TRPA1 in CCI rats. In contrast, FMT from diseased donor rats elevated the protein expression of IBA1, TNF- α and IL1 β , triggering microglial activation and neuroinflammation in healthy rats. In conclusion, our findings indicate that composition of gut bacteria with respect to the donor FMTs, not only influence pain modulation but may also drive pain-like behaviors through nerve injury-induced microbial dysbiosis, operating bidirectionally.

Invited Lecture 02:

Advancing Neurodegenerative Diseases Treatment with Nanomaterials

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Abstract

Neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease, Multiple Sclerosis, and Amyotrophic Lateral Sclerosis (ALS), affect over 50 million people globally and represent a significant societal and clinical challenge. These conditions are marked by progressive neuronal degeneration resulting from complex multifactorial mechanisms such as mitochondrial dysfunction, oxidative stress, and the accumulation of misfolded proteins. Current treatments are largely palliative, limited in efficacy, and hindered by the blood-brain barrier (BBB), which prevents more than 98% of conventional therapeutic agents from reaching the central nervous system.

In this study, we present a novel nanotechnology-based therapeutic approach using mesoporous silica nanoparticles (MSNs) for targeted treatment of ALS. We developed and characterized multifunctionalized MSNs (MSN-LEP-PIO) capable of exerting neuroprotective, anti-inflammatory, and antioxidant effects. Detailed structural and physicochemical analyses were performed using techniques such as X-ray diffraction (XRD), nitrogen adsorption (BET), transmission and scanning electron microscopy (TEM, SEM), and solid-state nuclear magnetic resonance (NMR). Drug release studies and conformational stability were evaluated through HPLC and circular dichroism.

In vitro BBB permeability was assessed via the PAMPA assay using polar brain lipid membranes, and *in vivo* experiments in ALS mouse models confirmed biocompatibility, absence of systemic toxicity, and no adverse effects on body weight. Notably, MSN-LEP-PIO demonstrated potential to cross the BBB, modulate reactive oxygen species, and protect against mitochondrial alterations and excitotoxicity. This nanosystem was effective in both pre-onset and symptomatic stages of ALS, highlighting its promise as a therapeutic strategy.

This research contributes to the growing field of nanomedicine for neurodegenerative diseases and underscores the potential of MSNs as versatile and efficient drug delivery vehicles to overcome current therapeutic limitations.

Invited Lecture 03:

Microbial Synergies in Phycoremediation and Carbon Sequestration: Pathways to Environmental Sustainability

Dr. Mohd Asyraf Kassim

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Abstract

The accelerating climate crisis and environmental degradation have heightened the need for innovative, nature-based solutions. Microbes, including bacteria, fungi, and microalgae, play a pivotal role in environmental remediation and carbon capture. This talk explores the synergistic role of microbial systems particularly in phycoremediation, the use of microalgae to remove pollutants from wastewater, and in biological carbon sequestration, where microbes fix atmospheric CO₂ into biomass. Emphasis will be placed on integrated systems combining microbial consortia to enhance pollutant removal, nutrient recovery, and greenhouse gas mitigation. By leveraging microbial potential, we can develop sustainable, low-cost technologies for water purification and climate change mitigation, aligning with global sustainability goals.

Invited Lecture 04:

Smart Viruses, Stronger Solutions: Bacteriophages in Biofilm Disruption

Aditi Singh

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Abstract:

Bacterial biofilms pose a significant challenge in clinical and industrial settings due to their resilience and resistance to conventional antimicrobial treatments. Bacteriophage-based therapy has emerged as a promising and targeted strategy to combat biofilm-associated infections. Bacteriophages (phages), viruses that specifically infect bacteria, can mitigate biofilms through multiple mechanisms. Primarily, phages directly infect and lyse bacterial cells within the biofilm, releasing progeny phages that propagate the infection cycle. Additionally, many phages produce depolymerases—enzymes that degrade the extracellular polymeric substance (EPS), the structural matrix that stabilizes biofilms—thereby weakening biofilm architecture and enhancing bacterial exposure to further treatment.

Recent advancements have enabled the engineering of phages to disrupt quorum sensing, the bacterial communication system responsible for coordinating biofilm formation and maintenance. By interfering with quorum sensing, engineered phages can prevent the establishment of new biofilms and promote the dispersal of existing ones. Furthermore, phages can be administered in combination therapies, such as phage cocktails or alongside antibiotics, to enhance their efficacy and overcome bacterial resistance mechanisms.

The unique advantages of phage-based biofilm mitigation include their host specificity, minimizing damage to beneficial microbiota, and their natural abundance, offering a sustainable and environmentally friendly treatment option. Phages also hold significant potential for genetic engineering to improve their biofilm-targeting capabilities, such as enhanced enzyme production or increased biofilm penetration.

Current research is focused on optimizing phage formulations for clinical applications, particularly in treating chronic wound infections, medical device-associated biofilms, and other persistent infections. Emerging technologies, such as phage encapsulation, are being explored to protect phages and ensure targeted delivery within biofilm environments. Collectively, phage therapy represents a novel, adaptable, and highly specific alternative to traditional antibiotics for managing biofilm-related infections.

Keywords: Bacteriophage therapy, Biofilm, Depolymerase, Quorum sensing, MDR bacteria, Phage engineering, Encapsulation

Invited Lecture 05:

C-Terminal Binding Protein 1 (CtBP1) and GATAD2B Serve As Novel Mediators of Progesterone/PR Suppression of Proinflammatory and Contractile Genes in the Pregnant Myometrium

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Abstract

Progesterone (P4), acting through its receptor (PR), plays a central role in the maintenance of pregnancy by suppression of proinflammatory (e.g. COX-2, IL-8) and contractile (e.g. CX43, OXTR) genes in the myometrium. P4/PR exerts these effects, in part, by tethering to nuclear factor- κ B (NF- κ B) bound to the promoters of these genes, resulting in a decline in NF- κ B transcriptional activity. Recently, we found that the PR DNA-binding domain (DBD) plays a crucial role in P4-mediated suppression of endogenous proinflammatory genes; however, this inhibitory effect of P4/PR was not mediated by direct DNA binding. We further observed that P4/PR transrepression activity occurred at the level of transcription initiation and was mediated by decreased recruitment of NF- κ B p65 and RNA Pol II to the COX-2 and IL-8 promoter regions. Thus, we postulated that nuclear proteins interacting with the PR DBD may play an important role in P4/PR mediated transrepressive activity. Using immortalized human myometrial cells (hTERT-HM) stably expressing wild-type PR-B (PR-BWT) or PR-B containing a mutation in the DBD (PRmDBD), we identified two transcriptional repressors, CtBP1 and GATAD2B, that interacted strongly with PR-BWT, but poorly with PR-BmDBD. P4 treatment of PRWT hTERT-HM cells, caused enhanced recruitment of endogenous GATAD2B and CtBP1 to NF- κ B-binding regions of the COX-2 and IL-8 promoters. Further, siRNA knockdown of endogenous GATAD2B or CtBP1 significantly reduced P4/PR-BWT transrepression of COX-2 and IL-8. Using RT-qPCR, we observed that GATAD2B and CtBP1 mRNA levels were significantly decreased in myometrial biopsies of pregnant women in-labor, as compared to those from women not-in-labor, at term. To gain further insight into expression and function of Gatad2b and Ctbp1 in the regulation of contractile gene expression during pregnancy and parturition, we analyzed myometrial tissues from timed pregnant mice. We observed that increased expression of OXTR and CX43 in mouse myometrium near term was associated with a marked decline in Gatad2b and Ctbp1 mRNA and protein. Using ChIPqPCR, we found that increased expression of OXTR and CX43 in myometrium near term occurred in concert with a marked decline in binding of endogenous Gatad2b and Ctbp1 to the NF- κ B-binding regions of the OXTR and CX43 promoters. This decline in corepressor recruitment was associated with a pronounced decrease in the repressive histone mark, H3K27me3. Together, these findings suggest



that *Gatad2b* and *Ctbp1* serve as novel mediators of P4/PR suppression of myometrial proinflammatory and contractile gene expression. The decreased expression and DNA-binding of these corepressors near term contribute to the decline in PR function and result in the induction of myometrial proinflammatory and contractile genes leading to labor.

This work is supported by grants from NIH (5-P01-HD011149) and March of Dimes Foundation Prematurity Initiative (21-FY14-146).

Invited Lecture 06:

Unveiling the Gaucher Disease: Causes, Diagnosis, and Treatment Options

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Abstract

Gaucher disease is the most common lysosomal storage disorder, caused by a deficiency in the enzyme glucocerebrosidase. This inherited condition leads to the buildup of glucocerebroside within macrophages, affecting various organ systems and resulting in characteristic pathological features. The disease is classified into three main types, distinguished by the extent of neurological involvement and systemic symptoms. Current treatment options include enzyme replacement therapy, substrate reduction therapy, and supportive care. Early detection through enzyme assays and genetic testing allows for timely intervention, which can greatly enhance patient outcomes. This work provides an overview of the molecular basis of Gaucher disease, diagnostic techniques, and current therapeutic approaches, while also discussing recent advances in treatment development.

Keywords: Gaucher disease, glucocerebrosidase, lysosomal storage disorder, enzyme replacement therapy, pathophysiology

Invited Lecture 07:

Recent Advancements in Plant-Microbe Interactions: Unlocking Sustainable Solutions for Agriculture and Ecosystem Health

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Abstract

The dynamic interplay between plants and microbes plays a pivotal role in shaping plant health, productivity, and stress resilience. Recent advancements in genomics, transcriptomics, and metabolomics have significantly deepened our understanding of plant-microbe interactions at both molecular and ecological levels. This presentation explores groundbreaking developments in symbiotic and associative interactions, particularly focusing on the roles of rhizobacteria, mycorrhizal fungi, and endophytes in promoting plant growth, enhancing nutrient acquisition, and mitigating biotic and abiotic stresses.

Key innovations include the engineering of synthetic microbial consortia, CRISPR-based modulation of plant immune responses, and microbiome-assisted breeding strategies. The integration of multi-omics approaches has unveiled novel signaling molecules and regulatory networks critical for establishing mutualistic relationships. Furthermore, recent studies highlight the potential of beneficial microbes in climate-smart agriculture, carbon sequestration, and phytoremediation.

This comprehensive overview underscores the potential of plant-associated microbiomes as sustainable tools for future-ready agriculture, offering environmentally sound alternatives to chemical inputs and paving the way for precision microbiome management in diverse agroecosystems.

Keywords: Plant-Microbe Interaction, Rhizosphere, Beneficial Microbes, Symbiosis, Microbiome Engineering, Sustainable Agriculture, Stress Tolerance, Multi-omics Approaches

Invited Lecture 08:

Quality Control and Quality Assurance in Research and Innovations
Dr. Garima Awasthi

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Abstract

Quality Control (QC) and Quality Assurance (QA) are the biggest support system of a robust quality management framework in research and innovation. QA encompasses the proactive strategies based on guidelines and systematic processes designed to prevent errors and ensure adherence to ethical, regulatory, and technical standards throughout the research project. It involves the implementation of Quality System Procedure (QSP), Standard Operating Procedures (SOPs), personnel training, and comprehensive documentation practices. QC focuses on the reactive aspect identifying, analyzing, and correcting errors through data validation, testing, and inspection that truly help in reaching the accurate and precise results for our research and innovation. Together, QA and QC foster scientific integrity, enhance reproducibility, and support the reliability of experimental outcomes. The various NABL guidelines are followed that support the research and innovation in different field such as ISO/ IEC 17025 for testing and calibration laboratories, ISO 15189 for medical testing laboratories. The integration is critical not only for maintaining high research standards but also for ensuring innovation is credible, scalable, and compliant with global standards. As scientific advancements increasingly intersect with societal applications, embedding QA and QC into research practices is vital for sustainable and impactful innovation.

Keywords: Quality control, assurance, NABL, SOPs, accuracy, precision, reproducibility

Invited Lecture 09:

**Life Cycle Assessment (LCA) of Microbial Production of Glucose Oxidase
Enzyme: A Sustainability Perspective**

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Abstract

The increasing demand for eco-friendly and sustainable biocatalysts in food, pharmaceutical, and biosensor industries has spotlighted *Glucose Oxidase* (GOx) as a valuable enzyme with widespread industrial applications. However, the environmental impact associated with its microbial production remains inadequately assessed. This study presents a comprehensive Life Cycle Assessment (LCA) of microbial production of glucose oxidase using *Aspergillus niger* under submerged fermentation conditions. The LCA was conducted in accordance with ISO 14040/44 guidelines, encompassing cradle-to-gate boundaries that include upstream (raw material procurement), core (fermentation and downstream processing), and utility inputs. Environmental indicators such as Global Warming Potential (GWP), energy consumption, eutrophication potential, and water footprint were evaluated using SimaPro software and Ecoinvent databases. Results reveal that substrate production and energy consumption during fermentation are the most significant contributors to environmental burdens. Process optimization strategies such as the use of agro-industrial waste substrates and renewable energy inputs showed promise in reducing the carbon footprint by up to 32%. This study not only benchmarks the environmental performance of GOx production but also provides actionable insights for process improvement, promoting the development of greener enzyme manufacturing technologies.

Keywords: Glucose Oxidase, Life Cycle Assessment, Microbial Enzyme Production, *Aspergillus niger*, Environmental Sustainability, Submerged Fermentation, Bioprocess Optimization



FLASH TALKS

FT01:

Investigating the Drivers behind the Surge in Adult Obesity

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Abstract

Obesity is a growing global public health challenge, with its prevalence rising sharply over recent decades. This epidemic is not limited to adults; it increasingly affects children and adolescents, raising concerns about its long-term societal and health impacts. Strongly linked to chronic conditions such as cardiovascular diseases, type-2 diabetes, certain cancers, and musculoskeletal disorders, obesity has become a leading cause of preventable mortality and morbidity. Additionally, it imposes psychological, social, and economic burdens, including stigmatization, reduced quality of life, and strain on healthcare systems. Hence the present study was taken with the objective of, *“Exploring the Factors Contributing to Rising Obesity Rates among adults”*, focused on understanding the prevalence and key determinants of obesity, a major non-communicable disease. The findings aim to inform public health strategies and empower individuals to adopt healthier lifestyles to mitigate the risks of obesity and related diseases. The survey was conducted in the Pune-Hinjewadi region on 100 voluntaries aged between 18-71 years (both men & women) using a dual approach to data collection: structured questionnaire-based interview to provide qualitative insights into their demographic profiles, lifestyle patterns, attitudes, beliefs, and behaviours influencing obesity and manual anthropometric measurements and advanced digital body composition analysis. This combination ensured a comprehensive and accurate evaluation of participants’ physical health indicators. The findings emphasized the significant impact of demographic and environmental factors on obesity rates and associated health outcomes. The study shed light on the broader implications of obesity as a public health concern and its strong association with chronic conditions like diabetes and cardiovascular diseases. In conclusion, the survey underscored the urgent need to address rising obesity rates by promoting targeted interventions, healthier lifestyles, and public awareness. The outcomes of this research provide valuable knowledge for developing actionable solutions to combat obesity and its long-term health impacts.

Keywords: Obesity, cardiovascular diseases, type 2 diabetes, cancers, musculoskeletal disorders

FT02:

Exploring the neurotherapeutic potential of *viburnum opulus* solid lipid nanoparticles in a tetrabenazine-induced rat model of parkinson's disease

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Abstract

Parkinson's disease (PD) is a progressive neurodegenerative disease seen with motor deficits, oxidative stress, neuroinflammation, and dopaminergic neuron loss. Current therapies offer symptomatic relief but do not slow disease progression. In this study, we investigated the neuroprotective effect of *viburnum opulus* extract solid lipid nanoparticles (SLNVE) in a tetrabenazine (TBZ)-induced PD rat model. TBZ, an inhibitor of vesicular monoamine transporter-2 (VMAT-2), reduces dopamine levels, causing Parkinson-like symptoms. Animals were divided into five groups: Control, Diseased (TBZ-induced), standard (levodopa+carbidopa), test-1 (SLNVE-50 mg/kg), and test-2 (SLNVE-100 mg/kg). Motor and cognitive function was significantly improved over the TBZ group, as assessed with behavioral parameters such as rotarod performance, catalepsy, hanging wire test and object recognition time in the SLNVE-treated groups. Biochemical analyses showed a significant decrease in oxidative stress indicated by the increased concentration of superoxide dismutase (SOD), catalase, and glutathione, with a decrease in malondialdehyde (MDA). Lower levels of C-reactive protein (CRP) and interferon-gamma (IFN- γ) suggested anti-inflammatory properties. SLNVE treatment resulted in an improvement in hematological parameters, suggesting systemic effects. RT-PCR analysis revealed upregulation of BDNF and downregulation of iNOS, supporting neuroprotective and anti-inflammatory actions, respectively. Histopathological examination revealed attenuated neural injury and inflammation. SLNVE of high-dose was superior with effectiveness versus standard drug therapy, making it a candidate such as a therapeutic agent for PD.

Keywords: *Viburnum opulus*; solid lipid nanoparticles; Parkinson's disease; neuroprotection

FT03:

Amino Acid-Derived Porous Polymer Nanocapsules for Targeted Cancer Therapy

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Abstract

Cancer remains the second leading cause of global mortality, driving urgent demand for advanced therapeutic strategies. In this context, biodegradable and biocompatible polymers-adhering to the 3B principle (bio-compatible, bio-degradable, bio-safe)-have emerged as promising platforms for drug delivery. Leveraging nanotechnology and biopolymer engineering, we report the synthesis of porous amino acid-based polymer nanocapsules (~200 nm) for sustained anticancer drug release and tumor-specific targeting. The selected copolymer, [(L-GluA-5-BE)-b-(PNIPAM)], was synthesized via ring-opening polymerization, enabling self-assembly into spherical nanoporous structures. These capsules exhibit high drug-loading efficiency for doxorubicin (DOX) and imatinib (ITM), demonstrating potent cytotoxicity against K562 leukemia cells. Their tunable properties-including surface tension, amphiphilicity, and crosslinking density-optimize stability and controlled release kinetics. Beyond oncology, these multifunctional capsules hold promise for tissue engineering *and* diagnostics, as validated by comprehensive characterization (FTIR, NMR, SEM, TEM, LSCM, MTT assays). This work underscores the potential of amino acid-derived porous polymers in next-generation biomedical applications.

Keywords: Amino acid, Polymer, synthesis, nanoporous, capsules, cancer

FT04:

Impact assessment of coal mining activity on soil quality around Samleshwari OCP Mines Jharsuguda, Orissa

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Abstract

The opencast mining operations have periodical effects on surrounding landscape and it is important to monitor the quality of the overburden (OB) soil. The samples collected from the depth of 5 cm on the surface of soil with different physical (soil texture and soil moisture) and chemical (pH, organic carbon, and nitrogen) parameters are analyzed to study the effect of opencast mining on the surrounding soil. The result of this analysis predicts the sample soils deficiency of nutrients contents like nitrogen, phosphorus, potassium, and calcium. The soil analysis comprises chemical parameters such as pH, lime status, texture, electrical conductivity, available macronutrients nitrogen (N), phosphorous (P), potassium (K), and heavy metals micronutrients such as Fe, Mn, Zn, and Cu percentages which are used to determine the condition and quality of the soil. The QGIS software (version 3.24.0.) was used to locate the study area.

Keywords: Heavy metals, soil, and geographic information systems (GIS)

FT05:

Assessment and Monitoring of Paediatric Radiation Dose in Computed Tomography Brain and Pulmonary Angiogram

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Abstract

Aim: To assess and monitor the Paediatric Radiation dose in Computed Tomography brain and pulmonary angiogram. The objective of Paediatric patient radiation dose assessment and monitoring for CT Brain and CT pulmonary angiogram is to ensure that the radiation dose values are comparable with the established Diagnostic Reference Levels and thereby check the appropriateness of the CT Protocol used. Site of the study: Department of Radiology and Imaging Sciences, Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai. Type of the study: Retrospective Sample size: CT BRAIN: 200 nos., CT PULMONARY ANGIOGRAM: 100 nos. Inclusion criteria: Pediatric patients who are referred to CT brain and pulmonary angiogram. Exclusion criteria: Patients above the age of 15. Patients referred for CT Brain were screened and positioned appropriately for scanning. For CT Pulmonary angiogram, proper preparation including fasting, RFT check, consent, and contrast media administration protocols were followed. Appropriate scanning parameters were applied based on the protocol in GE Revolution Evo 128 slice and Philips Brilliance 16 slice CT scanners using smart prep and bolus tracking techniques, respectively. Radiation dose data from PACS were retrospectively collected and analyzed including CTDI and DLP values per phase and in total. Results: The dose data showed significantly higher values in the 0–1-year-old group compared to older pediatric sub-groups. Children, due to their heightened sensitivity to ionizing radiation and longer life expectancy, face greater risks of radiation-induced effects. In conclusion, the 0–1 year group receives comparatively higher doses during CT scans, necessitating meticulous dose optimization strategies by radiology professionals to ensure safety in pediatric imaging.

Keywords: Paediatric Radiation, Computed Tomography, Pediatric patients, Pulmonary angiogram, radiology

FT06:

Chemical Composition and Antibacterial Activity of the Essential Oil Extracted from Peels of *Citrus* species against selected Food borne Pathogens

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Abstract

Lemon and Sweet Oranges in India are mostly processed for juice and their peels are wasted or landfilled. To addvalue, it is essential to utilize the peels and extract useful materials such as Citrus essential oils from the waste peelsof *Citrus lemon* (lemon) & *Citrus sinesis* (orange). Citrus Essential Oils (EOs) have the potential to be used as an alternative to synthetic chemical preservatives to prevent food spoilage in food products to be used as a foodpreservatives. The aim of this research work was to study the chemical composition and antibacterial activity of Citrus essential oils alone and in combinations against food borne pathogens namely *Staphylococcus aureus*, *E. coli* & *Pseudomonas aeruginosa*. The chemical composition of EOs was analyzed by gas chromatography–massspectrometry (GC-MS). The antibacterial activities of the EOs on selected three bacteria were tested by measuring the minimum inhibitory concentration (MIC) and inhibition zone diameter (IZD). In *C. lemon* essential oil, twentyfour compounds and *C. sinesis*, sixteen compounds were identified by Gas Chromatography Mass Spectrometry (GC-MS). We found that the active components of the *Citrus* EOs were mainly terpenes, and the content of d-limonene was the highest. The antibacterial activity of *Citrus* essential oils was screened by using Disc Diffusion and modified micro dilution method against selected bacteria. The antibacterial activity showed that Citrus EOs had selective antibacterial activity. In this study, combination of essential oils (*C. lemon* & *C. sinesis*) also tested showed excellent additive, synergistic and antibacterial activity as compared to single oils and references antibiotics. Interactions between these components may lead to antagonistic, additive or synergistic effects. These results conclude that mixture of oils can be used as excellent antibacterial agent for the food preservation with the aim of current study to explore the possibilities of replacing chemical antibacterial and antifungal with natural plant-based products in food industry.

Keywords: Additive, Synergistic, Essential Oils, Citrus, Inhibitory

FT07:

Nanotechnology: Bridging Environmental Safety and Medical Breakthroughs

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Abstract

Nanotechnology is a rapidly advancing field that utilizes nanoscale materials to address critical challenges in both environmental protection and medical science. In environmental applications, nanomaterials are proving to be more effective than traditional methods in removing pollutants from water, air, and soil. For instance, certain nanoparticles can eliminate heavy metals, chemicals, and harmful microbes from water sources, enhancing water quality and safety. They are also employed in treating oil spills and breaking down toxic substances, thereby preserving ecosystems and public health. Additionally, nano-enabled sensors can detect environmental pollutants swiftly and accurately, facilitating early intervention and mitigation. These innovations not only aid in pollution control but also contribute to resource efficiency and the promotion of renewable energy solutions. In the medical field, nanotechnology is transforming healthcare by making treatments more targeted and less invasive. Nanoparticles can be engineered to deliver drugs directly to affected cells, such as in cancer therapy, resulting in improved efficacy and reduced side effects. Moreover, nanotechnology supports the development of advanced diagnostic tools, enabling earlier and more accurate disease detection. It also contributes to innovations in medical imaging, tissue engineering, and wound healing, offering new avenues for personalized and regenerative medicine. Overall, the integration of nanotechnology in environmental and medical sectors is enabling faster, cleaner, and more efficient solutions to problems that were previously difficult to manage. By harnessing the unique properties of materials at the nanoscale, nanotechnology holds the potential to create a healthier and more sustainable future.

Keywords: Nanotechnology, Environmental Applications, Medical Applications, Nanomaterials, Pollution Control

FT08:

The Role of Robotics in Hospital Care: Advancing Efficiency and Safety

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Abstract

The growing complexity of healthcare demands innovative solutions to improve patient outcomes and streamline hospital operations. With global healthcare spending projected to reach \$10.5 trillion by 2026 and a shortage of 10 million healthcare workers by 2030 (WHO), hospitals are turning to robotics to fill critical gaps. Robotic systems offer significant gains in efficiency, accuracy, and safety. For instance, surgical robots now assist in over 1.5 million procedures annually, reducing complications by 21%, while delivery robots improve logistical efficiency by up to 50%. Robotic nursing aids have also been shown to reduce staff workload by 25%. This study explores the role of robotics in surgery, logistics, and patient care, evaluating their impact on operational efficiency and safety in modern hospital environments.

A systematic review with a qualitative approach was conducted using literature from 2015–2025 across PubMed, Scopus, Web of Science, and IEEE Xplore. Three hospital case studies and reported interviews were analyzed, focusing on surgical robots, delivery robots, and robotic nursing assistants. Thematic analysis was used for synthesis.

The findings reveal that surgical robots, such as the Da Vinci system, improved procedural accuracy, resulting in a 21% reduction in complications and 30% faster recovery times. Autonomous delivery robots enhanced logistics efficiency by up to 50%, decreasing staff workload and improving supply delivery speed. Robotic nursing assistants reduced routine task time by 25%, enabling nurses to focus on direct patient care. Across the reviewed cases, hospitals reported a 15–30% decline in medical errors and a noticeable drop in hospital-acquired infections. These findings highlight robotics as a key driver of improved efficiency and patient safety in hospital settings.

Despite challenges such as high initial costs and the need for specialized training, the long-term benefits of integrating robotics in hospital care are substantial. Robotics has proven to enhance workflow efficiency, optimize resource utilization, and significantly improve the safety and quality of patient care. As healthcare systems face increasing demands and workforce shortages, robotics offers scalable, sustainable solutions to bridge critical gaps. This review concludes that continued innovation, investment, and strategic implementation of robotic technologies will be essential in shaping the future of healthcare delivery making hospitals more efficient, responsive, and patient-centered.

Keywords: Hospital robotics, healthcare automation, surgical robots, patient, safety, operational efficiency, robotic nursing assistants

FT 09:

Catalyzing Resilience: Strategic Innovation in Science and Technology for an AI Driven Future

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Abstract

This study examines the strategic role of science and technology (S&T) innovation in fostering a resilient future within the accelerating context of Artificial Intelligence (AI). AI continues to transform critical sectors—such as healthcare, finance, and communication offering unprecedented opportunities for human advancement (Ries, 2011; Rogers, 2003). Yet, these technological leaps introduce multifaceted risks, including algorithmic bias, data privacy concerns, job displacement, and autonomy-related threats (Porter, 2008). A resilient future is defined here as one that anticipates, withstands, and adapts to sudden shocks and long-term stresses be they technological, environmental, or social. This paper asserts that resilience can only be achieved through forward-looking, interdisciplinary S&T innovation. Key areas include biotechnology for health security, renewable energy for climate resilience, sustainable computing, and advanced materials for infrastructural robustness. Crucially, these developments must be integrated with ethical AI frameworks to ensure equitable and responsible deployment (Lafley & Martin, 2013). The study underscores the need for inclusive innovation ecosystems that democratize access to technology and promote societal well-being. Employing a qualitative, conceptual methodology, this research synthesizes insights from innovation management, AI ethics, public policy, and sustainability science. A comprehensive literature review supports a multi-sectoral analysis of resilience-building strategies, combined with ethical assessments that highlight the societal implications of innovation. The findings have broad implications for policy, industry, education, and public discourse. They call for agile regulatory frameworks, resilience-focused investments, and educational reform that equips future generations with critical thinking and ethical literacy. Ultimately, the study contends that innovation must be guided by human-centric values, strategic foresight, and adaptive governance to effectively navigate the challenges of the AI age and secure a sustainable, resilient future.

Keywords: Innovation, resilience, artificial intelligence, science and technology, strategic foresight, ethical governance

FT 10:

Role of Innovation in Science and Technology in Building a Resilient Future

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Abstract

Innovation in science and technology is pivotal for constructing a resilient and sustainable future, addressing pressing global challenges such as climate change, public health emergencies, environmental degradation, and resource scarcity. Through continuous research and the integration of advanced methodologies like the scientific method, design thinking, and agile development, scientific innovation has emerged as a formidable instrument for societal progress. Few notable examples are development of renewable energy sources such as solar and wind power to transformative breakthroughs in healthcare and communication technologies, all of which have significantly enhanced quality of life, improved disaster preparedness, and stimulated economic growth. This paper delves into how both drastic and incremental innovations contribute to resilience by augmenting adaptive capacities and fostering sustainable development. It underscores the vital role of citizen science, inclusive technology, and data-driven decision-making in formulating solutions that are not only effective but also universally accessible, particularly to underserved populations. This study will further illuminate how innovation directly supports the achievement of the Sustainable Development Goals (SDGs), especially those pertaining to health, education, clean energy, and concerted climate action. Despite these significant strides, the paper identifies several persistent barriers, including pervasive inequities in technological access, insufficient infrastructural development in emerging economies, and the critical need for supportive policy frameworks to scale innovative solutions globally. The concluding remarks advocate for a comprehensive and holistic approach to innovation one that is inherently inclusive, widely scalable, and firmly rooted in collaborative efforts among diverse stakeholders, including governments, academic institutions, industries, and local communities. Ultimately, the paper emphasizes on an ongoing, dynamic process of rethinking, redesigning, and proactively responding to the world's complex and ever-evolving challenges in manners that are equitable, sustainable, and meticulously prepared for the future.

Keywords: Innovation, sustainable development, empowerment, equity, resilience, scientific methodology

FT 11:

Endocarditis: Host-Pathogen Interactions and Advances In Diagnostic Microbiology

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Abstract

Infective endocarditis (IE) is a high-mortality cardiovascular infection characterized by microbial colonization of heart valves and endothelial tissues. This research critically examines the pathogen-host dynamics, the molecular mechanisms of adhesion and biofilm formation, and current diagnostic limitations, particularly in culture-negative cases. Major causative agents *Staphylococcus aureus*, *Streptococcus viridans*, and *Enterococci* exploit thrombotic vegetations and fibronectin-coated prosthetic materials to establish infection. Emerging pathogens such as *Bartonella spp.* and *Coxiella burnetii* pose diagnostic challenges due to their fastidious nature and intracellular lifestyle. The study outlines how microbial virulence factors, including MSCRAMMs and FimA proteins, contribute to persistent colonization and immune evasion. Traditional blood cultures often fail, especially following empirical antibiotic use. This study compares the sensitivity of diagnostic tools: histopathology, serology, organism-specific PCR, and broad-range 16S rRNA gene PCR. Findings underscore that PCR testing of excised valve tissue achieves up to 92% detection sensitivity far surpassing serum or blood-based methods. The presentation advocates for a multi-modal diagnostic algorithm combining molecular and culture-based methods to enhance early detection. This approach is particularly vital in settings with limited resources, where diagnostic delays are common. By integrating clinical insight with microbiological innovation, this work contributes to more accurate, timely, and life-saving diagnostics for IE bridging the gap between pathogen complexity and practical care.

Keywords: infective endocarditis, biofilm, fastidious pathogens, PCR diagnostics, hostmicrobe interaction

FT 12:

Bioinformatics tools in Biology – An overview

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Abstract

Bioinformatics has emerged as an indispensable discipline that integrates biology, computer science, and statistics to manage, analyze, and interpret vast biological datasets. The rapid growth of genomic, transcriptomic, proteomic, and metabolomic data has necessitated the development and application of diverse bioinformatic tools to advance research in molecular biology, biotechnology, and medicine. This review highlights the wide-ranging applications of bioinformatic tools in biological sciences, emphasizing their role in sequence analysis, structural prediction, functional annotation, and data integration. Tools such as BLAST, Clustal Omega, and MUSCLE have revolutionized sequence alignment and homology searching, facilitating the identification of genes and conserved motifs. Structural bioinformatics platforms like SWISS-MODEL and Phyre2 allow researchers to predict three-dimensional protein structures, enhancing understanding of molecular interactions and drug target identification. Additionally, genome assembly and annotation software such as SPAdes, AUGUSTUS, and MAKER have accelerated the discovery and characterization of new genes and regulatory elements. Bioinformatics resources also contribute significantly to systems biology by enabling pathway analysis, network modeling, and visualization of complex biological processes through platforms like Cytoscape and KEGG Mapper. Furthermore, data repositories such as NCBI, Ensembl, and UniProt serve as foundational resources for data mining and comparative genomics. This review underscores the transformative impact of bioinformatic tools in modern biology, offering insights into their evolving capabilities and the need for continued development of user-friendly, robust platforms.

Keywords: Genomic, transcriptomic, proteomic, and metabolomic

FT 13:

Computational Assessment of SNPs in Key Genes Linked to Neurological Disorders

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Lucknow, UP, India

Abstract

Single Nucleotide Polymorphisms (SNPs) are the most common form of genetic variation and play a significant role in the pathogenesis of complex neurological disorders. This study aimed to perform a comprehensive bioinformatics analysis of SNPs associated with key genes implicated in major neurological diseases, including Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis (ALS), and multiple sclerosis (MS). Publicly available datasets were mined from dbSNP, GWAS Catalog, and DisGeNET to identify clinically relevant and high-frequency SNPs in neurological disease-related genes. Functional prediction tools such as SIFT, PolyPhen-2, and PROVEAN were employed to evaluate the potential deleterious effects of non-synonymous SNPs (nsSNPs) on protein function. Structural modeling and stability analysis were conducted using I-Mutant and Project HOPE to assess the impact of mutations on protein conformation and stability. Gene ontology and pathway enrichment analyses using DAVID and Enrichr revealed that most of the candidate genes are involved in synaptic signaling, neuroinflammation, and axonal transport pathways. Protein-protein interaction networks were constructed using STRING and Cytoscape to understand the connectivity and functional associations of SNP-affected genes. The integrative analysis identified several high-risk nsSNPs in APP, SNCA, MAPT, and GRN genes with potential pathogenic relevance. This purely computational approach demonstrates the utility of in silico SNP analysis in prioritizing genetic variants for further experimental validation and contributes to understanding the molecular basis of neurological disorders. The findings provide a foundation for future biomarker discovery and therapeutic targeting through precision medicine approaches.

Keywords: SNPs, Neurological Disorders, DisGeNET, DAVID, Bioinformatics

FT 14:

GIMAPS: A Sustained-Release Approach for Ulcerative Colitis Pranati Srivastava^{1*} and Ved Prakash Tripathi²

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Abstract

The present research focuses on the development and evaluation of a novel gastrointestinal mucoadhesive patch system (GIMAPS) for the targeted treatment of ulcerative colitis using prednisolone as the model drug. Current therapies for ulcerative colitis primarily utilize conventional dosage forms that often fail to provide site-specific delivery, leading to systemic side effects. The objective of this study was to formulate a sustained-release, colon-targeted drug delivery system that enhances therapeutic efficacy and minimizes adverse effects.

The drug prednisolone demonstrated good linearity in calibration curves across various pH media, indicating its suitability for controlled release formulations. Drug-excipient interaction studies via FTIR confirmed compatibility of prednisolone with selected polymers, pectin and Eudragit L-100. Multiple formulations (F1-F9) of GIMAPS were prepared and evaluated for physical properties including thickness, weight uniformity, swelling index, pH, folding endurance, drug content uniformity, mucoadhesive strength, and in-vitro dissolution profile. Among all, formulations F6 and F9 exhibited optimal performance with nearly 100% drug release over 8 hours, following zero-order release kinetics. Enhanced swelling index and mucoadhesive strength were observed with increased polymer concentration, confirming improved bioadhesion and controlled drug release capability.

In-vivo studies using an animal model demonstrated significant therapeutic efficacy of GIMAPS compared to standard oral dexamethasone. Parameters such as weight loss, stool consistency, rectal bleeding, and disease activity scores significantly improved in the formulation group. Histopathological examination further confirmed superior mucosal recovery and reduced inflammatory infiltration in animals treated with the mucoadhesive patch. This research establishes GIMAPS as a promising site-specific, sustained-release drug delivery system for effective management of ulcerative colitis, potentially overcoming limitations of conventional therapies.

Keywords: Colon-Targeted Therapy, Pectin-Eudragit Composite Systems, Zero-Order Drug Release Model, Histopathological Validation, Mucoadhesive Patch Formulation

FT 15:

Ancient Grains, Modern Health: Unlocking the Power of Nutri-Cereals

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Abstract

Nutri-cereals, often known as ancient grains, encompass a range of cereals like millets that are gaining renewed attention for their nutritional excellence and health benefits. Millets are among the earliest foods known to humans and were likely the first cereal grains domesticated for consumption. These grains are remarkable for their nutrient density. In India, millets are categorized as coarse cereals and are divided into major and minor millets. Millets are rich sources of protein, healthy fats, dietary fibre, and essential minerals such as iron, calcium, and magnesium. Despite their high nutritional value, millet consumption has declined over time due to the labour-intensive nature of their preparation and the lack of standardized processing methods that could make them as convenient as refined cereals. However, there is a growing recognition of millets' health-promoting properties. Research indicates that millets may help prevent and manage several health conditions, including diabetes, obesity, cardiovascular diseases, certain cancers, anaemia, celiac disease, and constipation. These benefits arise largely from their low glycaemic index, high fibre content, and the presence of phytochemicals with antioxidant and anti-inflammatory properties that support immune health. The current review aims to consolidate existing literature on the nutritional composition and health benefits of millets and to present this data in an easily documented pattern. Given the impressive nutritional profile and functional health benefits of millets, it is essential for nutritionists and dieticians to actively promote their inclusion in daily diets to enhance public health and revive interest in these ancient yet modern grains.

Keywords: Nutri-cereals, Major and minor millets, Functional Foods, Nutrient composition

FT 16:

Future Innovation for Waste Management in Healthcare System

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Abstract

Innovations in waste management for the healthcare system are crucial to improving sustainability, safety, and efficiency while reducing environmental and public health risks. Future innovations and trends are expected to shape healthcare waste management, as Smart Waste Segregation Systems includes AI and IoT-powered bins that automatically identify and sort different types of medical waste (e.g., sharps, infectious, pharmaceutical). Sensors can alert staff if improper segregation occurs, improving compliance and safety. Advanced Sterilization and Disinfection Technologies introduces Microwave and plasma pyrolysis to treat infectious waste in a cleaner, energy-efficient way. Non-burn treatment methods (e.g., autoclaving, ozone-based systems) to eliminate toxic emissions from incinerators. Circular Economy & Material Recovery involves Recycling and reprocessing of single-use devices (SUDs) using validated sterilization processes. Recovery of rare earths/metals from electronic healthcare waste (e-waste). Bioplastics and compostable packaging in hospitals to reduce plastic waste load. Blockchain for Waste Tracking includes the Use of blockchain systems to securely track medical waste from generation to disposal, ensuring transparency and preventing illegal dumping. AI-Driven Waste Analytics has the perspective of Predictive analytics to optimize waste collection schedules and reduce overflow can analyze usage and suggest operational changes to minimize waste at the source. Green Hospital Certifications & Zero-Waste Initiatives are important for the Development of zero-waste hospitals with full recycling, minimal incineration, and strong waste audits. Integration with green hospital certification systems (e.g., LEED for healthcare, WHO green hospitals initiative). Pharmaceutical Waste Innovations has significance for Drug take-back systems using smart kiosks for unused or expired medication. Drones and Automation for Waste Collection will introduce Autonomous vehicles or drones to transport waste in large hospital campuses, reducing human exposure. Biotechnology for Waste Degradation is the future for the Use of engineered microbes or enzymes that can degrade hazardous components of biomedical waste (like plastics, blood waste). Mycoremediation and bioremediation in landfills to detoxify healthcare waste.

Keywords: Waste management, Healthcare system, AI-powered tools, Pharmaceuticals, Waste degradation

FT 17:

Identification of potential hub genes for the diagnosis and therapy of Myositis

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Abstract

Myositis is an inflammatory autoimmune condition, where the body's immune system mistakenly attacks its own muscle fibers, causing inflammation and muscle damage. It can develop at any age but commonly appears in adults between 30-60 years and, in some types, children as young as 5-15 years. There are several types of myositis including Polymyositis (PM), Dermatomyositis (DM), Inclusion Body Myositis (IBM). PM is characterized by chronic muscle inflammation and weakness. DM presents with similar muscle weakness as polymyositis but includes a distinctive skin rash commonly found on the face, knuckles, elbows, knees, or chest. IBM is a progressive inflammatory disease, typically occurring in individuals over 50 years of age and uniquely affects both proximal and distal muscles of the forearms and lower legs. Understanding the specific genetic and molecular players in each type of myositis is essential due to its complex and variable presentation across different subtypes. The aim of this study is to identify hub genes associated with different types of myositis, using bioinformatics tools to analyze gene networks and prioritize key genes that may play central roles in disease mechanisms. Top 100 protein coding genes associated with PM, DM and IBM were retrieved from the GeneCards database. The 100 genes were imported into the STRING database to establish a protein-protein interaction (PPI) network, using a high-confidence score to ensure reliable connections. The PPI network was imported into Cytoscape, where the CytoHubba plugin was used to identify the top 10 hub genes based on network centrality measures. Finally, FunRich was used to find common genes associated with different myositis identified by CytoHubba. Results from the present study showed that IL1B, IL6 and TNF are the common hub genes among the all three types of myositis. CCL2 and CXCL10 are unique to PM while STAT3 and CD8A are unique to DM. IBM unique genes were identified as CTNNB1, INS, ALB, SIRT1, TP53, APOE and APP. Identifying hub genes, which represent highly connected and influential genes within the disease's protein-protein interaction networks, offers insight into the core pathways and biological processes driving each subtype. Identifying common hub genes across myositis types reveals shared molecular pathways driving muscle inflammation and immune response. These genes could serve as universal biomarkers for diagnosis and as targets for therapies applicable to multiple myositis subtypes. While unique hub genes to each subtype potentially serve as subtype-specific biomarkers and therapeutic targets.

Keywords: Dermatomyositis, Polymyositis, Inclusion body Myositis, Hub genes



FT 18:

Revolutionizing Scientific Innovation with Green Chemistry Approaches

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Abstract

Green chemistry, though not a new area, has recently garnered much importance. Industries prefer to adopt processes which are mainly non-hazardous, easier to undertake, lesser energy and time consuming, using re-usable reagents. This has laid the foundation to identify and develop various technologies such as microwave, ultrasonic, UV radiation, electrochemistry as green technologies. Solvents such as water have significant importance, being non-hazardous, easily recoverable, and lowering unnecessary wastage of energy. Other recoverable solvents such as acetone, alcohol, and methanol also come under green chemicals. Catalysts that promote chemical reactions, without causing hazardous effects and are recoverable, are also a part of green chemistry. Green chemistry methodology has improved various factors such as increased manufacturing efficiency, lowered production energy requirement, recycling of reagents, decreased solvent usage, less waste generation, and lowered the production cost.

Keywords: Efficiency, Catalyst, Green solvent, Green Technologies, Non-Hazardous



ORAL PRESENTATIONS



OP 01:

Sustainable Adsorbents from Cow Dung for Wastewater Treatment: Experimental Optimization and Mechanistic Study of Safranin O Removal

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Abstract

The increasing release of dye-tainted wastewater from textile factories is a major threat to both ecosystems and human health. This research looks at using biochar made from cow dung as a cheap and long-lasting way to get rid of Safranin O, a popular cationic dye. We made biochar by pyrolysis and then looked at its physical and chemical characteristics. We did batch studies to find the best settings for things like the amount of adsorbent, the concentration of dye, the pH, the temperature, and the amount of time the two substances were in contact. Adsorption followed the pseudo-second-order kinetic model and the Freundlich isotherm, which means that there were many layers of adsorption on a surface that wasn't uniform. Thermodynamic studies showed that the process happens on its own and takes in heat. The results show that using agro-waste to make dyes might be a good way to clean up wastewater, support circular economy practices, and develop long-term solutions for treating wastewater.

Keywords: Cow dung biochar, Safranin O, Adsorption kinetics, Thermodynamics, Wastewater treatment

OP 02:

Effectiveness of Progressive Muscle Relaxation Therapy for Stress Reduction in Patients with Coronary Artery Disease

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Abstract

throughout. In modern society, individuals face persistent stress and tension in daily life, and although people strive to stay healthy, contemporary lifestyles introduce multiple stressors that adversely affect well-being. Progressive Muscle Relaxation Therapy (PMRT) is a proven stress management technique that benefits various patient populations. Despite its effectiveness, stress assessment and management for patients with coronary artery disease (CAD) often receive inadequate attention in clinical settings. It is vital to educate and motivate CAD patients to adopt non-pharmacological interventions like PMRT. This study used an evaluative approach with a quasi-experimental design to examine the effectiveness of PMRT in reducing stress among CAD patients. A sample of 60 patients was selected using convenience sampling, with 30 patients assigned to an experimental group and 30 to a control group. Data were analyzed using descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (chi-square, paired t-test, unpaired t-test) to test the hypotheses. Before PMRT, the experimental group had 12% mild, 24% moderate, and 64% severe stress levels. After PMRT, stress levels improved significantly: 62% mild, 30.4% moderate, and 7.6% severe stress. The paired 't' test value of 10.353 was higher than the critical value at the 0.05 significance level, confirming a significant difference in stress levels pre- and post-intervention, thus accepting H1. Additionally, post-test results showed that the experimental group had notably lower severe stress levels than the control group, which reported 6.6% mild, 20% moderate, and 73.3% severe stress. The unpaired t-test value of 10.833 indicated a significant difference in post-test stress levels between groups, confirming the effectiveness of PMRT and supporting H2. Therefore, the study concludes that PMRT is an effective method for reducing stress in patients with coronary artery disease.

Keywords: Progressive Muscle Relaxation Therapy (PMRT), Coronary Artery Disease (CAD), Stress.

OP 03:

Harnessing Technological Innovation for a Resilient, Sustainable, and Inclusive Future: A Comprehensive Analysis

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Abstract

This research explores the pivotal role of science and technology in navigating the complex global landscape of the 21st century. Faced with overlapping crises—from climate change and pandemics to social and economic inequality—humanity stands at a critical juncture. The concepts of resilience, sustainability, and inclusivity have emerged as the foundational pillars for a viable future, yet their realisation is deeply intertwined and fraught with complexity. This analysis posits that while innovations in domains such as artificial intelligence (AI), biotechnology, green energy, and digital platforms offer unprecedented tools to accelerate progress towards the United Nations Sustainable Development Goals (SDGs), they are not a panacea. The deployment of these powerful technologies brings significant ethical and societal risks, including the amplification of bias, the deepening of the digital divide, and the erosion of privacy. The central thesis of this report is that the transformative potential of technology can only be harnessed through a deliberate, ethically-grounded, and globally coordinated governance framework. By examining the interdependencies of the core goals, surveying the technological frontier, analysing sectoral transformations, and confronting the associated perils, this report synthesizes a multi-stakeholder roadmap. It calls for a paradigm shift from reactive problem-solving to proactive system-building, where equity and sustainability are embedded by design. Ultimately, it argues that achieving a resilient, sustainable, and inclusive future requires not just technological breakthroughs, but a profound commitment to responsible innovation, multi-stakeholder collaboration, and adaptive governance that can navigate the rapid pace of change while ensuring technology serves human and planetary well-being.

Keywords: Sustainable, Resilient, Inclusive Future, Governance, Synergy Approach

OP 04:

Capillaries of the Western Ghats, Unveiling the Role of Freshwater Creeks in a Biodiversity Hotspot: A Review

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Abstract

The Western Ghats, an ancient mountain range and UNESCO World Heritage Site, is one of India's most vital biodiversity hotspots, encompassing a rich network of freshwater ecosystems. Among these, the often-overlooked creeks act as ecological capillaries small, seasonal water channels that play a foundational role in maintaining hydrological balance and ecological health. These creeks serve as headwaters for major river systems, support endemic species, sustain local livelihoods, and provide critical breeding grounds for amphibians. Their seasonal dynamics, shaped by monsoon patterns, create diverse microhabitats that enhance riparian biodiversity. Despite their ecological significance, these freshwater streams remain under-researched relative to the region's forests. Increasing anthropogenic pressures including habitat fragmentation, agricultural runoff, sewage discharge, and climate variability are degrading creek health and threatening their integrity. Water quality in many creeks is compromised by pollution, often exhibiting elevated bacterial loads, nutrient enrichment, and harmful chemical concentrations. Protecting these fragile ecosystems is imperative for maintaining the ecological resilience of the Western Ghats. Regular monitoring of creek water quality is essential to identify pollution sources, guide conservation strategies, and ensure the long-term sustainability of freshwater resources in the region.

Keywords: Western Ghats, Creeks, Microhabitats, Fragmentation, Water quality

OP 05:

Microbial Decomposers as a Sustainable Strategy for Enhancing Enzymatic Activity and Nutrient Release in Wheat Straw Decomposition

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Abstract

This study assesses the efficacy of isolated crop residue decomposers on lingo-cellulolytic decomposing enzymes, microbial activity, soil enzymatic activities and nutrient status in soil after wheat straw decomposition. Among the inoculants, CRDB48 demonstrated the highest microbial activity, followed by CRDB24, CRDB52, CRDF32, and CRDF8. The activities of β -glucosidase, protease, xylanase, and chitinase in soil after wheat straw decomposition varied significantly among the treatments which ranged from 12.46 to 39.6, 9.17 to 30.5, 141.76 to 65.12 and 1.33 to 0.65 $\mu\text{g g}^{-1} \text{h}^{-1}$, respectively. The highest β -glucosidase activity (39.6 $\mu\text{g PNP g}^{-1} \text{h}^{-1}$), protease (30.5 $\mu\text{g try g}^{-1} \text{soil h}^{-1}$) and chitinase activity (1.33 $\mu\text{g N-acetyl glucosamine g}^{-1} \text{soil h}^{-1}$) were recorded in CRDB48 isolates while as xylanase activity was peaked in CRDB24 (141.76 $\mu\text{g GE g}^{-1} \text{h}^{-1}$). Inoculation of crop residues decomposers on wheat straw increased soil organic carbon (SOC) from 0.37% to 0.51% and total carbon (TC) from 25.0 to 34.2 mg kg^{-1} and total nitrogen (TN) from 1.80 to 2.99 mg kg^{-1} soil. Among the inoculants, CRDB48 exhibited the highest SOC, TC, TN, available N (246.7 kg ha^{-1}), while CRDB24 and CRDF32 showed the highest available P (18.4 kg ha^{-1}). Molecular identification of CRDB24, CRDB48 and CRDB52 isolates showed close similarity with *Bacillus haynesii*, *Bacillus altitudinis*, and *Bacillus stratosphericus* as predominant bacterial species, while CRDF8 and CRDF32 isolates close similarity with *Fusarium oxysporum* and *Aspergillus fumigatus*. Over, it is concluded that *Bacillus altitudinis* strains was most effective in increasing microbial and enzymatic activity and nutrient status in soil.

Keyword: Microbial inoculants, Crop residue decomposers, Soil enzyme activities, Soil health

OP 06:

Compare the Thermal Performance, Energy Efficiency, and Sustainability Aspects of Bio-PCMs against Conventional Materials in High-Rise Building Applications

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Abstract

The pursuit of sustainable and energy-efficient solutions in the built environment has prompted the exploration of advanced materials for enhancing thermal performance in high-rise buildings. Among these, bio-based Phase Change Materials (bio-PCMs) have emerged as a promising alternative to conventional construction materials, owing to their ability to store and release latent heat within narrow temperature ranges. This paper presents a comparative analysis of the thermal performance, energy efficiency, and sustainability aspects of bio-PCMs versus conventional building materials in the context of high-rise applications.

Thermal performance evaluation reveals that bio-PCMs significantly reduce temperature fluctuations within building envelopes by absorbing excess heat during peak hours and releasing it during cooler periods. This thermal buffering leads to enhanced indoor thermal comfort and reduces reliance on active heating and cooling systems. In contrast, conventional materials such as concrete or insulation boards provide only passive resistance to heat flow, lacking the dynamic thermal regulation offered by PCMs. From an energy efficiency standpoint, integrating bio-PCMs into walls, ceilings, and facades contributes to notable reductions in HVAC energy demand. Simulation studies and experimental results demonstrate energy savings of up to 20–30% annually when compared to traditional materials. Furthermore, bio-PCMs can be tailored to specific climatic conditions, maximizing energy savings in composite and extreme climates typically encountered in high-rise buildings. Sustainability is another crucial aspect where bio-PCMs hold a distinct advantage. Derived from renewable sources such as plant oils or animal fats, bio-PCMs have a lower environmental footprint, are biodegradable, and often non-toxic, aligning with green building standards and life cycle assessment criteria. Conventional materials, in contrast, often involve high embodied energy and limited recyclability.

In this research paper, the integration of bio-PCMs in high-rise construction offers a multifaceted solution for achieving thermal comfort, reducing energy consumption, and promoting environmental sustainability, making them a viable and forward-looking alternative to conventional building materials.

Keywords: bio-PCMs, HVAC, energy savings, biodegradable, recyclability

OP 07:

Host Range Determination of Isolated Bacteriophages against Multi-Drug-Resistant *Pseudomonas Aeruginosa*

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Abstract

The emergence of multidrug-resistant (MDR) *Pseudomonas aeruginosa* poses a significant challenge to public health due to limited treatment options and high morbidity associated with infections. Bacteriophage therapy offers a promising alternative, exploiting the natural antibacterial activity of viruses that selectively target and lyse bacterial cells. This study aimed to isolate and evaluate the efficacy of bacteriophages obtained from various environmental water sources against clinical MDR isolates of *P. aeruginosa*. Water samples were collected from sewage and hospital effluents, were subjected to enrichment and filtration techniques to isolate specific bacteriophages by using Double Agar Overlay method. Total 50 clinical strains from different patient samples (Sputum, urine, Blood, CSF) were isolated and identified by MALDI-TOF. Out of them 40 were confirmed as Multi Drug Resistant by performing Antibiotic susceptibility testing (Kirby Bauer Method) as they were resistant for more than three classes of antibiotics. The isolated phages were purified and tested for their lytic activity using spot assays methods against a panel of MDR *P. aeruginosa* clinical isolates (40 MDR isolates of *P. aeruginosa*), demonstrating strong lytic potential. The results indicated that isolated bacteriophages from MDR *P. aeruginosa* showed potent lytic activity against diverse patient samples of MDR *P. aeruginosa* strains (31 out of 40 MDR strains), showing 77.5% of lytic activity, with some displaying broad host range and favorable stability under varying environmental conditions. These findings underscore the potential of using naturally occurring bacteriophages as targeted biocontrol agents for MDR *P. aeruginosa* infections. Future work will focus on characterization of isolated bacteriophages and checking its various physicochemical activities.

Keywords: Bacteriophages, *Pseudomonas aeruginosa*, Multidrug resistance, Clinical isolates

OP 08:

Revitalizing Soil Quality Using Vermicompost at St. Philomena's (Autonomous) College Campus, Bannimantap, Mysore, Karnataka

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Abstract

Soil quality is a crucial determinant of agricultural productivity and ecosystem sustainability. This study investigates the role of vermicompost as an effective amendment for revitalizing soil quality at St. Philomena's College (Autonomous) Mysore, focusing on its effects on physicochemical properties, biological activity, and overall soil health. Vermicompost is the product of organic waste processing by earthworms. Field experiments were conducted across diverse agro-ecosystems within the college's agricultural research facilities to assess the impact of varying vermicompost application rates on soil characteristics and plant growth. The results indicated significant improvements in soil structure, with increased aggregation and porosity, which facilitated enhanced water retention and aeration. Notably, vermicompost application led to a marked increase in organic matter levels, providing a sustained release of essential nutrients over time. Additionally, the combination of vermicompost with other organic amendments significantly increased plant growth parameters. For instance, studies have shown that vermicompost can enhance plant height by up to 26% and total biomass by 13% compared to controls. The findings highlight the potential of vermicompost not only to ameliorate degraded soils but also to serve as a viable strategy for organic waste management. This study emphasizes the importance of integrating vermicompost into soil management regimes at St. Philomena's College to promote long-term soil health, enhance agricultural productivity—including significant increases in plant growth—and mitigate environmental impacts from conventional farming practices. Overall, vermicompost emerges as a multifaceted solution for revitalizing soil quality and improving plant growth, underscoring the need for broader adoption in modern agricultural systems.

Keywords: Revitalization, Vermicompost, mitigation, Organic material, modern agriculture

OP 09:

Systems and Structural Insights into ECM Remodeling in Pulmonary Fibrosis

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Abstract

The progression of fibrotic lung diseases is driven by a dynamic interplay between structural proteins, signaling molecules, and extracellular matrix-modifying enzymes. To gain a deeper understanding of the molecular architecture underlying fibrosis, this study focused on a select group of proteins **COL1A1**, **ACTA2**, **MMP2**, **MMP9**, **FBLN1**, and **TGFBI**—all of which are known contributors to pathological tissue remodeling in the lung. Rather than relying solely on gene expression data, we employed structural bioinformatics and protein interaction analysis to uncover potential cooperative mechanisms among these molecules. Structural alignments were performed using **US-ALIGN** to assess 3D conformational similarities. This analysis revealed notable domain conservation between collagen-related and metalloproteinase proteins, indicating potential structural bases for shared functionality. To investigate their biological context, a protein-protein interaction (PPI) network was generated using the **STRING** database. The network highlighted key interactions and pathway associations, with **TGFBI** acting as a central hub influencing multiple downstream targets, particularly those involved in ECM regulation and myofibroblast activation. This approach provides a structural and systems-level perspective on proteins implicated in fibrotic lung pathology. Rather than analyzing individual genes in isolation, our findings support a model in which these proteins function in a highly interconnected and regulated environment. Such insights are valuable for identifying candidate proteins for therapeutic intervention and for designing future studies focused on protein-level modulation in chronic lung diseases. This work underscores the importance of integrative bioinformatics in deciphering disease mechanisms beyond transcriptomics.

Keywords: Fibrotic Lung Disease, Myofibroblast Activation, Pulmonary Fibrosis protein interaction, Bioinformatics

OP 10:

Sustainable Remediation of Cr (VI) Using Phyto-Synthesized Zerovalent Iron Nanoparticles: An RSM-Based Approach

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Abstract

Hexavalent chromium is a highly toxic and carcinogenic pollutant commonly found in industrial wastewater, posing serious threats to both environmental and human health. This study explores the use of green-synthesized zerovalent iron nanoparticles derived from *Aegle marmelos* (Bael) leaf extract for the efficient removal of Cr (VI) from aqueous solutions. The synthesis method employed plant-based reducing and stabilizing agents, offering an eco-friendly alternative to conventional chemical approaches. The nanoparticles were thoroughly characterized using Scanning Electron Microscopy, and Dynamic Light Scattering confirming their nanoscale structure and the presence of functional groups responsible for reduction and stabilization. Batch adsorption experiments were conducted to examine the effects of key operational parameters, including solution pH, nanoparticle dosage, and contact time on Cr

(VI) removal efficiency. Optimization of the process was achieved using Response Surface Methodology with a Central Composite Design. The statistical model showed a strong fit ($R^2 = 0.9987$), and Analysis of Variance confirmed its significance. The reduction of Cr (VI) to Cr (III) followed by adsorption onto the nanoparticle surface is identified as the dominant mechanism. This study highlights the potential of green-synthesized zerovalent iron nanoparticles as a cost-effective, sustainable, and highly efficient material for the removal of toxic heavy metals from wastewater. The integration of green nanotechnology with statistical optimization provides a reliable framework for developing scalable and environmentally friendly water treatment solutions.

Keywords: Adsorption; Chromium (VI); Green synthesis; Response Surface Methodology; Wastewater treatment; Zero-valent iron nanoparticles

OP 11:

Fermentative Cellulase Production from Agro-Waste Using *Bacillus subtilis* and Substrate Interaction Analysis via Molecular Docking

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Abstract

The growing emphasis on sustainable bioprocessing has positioned microbial biotechnology and agro-waste valorisation as promising strategies for economical enzyme production. This study explores a hybrid in silico–in vitro approach for cellulase production using *Bacillus subtilis* and dried fruit waste as substrate under submerged fermentation. To support substrate selection and optimize enzyme-substrate interaction, molecular docking was performed between a modelled cellulase enzyme (retrieved from NCBI and built via SWISS-MODEL) and key polysaccharides—cellulose and hemicellulose—found in agro-waste. Ligand structures were obtained from PubChem, and AutoDock Vina was used to evaluate binding affinities, confirming strong interactions that justified further experimental work. In the wet lab phase, *Bacillus subtilis* was inoculated into Mineral Salt Medium (MSM) supplemented with 10 g of dried fruit waste in 200 mL total volume, and incubated under shaking conditions. Fermentation performance was monitored through daily sampling, followed by centrifugation to collect cell-free supernatants. Protein concentration was quantified using the Lowry assay, and cellulase activity was determined via CMC_{Case} assay. The results confirmed that dried fruit waste serves as a viable substrate for microbial cellulase production, with significant enzyme activity observed in the experimental setups. This study highlights a low-cost and scalable strategy for enzyme production, guided by computational insights into enzyme-substrate affinity. The integration of bioinformatics and fermentation validates the potential of *Bacillus subtilis* as an effective biocatalyst and promotes the circular bioeconomy by converting agro-waste into value-added bioproducts.

Keywords: agro-waste, Lowry assay, enzyme-substrate interaction, cellulase, bioinformatics

OP 12:

Long Non-coding RNAs (lncRNAs) as Biomarkers to Predict the Severity of Ischemic Stroke Patients

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Abstract

In the aftermath of an ischemic stroke (IS), the delicate balance of the brain's cellular environment is disrupted, leading to a series of devastating consequences. Evidence has shown that the expression of long non-coding RNAs (lncRNAs) plays a crucial role in the complex molecular pathways that affect stroke severity and outcomes. We investigated the intricate relationships among lncRNA profiles, the extent of brain damage (cerebral infarct volume), and disease severity. In this prospective case-control study, we have included 100 subjects [IS patients=50, normal control =25, and diseased controls (seizures, migraines, headaches) =25]. In IS cases, infarct volume was calculated. The Medscape app calculates the NIHSS score to evaluate disease severity. Furthermore, the expression of circulating lncRNAs (SNHG4, UCA1, FAL1, and MALAT1) was quantified by qRT-PCR. In IS cases there were minor stroke (n=17), major stroke (n=7), right hemiparesis (n=12), left hemiparesis (n=12), anterior circulation stroke (n=20), posterior circulation stroke (n=4). In our study population, the mean age of IS patients (57.16), DC (51.54), and control participants (50.03). Significant overexpression of lncRNAs-SNHG4 (4.43 and 2.21-fold), UCA1 (2.28 and 1.04-fold), FAL1 (4.21 and 1.78-fold), MALAT1 (2.94 and 2.68-fold), in the plasma of IS cases compared to the DC & NC groups. Infarct volume and NIHSS is significantly associated with the expressions of lncRNAs- SNHG4, FAL1, UCA1, and MALAT1. Our study shows elevated lncRNAs-SNHG4, FAL1, UCA1, and MALAT1 in IS cases, suggesting their role as predictive biomarkers. Additionally, SNHG4, FAL1, UCA1, and MALAT1 expressions are linked to infarct volume and NIHSS scores, indicating IS severity.

Keywords: Ischemic stroke, Long non-coding RNA, National Institutes of Health Stroke Scale

OP 13:

Wearable Health Devices for Early Warning and Detection of Cervical Cancer

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Abstract

Wearable health devices have the potential to revolutionize early warning and detection of diseases, including cervical cancer. While cervical cancer itself is typically diagnosed through clinical screening methods like Pap smears or HPV testing, wearable health technologies could play a crucial role in early detection, monitoring health indicators, and preventing the disease through continuous data collection. Wearables can collect real-time data on various health metrics that could provide insights into the presence of cancer-related biomarkers like Heart Rate Variability (HRV), Blood Oxygen Levels, Skin Temperature and Hydration. Some wearables are being designed to analyze volatile organic compounds (VOCs) Biomarker Detection through Sweat. Future wearables could incorporate nanotechnology to monitor biomarkers in urine, sweat, or saliva. Since persistent infection with high-risk types of HPV (Human Papillomavirus) is the leading cause of cervical cancer, wearables could play a role in early detection and prevention by HPV Testing Integration and HPV Vaccine Monitoring Wearables paired with artificial intelligence could be used to continuously analyze health data and identify early warning signs of cancer. For example, Pattern Recognition and Predictive Analytics. Wearables can send real-time health data to healthcare providers, which enables remote monitoring and prompt action if any potential signs of cervical cancer are detected by Alerting Patients and Doctors and Virtual Health Consultations: Wearables could assess lifestyle factors that increase cervical cancer risk, such as: Smoking Detection, Physical Activity and Diet and Nutrition Wearables can also play a role in the post-treatment phase by monitoring the recurrence of cervical cancer by Continuous Monitoring and Psychological Well-Being Examples of Wearable Devices and Technologies for Cancer Detection are Fitbit & Apple Watch, E-skin Devices, Senseonics Eversense and BioPatch by BioTraceIT. Future Considerations have to be taken for Regulatory Approval, Data Privacy and Cost and Accessibility. In conclusion, wearable health devices hold immense promise for enhancing early detection, monitoring, and prevention of cervical cancer.

Keywords: Wearable device, Cervical Cancer, Smart watch, Early detection, Monitoring

OP 14:

Studies on Industrial Production of Ethanol to Optimize the Existing Fermentation Parameters for Maximizing Yield & Productivity

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Abstract

The global drive for more sustainable energy has increased the need for greater efficiencies in bioethanol production processes. This study sought to increase ethanol yield and productivity by optimizing the fermentation parameters held constant within an industrial context. Using the carbohydrate molasses as the only substrate, and glucose as a control, the project assessed the impact of temperature, pH, sugar concentration, nutrient level, and agitation of the media on metabolically active yeast strains commonly used in commercial fuel ethanol (bioethanol) production. Using a mixture of laboratory-scale experiments and statistical optimization strategies, including Taguchi Design and Response Surface Methodology (RSM), we were able to quantify optimal process parameters for the production of ethanol. The data indicate that altering fermentation parameters can lead to yield improvements of approximately 15%, along with better substrate utilization, and shorter fermentation times of the cycle. These results provide useful information and way forward for process engineers or biofuel manufacturers that want to obtain greater efficiencies of their processes without much alterations in infrastructure.

Keywords: Bioethanol, Fermentation, Industrial Ethanol Production, Molasses-Based Bioethanol

OP 15:

Computational Drug Repurposing Study Targeting Key Proteins in Alzheimer's Disease Using Molecular Docking Approaches

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Abstract

Alzheimer's Disease (AD) is a progressive and debilitating neurodegenerative disorder characterized by cognitive decline, memory loss, and impaired behaviour. Despite extensive research, current therapeutic options are limited, and the development of novel drugs remains challenging due to high costs, long timelines, and frequent clinical trial failures. In this context, drug repurposing has emerged as a promising alternative strategy, enabling the identification of new therapeutic uses for existing compounds with established safety profiles. The present study employed a computational drug repurposing approach using molecular docking techniques to evaluate the binding affinities of ten FDA-approved or bioactive phytochemical compounds—Apigenin, Berberine, Curcumin, Huperzine A, Kaempferol, L-Theanine, Quercetin, Resveratrol, Withaferin A, and Sorafenib—against three key proteins implicated in AD pathogenesis: Nicastrin, TREM2, and Cystatin C. These proteins play critical roles in amyloid-beta processing, immune regulation, and neuroprotection, respectively. Molecular docking was carried out using AutoDock Vina, and the results were analyzed based on the binding energy scores, which reflect the strength and stability of ligand-protein interactions. Among the tested compounds, Withaferin A and Sorafenib demonstrated the most favorable binding affinities, particularly with Cystatin C, exhibiting binding energies of -7.6 kcal/mol and -7.7 kcal/mol, respectively. These results indicate a potential for both compounds to act as multi-target therapeutic agents in AD treatment. Other phytochemicals such as Curcumin, Quercetin, and Huperzine A also displayed moderate to good binding affinities, supporting their continued evaluation. In conclusion, this *in silico* study highlights the utility of molecular docking in drug repurposing and identifies Withaferin A and Sorafenib as promising candidates for further investigation. Future *in vitro* and *in vivo* studies are essential to validate these findings and to assess the pharmacodynamics, toxicity, and therapeutic efficacy of these compounds in the context of Alzheimer's Disease.

Keywords: AutoDock Vina, Nicastrin, TREM2, Cystatin C, binding affinity

OP 16:

A Study on the Bioaccumulation of pesticides in *Catla catla* from selected taluks of Mysore District, Karnataka

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Abstract

This study explores the extent of pesticide bioaccumulation and its physiological effects on *Catla catla*, a freshwater fish species, collected from three different taluks of Mysore district: Sargur, Tirumakudal-Narasipura (T. Narasipura), and Periyapatna. The research focuses on assessing biochemical alterations that reflect environmental stress caused by agricultural runoff and associated pesticide contamination in freshwater habitats. To evaluate the general physiological condition of the fish, total protein estimation was conducted using Lowry's method. Reduced protein levels were considered indicative of metabolic disturbances and stress. Furthermore, oxidative stress was assessed through mitochondrial enzyme activity assays targeting three key biomarkers: glutathione S-transferase (GST), catalase (CAT), and superoxide dismutase (SOD). These enzymes play critical roles in detoxification and protecting cells from oxidative damage caused by reactive oxygen species (ROS), which are often elevated in polluted environments. The findings demonstrated significant regional variations. Fish from Sargur taluk exhibited the lowest protein concentrations and the most severe decline in mitochondrial enzyme activities, indicating high levels of oxidative stress and cellular damage. This suggests that aquatic ecosystems in Sargur are subject to higher pesticide contamination, likely due to intensive agricultural practices. Samples from T. Narasipura displayed moderate reductions in both protein content and enzyme activities, reflecting an intermediate level of exposure. In contrast, fish from Periyapatna exhibited relatively stable protein levels and minimal changes in enzymatic activity, indicating a comparatively healthier aquatic environment. These biochemical markers collectively point to a clear gradient of pesticide impact across the three study sites. The results underline the urgent need for region-specific environmental monitoring and pollution control strategies. Such interventions are essential to mitigate pesticide runoff, preserve aquatic biodiversity, and safeguard the health of local communities that depend on these water bodies for sustenance.

Keywords: Bioaccumulation, *Catla catla*, Pesticide bioaccumulation, mitochondrial enzyme assay, Lowry's method

OP 17:

Circadian Abnormalities, Molecular Clock Genes, and Chronobiological Treatment of Psychiatric Disorders

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Abstract

Anomalies of the circadian rhythm are important in mental illnesses such as anxiety, schizophrenia, bipolar disorder, and depression. Dysregulated molecular clock genes, including CLOCK, BMAL1, PER, and CRY, are frequently linked to disturbances in hormone production, sleep-wake cycles, and neurotransmitter modulation. These genes affect mood, thought, and behaviour by controlling the body's internal clock. Circadian system dysfunctions can worsen mental health issues by impairing cognitive function, mood swings, and sleep patterns. Restoring circadian stability is the goal of chronobiology-based therapies. Bipolar illness and seasonal affective disorder (SAD) are two mood disorders that are commonly treated using light therapy. Supplementing with melatonin aids in the regulation of sleep patterns, and chronotherapy methods like wake therapy and sleep phase shifting can quickly alleviate depression symptoms. Pharmacological drugs that target circadian rhythms may improve therapeutic efficacy, according to recent studies. Managing mental illnesses may be possible by coordinating behavioural and medicinal treatments with circadian cycles. Psychiatric care must address circadian disturbance since it can improve mood stability, cognitive function, and general health. There is potential to improve the outcomes of psychiatric disorders by comprehending molecular clock mechanisms and incorporating chronotherapeutic techniques.

Keywords: Circadian Rhythm, Clock Gene, Jet lag, Dark Therapy, Bright light Therapy

OP 18:

Valorization of Rice and Paper Waste for Sustainable Bioethanol Production

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Abstract

Turning waste into wealth" is an essential goal for a sustainable future. As urbanization and industry grow, waste generation is increasing rapidly, making its effective utilization critical. Bioethanol, a renewable and eco-friendly alternative to fossil fuels, offers significant potential for reducing carbon emissions and our reliance on non-renewable resources. *Saccharomyces cerevisiae*, a well-known yeast strain, is widely used in fermentation because of its high efficiency and adaptability. However, optimizing the production process is crucial to make bioethanol generation from low-cost or waste-derived feedstocks viable. This work focuses on using broken rice and paper waste as economical and readily available raw materials for bioethanol production. Semi-solid-state fermentation was carried out, with ethanol recovery through distillation. The highest ethanol yield from rice waste was approximately 0.09 mg/ml after 72 hours of incubation, reflecting its rich carbohydrate content and easy conversion. Paper waste also produced detectable ethanol levels, though its lignocellulosic structure posed more challenges. These results highlight the promise of using such waste materials for bioethanol production, demonstrating the need for further optimization to improve yields and support cleaner, more sustainable energy solutions.

Keywords: Bioethanol, waste valorization, *Saccharomyces cerevisiae*, rice waste, paper waste, renewable energy

OP 19:

Strategic Research Directions to Address Critical Gaps in Agricultural Nanotechnology: A Roadmap from Lab to Field

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Abstract

Agricultural nanotechnology holds transformative potential for enhancing crop productivity, resource efficiency, and sustainability. However, the transition from laboratory-scale innovations to field-ready applications remains hindered by critical knowledge, regulatory, and infrastructural gaps. This review systematically identifies and addresses these barriers, offering a strategic roadmap for the responsible and effective implementation of nanotechnology in agriculture. Key challenges include limited scalability of nanoparticle synthesis, lack of standardized field-testing protocols, insufficient understanding of long-term environmental fate and biological impacts, and the absence of harmonized regulatory frameworks. Additionally, public skepticism, low farmer awareness, and economic hurdles further complicate adoption. The review proposes interdisciplinary research priorities spanning formulation stability, scalable delivery systems, environmental risk assessment, AI-driven analytics, and stakeholder engagement. Emphasis is placed on designing biodegradable nanoformulations, developing cost-effective monitoring technologies, and integrating socio-economic perspectives into technology deployment. A tiered approach to risk assessment and regulatory standardization is advocated to balance innovation with safety. The paper culminates in a stepwise framework—from nanoparticle design to commercialization and farmer adoption—underscoring the need for global collaboration and participatory research. By addressing these critical gaps, the roadmap seeks to ensure that agricultural nanotechnology fulfills its promise of sustainable, safe, and socially acceptable agricultural transformation.

Keywords: Agricultural Nanotechnology, Nanoformulation Scalability, Environmental Nanotoxicology, Regulatory Frameworks, Nano-enabled Agrochemicals

OP 20:

Banana Pseudostem as a Bioactive Coating Agent: A Multifunctional Approach to Food Shelf-Life Extension

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Abstract

The growing demand for sustainable and environmentally friendly food preservation options has boosted research into biodegradable polymers obtained from agricultural waste. Banana pseudostem, a common agro-waste byproduct, has emerged as a prospective contender due to its high phytochemical content and intrinsic antibacterial capabilities. This review investigates the varied potential of banana pseudostem as a bioactive coating agent for increasing the shelf life of perishable food products. The emphasis is on its phytochemical makeup, bioactive ingredient extraction methods, and demonstrated antibacterial activity against foodborne pathogens. Furthermore, the green production of metal nanoparticles using banana pseudostem extract and subsequent incorporation into edible films is described as a novel method for improving barrier and antibacterial capabilities.

The paper also discusses recent advances in combining banana pseudostem with natural polymers to create functional coatings suited for real-world culinary applications. Despite its promise, several obstacles such as extraction method standardisation, compatibility with various biopolymers, and regulatory considerations must yet be solved. Overall, banana pseudostem is a sustainable, cost-effective, and biodegradable resource with enormous potential for future food preservation technology.

Keywords: Sustainable, food preservation, banana pseudostem, edible film, antibacterial

OP 21:

Bioconversion of Alkaline-Pretreated Sugarcane Bagasse into Purified Cellulase Using *Aspergillus niger*: A Sequential Fermentation and Chromatographic Purification Strategy

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Abstract

The transformation of agricultural residues into industrially valuable enzymes offers a sustainable route for waste valorization and green bioprocessing. In this study, sugarcane bagasse—a lignocellulosic byproduct—was utilized as a substrate for cellulase production following alkaline pretreatment to enhance its cellulose accessibility. Sodium hydroxide (NaOH) treatment effectively disrupted the lignin matrix, thereby improving the availability of fermentable polysaccharides for microbial action. The pretreated biomass served as a carbon-rich feedstock for *Aspergillus Niger*, a well-established cellulolytic fungus, under submerged fermentation conditions. Key parameters such as pH, temperature, fermentation time, and substrate concentration were optimized to maximize cellulase yield. The enzymatic activity was assessed using the dinitro salicylic acid (DNS) assay, confirming effective hydrolytic potential of the crude extract. Following fermentation, a downstream purification step was performed using ion exchange chromatography to isolate the cellulase enzyme. DEAE-cellulose resin was employed as the stationary phase, allowing selective binding and elution of the enzyme under controlled pH and salt gradient conditions. Purity and activity of the cellulase were evaluated through total protein content, specific activity, purification fold, and SDS-PAGE analysis.

This study presents an integrated bioprocess that combines effective pretreatment, fungal fermentation, and chromatographic purification to yield high-purity cellulase. The approach not only enhances enzyme productivity but also promotes a circular bioeconomy through the utilization of agro-waste. The findings support the potential scalability of this system for applications in biofuel production, paper and textile industries, and waste biomass degradation.

Keywords: Cellulase, *Aspergillus niger*, Sugarcane Bagasse, Bioconversion

OP 22:

In Silico Screening and Identification of Genes and Proteins for Plastic Biodegradation: A Computational Approach to Environmental Sustainability

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Abstract

The global accumulation of synthetic plastic waste, including polymers like polyethylene terephthalate (PET), polyethylene (PE), polystyrene (PS), and polyurethane (PU), presents a pressing environmental challenge due to their resistance to natural degradation. This study employs a focused *in silico* approach to identify microbial genes and proteins with the potential to degrade such persistent plastics. Instead of relying on experimental screening, which is often time-consuming and resource-intensive, we leverage publicly available databases and computational tools to accelerate the discovery process. Microbial genomes and protein sequences were retrieved from NCBI, and UniProt, respectively, based on prior evidence or predicted activity against plastic substrates. Protein-coding genes associated with plastic-degrading enzymes such as PETase, alkane monooxygenase, and cutinase were selected and analyzed. Three-dimensional protein structures were retrieved from PDB database and predicted using homology modeling using I tasser tool. Further, proteins were classified into superfamilies to identify conserved functional domains and evolutionary links. Key structural features including cavity volume, binding site residues, and hydrophobicity were examined to assess substrate compatibility. The identified and screened protein were docked with representative plastic oligomers using CB-Dock and AutoDock Vina, with cavity detection and binding affinity evaluation forming the basis for interaction analysis. This computational workflow enables the screening and evaluation of plastic-degrading proteins in a cost-effective and high-throughput manner. The findings lay the groundwork for experimental validation and offer candidates for further enzyme engineering, contributing toward microbial or synthetic biological solutions for plastic pollution under the lens of environmental sustainability.

Keywords: Plastic, Biodegradation, molecular docking, PETase, cutinase



OP 23:

Biofunctional Zinc Nanoparticles from *Butea Monosperma* Root Extract: A Green Approach to Antimicrobial Wound Healing

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Abstract

The combination of traditional medicine herbs with current nanotechnology have made it possible to make eco-friendly and bioactive nanomaterials. This work shows how to synthesize zinc nanoparticles (ZnNPs) in an environmentally friendly way utilizing the water extract of the roots of *Butea monosperma*, a plant that is well known in Ayurvedic medicine for its healing powers. We used physico-chemical characterization methods such as UV-Visible spectroscopy, FTIR, SEM-EDX and PXRD to characterize the synthesized material. Antimicrobial study has been carried out using agar well diffusion and MIC tests. The bio functional ZnNPs are very promising for use in topical formulations or nanogel systems to help wounds heal. Our results show a long- lasting, cheap and effective way to make new wound healing medicines utilizing plant-mediated nanotechnology.

Keywords: Zinc nanoparticles, *Butea monosperma*, green synthesis, antimicrobial activity, wound healing

OP 24:

Evaluation of Antibacterial Activity of Herbal Extracts Against Antibiotic-Resistant *Escherichia coli*

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Abstract

The growing prevalence of antibiotic-resistant *Escherichia coli* poses a serious global health threat, prompting the need for alternative antimicrobial strategies. This study investigates the antibacterial potential of herbal extracts derived from *Mentha* (mint) and *Plumeria rubra* (gulachin), both traditionally known for their medicinal properties, against drug-resistant *E. coli* strains. Fresh leaves of *Mentha* and *Plumeria rubra* were crushed and subjected to chloroform-based extraction to obtain phytochemical-rich solutions. The bacterial cultures were treated with varying concentrations of these extracts and incubated for 48 hours. Post-treatment, the cultures were plated on nutrient agar using the spread plate technique to evaluate bacterial growth relative to untreated controls. Results demonstrated that both *Mentha* and *Plumeria rubra* extracts significantly reduced the growth of antibiotic-resistant *E. coli* in a concentration-dependent manner. Among all tested conditions, *Plumeria rubra* extract at 100 µg/mL exhibited the most pronounced inhibitory effect, with visibly reduced colony counts compared to control plates, indicating strong antibacterial activity. *Mentha* extract also showed moderate but consistent inhibition of bacterial growth. These findings suggest that the phytochemicals present in *Mentha* and *Plumeria rubra* possess promising antibacterial properties against multidrug-resistant *E. coli*. Unlike conventional zone of inhibition assays, the use of post-treatment viable colony count offers a direct measure of bacterial survivability, supporting the effectiveness of these extracts. The study highlights the potential of plant-based antimicrobials as sustainable and accessible alternatives or supplements to conventional antibiotics. Further chemical profiling and in vivo assessments are recommended to isolate active compounds and elucidate their mechanisms of action.

Keywords: antimicrobials, gulachin, mint, phytochemical, antibiotics

OP 25:

Performance Auditing of Lakes of Bangalore

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Abstract

Over 90% of Bengaluru's lakes are severely polluted due to untreated sewage, industrial waste, and encroachments. Foam and toxic frothing, especially in Bellandur and Varthur lakes, highlight this crisis. Eutrophication from wastewater causes algal blooms and oxygen depletion, harming biodiversity. Encroachments, poor stormwater management, and illegal construction worsen flooding and reduce groundwater recharge. Ineffective governance and delays in restoration projects exacerbate the issue. Urgent action is needed to enforce regulations, restore ecosystems, and ensure water security. Collected documents on Yelahanka, Jakkuru, and Rachenahalli lakes, focusing on green cover, encroachments, and sewage infusion. Collected and tested lake water samples, analysing qualitative parameters. Reviewed literature, water test reports, and encroachment records using remote sensing. KSPCB, BBMP, audit reports, Central Audit general, IISc, Etc. Physical inspections, data collection, stakeholder discussions, and scientific evaluation of water quality, encroachments, socio-economic benefits, and ecological value. The city's lakes suffer from severe pollution due to multiple systemic failures. Inadequate sewage management allows untreated waste to flow directly into water bodies, as sewage treatment plants remain underutilized or inefficient. Financial mismanagement further exacerbates the issue, with restoration funds poorly utilized and projects yielding minimal progress. Public apathy and lack of awareness contribute significantly, as industries and citizens continue polluting due to weak enforcement and limited understanding of environmental consequences. Additionally, inconsistent monitoring hampers effective intervention, as irregular and non-transparent environmental assessments make it difficult to track lake health and policy effectiveness. Addressing these issues requires stricter sewage treatment regulations, better fund allocation, stronger public engagement, and a more robust monitoring system. Without immediate action, lake ecosystems will continue to deteriorate, leading to long-term environmental and public health consequences. The audit highlights an urgent need for a paradigm shift in the management of Bengaluru's lakes. Protecting these ecosystems requires strict enforcement of regulations, sustainable planning, and active participation from both authorities and citizens. Restoring lakes is vital not only for environmental balance but also for Bengaluru's water security and resilience to urban challenges.

Keywords: Lakes, biodiversity, water quality, flood, pollution

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OP 26:

In Silico Molecular Docking of Herbal Bioactive Compounds Against Parkinson's Disease-Associated Target Proteins for Novel Drug Discovery

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Abstract

Parkinson's disease (PD) affects nearly 1% of individuals over 60 and is characterized by the accumulation of misfolded α -synuclein proteins (forming Lewy bodies) and progressive degeneration of dopaminergic neurons in the substantia nigra. Core motor symptoms include bradykinesia, rigidity, postural instability, and resting tremors. Current treatments like levodopa and dopamine agonists provide symptomatic relief but do not halt disease progression and often cause long-term side effects. Therefore, novel therapeutics targeting the molecular mechanisms of PD are urgently needed. This study investigates the therapeutic potential of herbal bioactive compounds through in silico molecular docking against Parkinson's disease-associated proteins. Target proteins— α -synuclein (SNCA), Parkin (PARK2), and DRP2—involved in oxidative stress, neuroinflammation, mitochondrial dysfunction, and protein aggregation were selected. Protein structures were obtained from the Protein Data Bank (PDB) or modelled using Swiss-Model. Herbal ligands such as chrysin, thymoquinone, and ferulic acid were selected from PubChem. Docking simulations were conducted using AutoDock Vina. Chrysin showed significant binding affinity to DRP2 with a Vina score of -9.1 and cavity size of 1445, suggesting strong inhibitory potential. Similarly, PARK2 showed a favourable Vina score of -7.5 with a binding cavity size of 6767 and Asiatic acid showed binding affinity of 5.6 vina score and binding cavity size of 27 highlighting good compatibility with selected ligands. These results demonstrate the potential of herbal compounds, particularly chrysin, in targeting key PD-related proteins. This study supports the use of computational approaches to accelerate drug discovery and proposes a sustainable, bioinformatics-guided path for developing neuroprotective therapies for Parkinson's disease.

Keywords: α -synuclein, Parkin, herbal bioactives, AutoDock Vina, sustainable therapeutics

OP 27:

Kinetic Study for Biodegradation of Reactive Red Dye

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Abstract

Dye degradation is a vital necessity for textile industries to reduce the dangerous impact of dye laden effluents on the environment. Reactive dye, including Reactive Red Dye, are extensively used in the cloth sector but are delicate to degrade due to their complex sweet structures and resistance to conventional treatments. In this study, the biodegradation of Reactive Red dye (RRD) was assessed using native bacterial strains isolated from the Kukrail drain under submerged fermentation conditions. The degradation was estimated at three different dye concentration 100 ppm, 300 ppm, and 500 ppm. The experimental duration was 96 hours with observations recorded at 24-hour intervals. Two biochemical assays were employed the Lowry Assay for protein estimation and the 3,5- dinitrosalicylic acid (DNS) assay for quantifying reducing sugars. Results from the Lowry Assay indicated a harmonious rise in protein content up to 48 hours across all attention, suggesting active bacterial metabolism. The maximum protein content was observed at 500 ppm after 48 hours (0.3788 mg/ml), while at 100 ppm the protein content observed after 96 hours (0.0715 mg/ml). The glucose content showed a sharp decline within the first 24 hours dropping from 5.25 to 2.25 mg/ml at 100 ppm and from 4.15 to 1.28 mg/ml at 500 ppm indicating effective degradation of complex dye. Significantly, visible degradation of the dye at 100 ppm was observed as early as 24 hours, turning from deep red to pale pink by 96 hours. This study demonstrates the promising eventuality of native bacterial strains for eco-friendly dye effluent treatment and supports their binary part in dye degradation and microbial protein/ enzyme product.

Keywords: Reactive Red, biodegradation, bacteria, textile, effluent, submerged fermentation

OP 28:

Data-Driven Drug Repurposing and Biomarker Discovery in Colorectal Cancer using Transcriptomics and Machine Learning

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Abstract

Colorectal cancer (CRC) ranks third as a major cause of cancer-related death globally. The urgent development of accurate diagnostic and therapeutic strategies is extensively needed. The drug discovery process in oncology remains a critical bottleneck in modern medicine due to its high cost, long timelines, and frequent clinical trial failures. In contrast, Drug repurposing, a subset of Drug Discovery, identifies new therapeutic uses for existing drugs and has emerged as a powerful strategy to accelerate treatment development. This study aims to establish a computational framework integrating transcriptomic profiling, network pharmacology, and machine learning to identify prognostic biomarkers and prioritize repurposable drugs for colorectal cancer (CRC). High-throughput RNA-seq data from CRC patients were analyzed to identify differentially expressed genes. A protein-protein interaction (PPI) network was constructed to isolate hub genes, of which three genes were significantly overexpressed in tumors and strongly correlated with poor patient survival. This process proved them as key prognostic biomarkers. A drug-gene interaction network was built using curated databases. An unsupervised machine learning pipeline combining PCA and KMeans clustering was developed to integrate gene expression data, survival scores, and interaction profiles for drug ranking. Among 34 candidate drugs, Palbociclib, Vorinostat, Methotrexate were identified as high-potential multi-target drugs with all three prognostic genes. These findings suggest multi-target repurposing opportunities in CRC. This interdisciplinary approach demonstrates how computational biology and AI can accelerate drug discovery by revealing effective repurposing candidates, bypassing the novel compounds' long development cycle. This makes our framework a scalable and practical tool for fast, cost-effective discovery of new therapies in colorectal cancer and other complex diseases.

Keywords: Drug Repurposing, Colorectal Cancer, PPI, Transcriptomics, Oncology

OP 29:

Next-Generation DNA Technologies in Forensic Applications

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Abstract

Advancements in DNA technology have profoundly impacted forensic science, with Next-Generation DNA Technologies (NGDTs) marking a new era of precision, speed, and breadth in forensic investigations. Unlike traditional methods that rely primarily on Short Tandem Repeat (STR) analysis through capillary electrophoresis, NGDTs—including Next-Generation Sequencing (NGS), Rapid DNA analysis, forensic epigenetics, and forensic microbiomics—offer enhanced capabilities for individual identification, ancestry inference, phenotype prediction, and sample origin analysis. NGS enables massively parallel sequencing of multiple genetic loci, allowing for the analysis of autosomal STRs, Y-STRs, mitochondrial DNA, and even single nucleotide polymorphisms (SNPs) in a single run. This not only improves the resolution of DNA profiles but also facilitates analysis of degraded or mixed samples commonly encountered at crime scenes. Rapid DNA systems further accelerate processing by enabling sample-to-profile generation within 90 minutes, making real-time identity verification feasible at police stations and border controls. Emerging approaches such as epigenetic age estimation and forensic DNA phenotyping can infer external traits (e.g., hair/eye colour, biogeographical ancestry) and even age from crime scene samples, aiding in criminal investigations where suspects are unknown. Additionally, forensic microbiome analysis is being explored for time-since-death estimation and trace evidence linkage. While NGDTs greatly expand the investigative toolkit, their implementation raises challenges related to data interpretation, standardization, legal admissibility, cost, and ethical concerns about privacy and surveillance. Nonetheless, the integration of NGDTs into forensic workflows represents a transformative leap toward more comprehensive and informative forensic analyses.

Keywords: Next-Generation Sequencing (NGS), forensic science, forensic DNA technologies, Rapid DNA, forensic epigenetics

OP 30:

Development, Design, and Characterization of Bismuth and Titanium Nanoparticle-Enhanced Silk Fibroin Composites for Biomedical Applications

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Abstract

The natural protein polymer Silk fibroin (SF) is well-regarded for its biocompatibility, mechanical strength, and biodegradability making it a suitable matrix for biomedical materials. Our research shows the development of silk fibroin-based nanocomposites through the incorporation of inorganic nanoparticles such as bismuth and titanium to enhance their physicochemical and biological properties. The characterization has been carried out using FTIR, PXRD, SEM-EDX and thermal analysis which confirmed successful nanoparticle incorporation and improved structural and thermal features.

The materials also exhibited antimicrobial activity against common bacterial strains, supporting their potential in infection-prone environments.

Overall, the nanoparticle-enhanced silk fibroin composites demonstrated a balanced improvement in mechanical performance, antimicrobial functionality, and biocompatibility. These multifunctional materials hold promise for use in bone regeneration; wound healing, soft tissue regeneration, and other biomedical applications where structural support and biological interaction are essential.

Keywords: Silk fibroin, Nanocomposite, Nanoparticles, Antimicrobial, Biocompatibility, Biomedical applications



OP 31:

Utilization of Kitchen Waste for the Production of Acid

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Abstract

The production, harvesting, sorting, and packing of fruits and vegetables generate a large volume of waste. Improper disposal of this fruit and vegetable waste (FVW) poses serious environmental risks and can adversely affect human health. A sustainable alternative is to recycle FVW into value-added products, offering both environmental and economic benefits. This study presents a novel biorefinery approach that utilizes solid-state fermentation (SSF) to produce succinic acid from kitchen waste. The process involves the use of *Aspergillus niger* and *Rhizopus oryzae* in SSF to generate a crude enzyme-rich solid mash from various types of kitchen garbage. When this enzyme complex is added to kitchen waste suspensions, it facilitates hydrolysis, breaking down the waste into fermentable sugars and essential nutrients such as amino acids. These compounds support bacterial growth and the biosynthesis of succinic acid, demonstrating a promising method for converting household organic waste into valuable biochemicals through microbial biotechnology.

Keywords: Kitchen Waste, Fruit and vegetable wastes, succinic acid, solid-state fermentation

OP 32:

Development of a Novel Cattle Feed

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Abstract

The need for economically priced and sustainable cattle nutrition has spurred developments in cattle feed formulation. In this research, a new type of cattle feed is developed through a synergistic combination of natural plant extracts, essential oils, and non-pathogenic microbes, aiming to maximize nutrient availability, promote gut health, and enhance overall animal productivity. In the feed formulation, agro-residues such as wheat straw were supplemented with bioactive elements, including *Moringa oleifera* extract, acacia tannins, and essential oils with antimicrobial and antioxidant properties. A SynCom (synthetic microbial consortium) consisting of *Bacillus subtilis*, *Bacillus megaterium*, and *Lactobacillus* spp. was designed, freeze-dried, and added to the feed to enhance beneficial microbial colonization and digestibility. The carbohydrate and protein content were quantified by the phenol-sulfuric acid and Lowry methods, respectively. Microbial viability and activity were verified with selective culture media and colony-forming unit (CFU) determination. The biochemical parameters were monitored before and after microbial treatment to monitor compositional alterations. Graphical representation of data demonstrated a quantifiable decrease in carbohydrate content following microbial fermentation, confirming substrate consumption by the added SynCom. The feed was sterilized by sun-drying and oven treatment and then blended under aseptic conditions with microbial pellets. The final product was stored and checked for stability. This new feed strategy combines natural, harmless additives and probiotics for improving the efficiency of the rumen, lowering the pathogenic burden, and promoting cattle health independently of synthetic antibiotics or hormones. The creation promotes a sustainable agri-model through the usage of low-cost residues and environmentally friendly additives. Future research can include field trials for assessing performance metrics like weight gain, milk production, and feed conversion ratio in live animals.

Keywords: SynCom, cattle feed, microbial consortium, *Moringa* extract, sustainable agriculture

OP 33:

Precision Medicine and Diagnostics: Transforming Global Healthcare through Individualized Therapies

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Abstract

Precision medicine represents a paradigm shift in healthcare, moving from a one-size-fits-all model to a more individualized approach that considers genetic, environmental, and lifestyle factors. By integrating advanced diagnostic tools, genomic sequencing, bioinformatics, and data analytics, precision medicine enables the development of targeted therapies with improved efficacy and reduced adverse effects. Precision medicine leverages molecular profiling, next-generation sequencing (NGS), and biomarker discovery to enhance early disease detection and risk stratification. These innovations have revolutionized the management of complex diseases such as cancer, cardiovascular disorders, and rare genetic conditions. Companion diagnostics, which identify patients most likely to benefit from specific treatments, are becoming increasingly integral to clinical decision-making. The integration of artificial intelligence (AI) and machine learning (ML) further augments diagnostic accuracy, allowing real-time data interpretation and personalized treatment planning. AI provides insights through advanced computation and inference, enabling the system to reason and learn while enhancing physician decision-making. Many cellular characteristics, including gene up-regulation, protein-nucleic acid interactions, and splicing events, can now be measured at high throughput and used as training objectives for predictive models. Research in “omics” has advanced significantly, with major developments in genomics, epigenomics, proteomics, transcriptomics, metabolomics, and microbiomics. Pharmaco-omics has also gained prominence, facilitating the development of drugs tailored to specific subpopulations, thereby avoiding prescriptions to non-responders, preventing adverse effects, and proving economical in the long run. This study explores the current advancements, practical applications, and future directions of precision medicine and diagnostics. As precision diagnostics evolve, they hold the potential to redefine disease management, optimize therapeutic outcomes, and promote global health equity.

Keywords: genomic sequencing, next-generation sequencing (NGS), molecular profiling, targeted therapy, artificial intelligence

OP 34:

In Vitro Evaluation of Probiotic Properties of *Lactobacillus* Isolates under Stimulated Gastrointestinal Conditions

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Abstract

Lactobacillus species are well-known probiotics, commonly present in fermented foods like yogurt. Their efficacy as probiotics relies on key functional properties such as acid and bile salt tolerance, along with antimicrobial activity, which collectively determine their ability to survive and function in harsh gastrointestinal environments. This study aimed to evaluate these probiotic characteristics of *Lactobacillus* strains isolated from curd through in vitro assays simulating gut-like conditions. For acid tolerance, pure *Lactobacillus* cultures were inoculated in MRS broth adjusted to pH 2.0 and incubated at 37°C for 48 hours. Post-incubation, cultures were streaked on MRS agar to assess viability. A significant growth on MRS agar confirmed strong acid resistance of the isolates. Bile salt tolerance was tested by culturing the isolates in MRS broth containing 0.3% bile salts, and optical density (OD₆₀₀) was measured over time to evaluate survival. Results indicated consistent growth with OD values remaining above 0.5, demonstrating good tolerance to bile salts. Antimicrobial activity was assessed using the agar well diffusion method against *Escherichia coli*. Wells containing *Lactobacillus* culture were prepared on nutrient agar plates pre-inoculated with *E. coli* and incubated for 48 hours. A clear inhibition zone of 12–18 mm around the wells indicated notable antagonistic activity. These results collectively demonstrate that *Lactobacillus* strains isolated from curd exhibit strong probiotic potential due to their high acid and bile resistance, as well as their ability to inhibit common gut pathogens. Such strains may be promising candidates for probiotic applications in food and health industries.

Keywords: probiotics, MRS media, acid tolerance, bile salt, antimicrobial

OP 35:

Dielectric Conductivity and Dielectric Properties of Co-doped NiFe₂O₄ at Room Temperature

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Abstract

The physical and chemical characteristics of ferrite materials can be customized by utilizing their spinel structure to control cation distributions between tetrahedral and octahedral sites, as well as their electronic configurations. This customization can be further improved through targeted doping with various elements. An auto-combustion method was used to dope nickel ferrite with different Co²⁺ concentrations, producing the Ni_{1-x}Co_xFe₂O₄ nanoparticle series. A comprehensive analysis of this series involved structural, morphological, and compositional studies using techniques such as XRD, FTIR, SEM, EDX, as well as electrical testing with impedance analysis, and electrochemical evaluations including cyclic voltammetry, galvanostatic charge-discharge, and electrochemical impedance spectroscopy. The nanoparticles are confirmed to be single-phase, face-centered cubic, which indicates their crystalline purity. Additionally, properties like the dielectric constant and AC conductivity demonstrate the potential for these materials in both low- and high-frequency applications, making them suitable for high-frequency uses as well.

Keywords: Ni-Co ferrite, Auto-combustion, Spinel ferrite, AC conductivity, Hopping mechanism

OP 36:

Skin Disease Prediction using Artificial Intelligence

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Abstract

Artificial Intelligence (AI) is increasingly revolutionizing dermatological practice by enhancing the accuracy and speed of the diagnosis of skin diseases. Skin diseases like Tinea (Ringworm), melanoma, psoriasis, atopic dermatitis, onychomycosis, and pigmented skin lesions pose varied diagnostic challenges due to visually indistinguishable presentations and heterogeneity of symptoms. Among these, Tinea is a widespread fungal infection that typically infects populations that live in hot and humid climates and must be diagnosed early to prevent its spread. In this work, an AI-based diagnostic system based on MobileNetV2, a lightweight convolutional neural network optimized for mobile and embedded devices, is used to diagnose several skin diseases. MobileNetV2 uses depthwise separable convolutions to produce substantial computational savings at high accuracy, thus being perfect for real-time diagnosis under resource-constrained environments like rural clinics or teledermatology platforms. By training the model on a varied image dataset of clinical and dermoscopic images of the above-mentioned skin diseases, the system shows promising performance and attains accuracy levels comparable to dermatologists in classifying Tinea, melanoma, and other skin diseases. These models can be blended to facilitate early detection, especially for diseases with limited dermatologist access, thus enhancing patient outcomes. The performance of AI systems, however, relies on high-quality annotated data and adherence to ethical principles in data privacy, bias avoidance, and explainability of algorithms. With growing AI adoption, models like MobileNetV2 can help fill diagnostic gaps, facilitate streamlined clinical workflows, and facilitate a patient-centric method of skin care.

Keywords: Artificial Intelligence, Skin Diseases, Tinea, MobileNetV2, Diagnosis

OP 37:

Morphomolecular Identification and Characterization of Sporidia Cultures Associated with *Sporisorium scitamineum* Infecting Sugarcane

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Abstract

Sugarcane smut, caused by *Sporisorium scitamineum*, is a major fungal disease affecting sugarcane productivity worldwide. The pathogen produces characteristic black whip-like structures known as smut whips, severely reducing cane yield and quality. This study aimed to morphologically and molecularly identify and characterize sporidia cultures of *S. scitamineum* to enhance understanding of its diversity and aid in developing effective management strategies. Field surveys were conducted to collect infected sugarcane whips, followed by meticulous dissection of teliospores. Inoculum preparation and culture media preparation were performed using Potato Dextrose Agar (PDA) and Yeast Extract Peptone Sucrose Agar (YEPSA) to isolate and subculture sporidia. Microscopic examinations enabled morphological characterization, including colony type, growth rate, color, and sporidial shape, facilitating preliminary identification. For molecular analysis, a DNA extraction protocol from fungal cultures was standardized, and DNA quality and quantity were assessed using Nanodrop spectrophotometry and agarose gel electrophoresis. Primers targeting the Internal Transcribed Spacer (ITS) region and bE mating type gene were selected and optimized for PCR amplification under standardized conditions. Amplified PCR products were visualized via agarose gel electrophoresis and documented using gel imaging systems. PCR products were subsequently purified for sequencing or prepared for outsourcing. Preliminary sequence analysis involved BLAST searches for similarity identification and phylogenetic tree construction using MEGA software to elucidate genetic relationships among isolates. This integrated morphomolecular approach provided reliable identification and differentiation of *S. scitamineum* isolates, contributing valuable insights into the pathogen's diversity and epidemiology. Such comprehensive characterization is critical for accurate diagnosis and monitoring of sugarcane smut, enabling informed breeding programs and effective disease management strategies for sustainable sugarcane production.

Keywords: *Sporisorium scitamineum*, smut whips, teliospores, Nanodrop spectrophotometry, PCR

OP 38:

Microbial Solutions to Plastic Waste: Enzyme and Bacteria-based Degradation

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Abstract

Public health and environmental sustainability are seriously threatened by the ongoing buildup of plastic garbage, which calls for creative and environmentally responsible solutions. Conventional techniques for getting rid of plastic, such as landfilling and burning, are either ineffective or lead to secondary pollution. Through microbial breakdown, microbiology has become a potent ally in the fight against plastic pollution in recent years. This method converts synthetic polymers into non-toxic byproducts by using the metabolic capabilities of specific bacteria and fungi. Notably, *Ideonella sakaiensis*-produced enzymes like PETase and MHETase have shown exceptional effectiveness in breaking down polyethylene terephthalate (PET), a common plastic used in bottles and packaging. Under particular environmental circumstances, other microbial strains, including *Pseudomonas*, *Bacillus*, and *Aspergillus* species, have also demonstrated the ability to degrade polymers such as polyethylene (PE), polyurethane (PU), and polystyrene (PS). By improving enzyme expression, stability, and substrate specificity, recent advances in synthetic biology and genetic engineering have significantly increased the effectiveness of microorganisms that break down plastic. Microbial consortia-based bioreactors are also being investigated for the scalable treatment of plastic waste. The identification of new plastic-degrading enzymes from harsh settings like landfills, composts, and marine habitats has been made easier by metagenomics and proteomics techniques. These results highlight the enormous and mainly unrealised potential of microbial biodiversity in solving one of the most important environmental problems. Notwithstanding these developments, there are still obstacles to overcome before microbial plastic degradation may be widely used. The efficiency of existing systems is limited by elements including the changeable climatic conditions, the sluggish pace of deterioration, and the structural complexity of plastic polymers. Future studies should concentrate on creating synergistic engineered microbial consortia, enhancing the architecture of bioreactors, and integrating microbial degradation with other environmentally friendly technologies. Additionally, moving from successful laboratory-scale treatments to workable, large-scale solutions requires industry cooperation, supportive regulations, and public awareness. We can get one step closer to a resilient, plastic-free future by utilising microbial breakthroughs.

Keywords- Microbes, environment, sustainable, polyethylene terephthalate, PET

OP 39:

AI-Driven Agriculture: Transforming Food Security and the Blue Economy

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Abstract

This book explores the transformative potential of artificial intelligence (AI) and machine learning (ML) in revolutionizing agriculture while enhancing the blue economy and reducing ozone-depleting emissions. By integrating AI-driven precision farming, IoT-enabled real-time monitoring, and predictive analytics, agricultural practices can optimize resource use, boost crop yields, and minimize environmental impact. The study highlights how AI-powered systems, such as automated irrigation and selective pesticide application, reduce water and chemical overuse, directly addressing greenhouse gas emissions linked to ozone depletion. The research also examines AI's synergy with the blue economy, emphasizing sustainable aquaculture through ML-based water quality monitoring and fish stock management. These innovations ensure marine ecosystem health while supporting economic growth in coastal communities. Case studies from India's coastal regions demonstrate how AI-driven aquaponics and smart fisheries enhance productivity and resilience against climate challenges, aligning with Sustainable Development Goals (SDGs). Furthermore, the book addresses challenges like high initial costs and data accessibility, proposing policy frameworks and public-private partnerships to democratize AI adoption. By leveraging renewable energy for AI computations, the study underscores a path to carbon-neutral agriculture. The integration of blockchain for transparent supply chains and AI for weather forecasting further ensures food security and sustainability. This work forecasts AI's role in creating a circular economy, where agricultural and aquatic systems coexist symbiotically, reducing emissions and fostering biodiversity. It calls for interdisciplinary collaboration to scale AI solutions, offering a roadmap for researchers, policymakers, and farmers to build a resilient, eco-conscious agricultural future. This book is a vital resource for understanding AI's potential to transform global food systems while safeguarding the planet's ozone layer and marine ecosystems.

Keywords: artificial intelligence, precision farming, automated irrigation, aquaponics, Sustainable Development Goals (SDGs)

OP 40:

Screening of Indigenous Plant Extracts for Alpha-Amylase Inhibition: A Preliminary Study towards Natural Antidiabetic Agents

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Abstract

Diabetes is a chronic metabolic disorder that impairs the regulation of blood glucose levels, often leading to serious complications such as cardiovascular diseases, kidney failure, neuropathy, and vision loss if left unmanaged. A key therapeutic strategy for managing Type 2 diabetes is the inhibition of alpha-amylase, an endoenzyme responsible for breaking down dietary starch into glucose, thereby controlling post-prandial blood sugar spikes. This in vitro study investigates the alpha-amylase inhibitory potential of phytochemicals, particularly phenolic compounds, extracted from *Azadirachta indica* (neem) and *Coriandrum sativum* (coriander). Plant extracts were prepared at three concentrations (0.01, 0.05, and 0.1 g/mL), and phenolics were separated using ion-exchange chromatography employing a sodium chloride gradient ranging from 0.1 M to 1.0 M. The inhibitory effect of the separated phenolic fractions on alpha-amylase activity was evaluated using the DNS (3,5-dinitrosalicylic acid) assay, with absorbance measured via UV-Vis spectrophotometry. Among all samples tested, the

0.1 g/mL concentration exhibited the highest inhibition of alpha-amylase activity. These findings suggest that phenolic compounds in neem and coriander possess significant antidiabetic potential through enzymatic inhibition. The study underscores the possibility of using readily available medicinal plants as natural sources for managing diabetes and encourages further research into their application in dietary or therapeutic formulations.

Keywords: phytochemicals, ion-exchange chromatography, sodium chloride gradient, DNS assay, UV-Vis spectrophotometry.

OP 41:

Revolutionizing Pharmacovigilance through Artificial Intelligence and Machine Learning: A Global Scientific Outlook

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Abstract

Pharmacovigilance, the science of detecting, assessing, understanding, and preventing adverse drug reactions (ADRs), is evolving rapidly with the integration of Artificial Intelligence (AI) and Machine Learning (ML). Traditional pharmacovigilance relies heavily on manual case processing and spontaneous reporting, often limited by underreporting, data heterogeneity, and delayed signal detection. AI and ML offer scalable, data-driven solutions to these challenges by efficiently analysing vast, complex datasets from clinical trials, electronic health records, social media, and real-world evidence. Techniques such as natural language processing (NLP), deep learning, and advanced classification algorithms enhance signal detection sensitivity and specificity. AI-driven platforms now enable automated case triaging, duplicate detection, and predictive modeling for ADR trends, reducing time to detection and optimizing resource allocation. For example, recent studies have demonstrated AI's capability to identify safety signals months earlier than conventional methods, particularly in oncology and post-marketing surveillance. However, the adoption of AI/ML in pharmacovigilance raises critical concerns regarding algorithm transparency, validation, data quality, and bias mitigation. Regulatory authorities, including the FDA, EMA, WHO, and ICH, emphasize the need for rigorous validation, ethical AI use, and harmonized data governance frameworks. Interdisciplinary collaboration among pharmacologists, clinicians, data scientists, and regulatory bodies is essential to ensure AI tools are interpretable, compliant, and applicable across diverse healthcare settings. With appropriate safeguards, AI and ML can redefine pharmacovigilance by enabling more proactive, real-time, and patient-centered drug safety monitoring. As global healthcare systems embrace digital transformation, integrating AI responsibly represents a pivotal step towards more efficient and predictive pharmacovigilance practices, ultimately enhancing patient safety and public health.

Keywords: drug safety, adverse drug reaction, signal detection, regulatory compliance, predictive analysis

OP 42:

**Raman Spectroscopic Analysis of the Medicinal Plant *Vitex negundo*:
Investigation of Anti-Arthritic Potential in a Complete Freund's Adjuvant-
Induced Murine Model of Rheumatoid Arthritis and Study of Antimicrobial
Efficacy of Methanolic Leaf Extract of *Vitex negundo***

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Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune disorder marked by inflammation, autoantigen production, and protein denaturation, often managed using NSAIDs, corticosteroids, and DMARDs. However, the prolonged use of these agents is associated with adverse effects, including gastrointestinal disturbances and renal or hepatic dysfunctions. In search of safer therapeutic alternatives, Indian traditional medicine offers plant-based remedies with anti-inflammatory properties. *Vitex negundo*, a well-documented herb in Ayurveda, has been traditionally used for treating arthritis, inflammation, and microbial infections. In this study, we investigated the anti-arthritic potential of aqueous, ethanolic, and methanolic leaf extracts of *V. Negundo* by evaluating their ability to inhibit protein denaturation *in vitro*, with diclofenac sodium serving as the reference standard. The extracts demonstrated significant inhibition of protein denaturation, indicating potential anti-inflammatory efficacy. The extract with optimal activity will be employed for *in vivo* evaluation using a Complete Freund's Adjuvant (CFA)-induced murine model of arthritis. Additionally, the study explores the application of Raman spectroscopy (RS) to diagnose RA and monitor therapeutic response, particularly in ACPA-negative cases where conventional biomarkers are insufficient. RS aims to detect unique spectral fingerprints correlating with disease progression and treatment efficacy. Concurrently, the antimicrobial potential of *V. Negundo* extracts was assessed against methicillin-resistant *Staphylococcus aureus* (MRSA), revealing significant inhibitory activity, especially for methanolic (MIC = 100 µg/ml) extracts. The chemical composition of the bioactive extracts was characterized using Fourier-transform infrared spectroscopy (FTIR), Raman spectroscopy, and phytochemical screening, confirming the presence of compounds with antimicrobial and anti-inflammatory potential. Collectively, this multidisciplinary approach underscores *V. Negundo* as a promising source of therapeutic agents for RA management and antimicrobial intervention, warranting further pharmacological and mechanistic exploration.

Keywords: Rheumatoid arthritis, *Vitex negundo*, protein denaturation, Raman spectroscopy, anti-inflammatory

OP 43:

Production and Purification of Antimicrobial Compound through Bacterial Strain

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Abstract

The increasing prevalence of antibiotic – resistant pathogens has led to an urgent need for new and effective antimicrobial agents. Microorganisms, especially bacteria, are a promising source of novel bioactive compounds with therapeutic potential. This study focuses on the isolation, production, and purification of antimicrobial compounds from a selected bacterial strain obtained from a natural environment. Initial screening was conducted using primary and secondary assays to identify bacterial isolates with significant antimicrobial activity against test organisms, including both gram positive and gram-negative pathogens. Among the isolates, one strain demonstrated potent and broad-spectrum antimicrobial properties. The selected strain was cultured under optimized conditions, including variations in media composition, pH, temperature, and incubation time, to enhance metabolite production. Submerged fermentation in rich nutrient media facilitated the large-scale production of the antimicrobial compound. The crude extract obtained from the culture supernatant was subjected to solvent extraction using ethyl acetate, followed by partial purification using Thin Layer Chromatography [TLC] to identify active fractions. Further purification was achieved through chromatographic techniques such as column chromatography. The antimicrobial activity of the purified fractions was assessed using the agar well diffusion method, and zone of inhibition was recorded. The results indicated a strong and consistent inhibitory effect, confirming the presence of an effective antimicrobial agent. Preliminary characterization suggests that the compound may belong to the class of peptide- based or polyketide antibiotics. Further structural elucidation and toxicity evaluation are planned for future studies. This work highlights the potential of environmental bacterial strains as sources of novel antimicrobial agents and supports the development of natural alternatives in the fight against multidrug resistant microorganisms. Continued research in this area can contribute to the discovery of new antibiotics and improve public health strategies for infection control.

Keywords: Polyketide antibiotic, resistant, natural product discovery, screening, polyketide antibiotics

OP 44:

Microbial production of Bioethanol using Sugarcane Bagasse

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Abstract

Microbial fermentation of ethanol from waste materials is an environmentally sustainable biotechnological method of creating biofuels that allows agricultural, industrial, or food waste to be used to create renewable energy. Certain microorganisms such as *Saccharomyces cerevisiae*, ferment the sugar content of waste organic matter to produce energy in the form of ethanol. This approach provides waste management solutions to society and helps decrease the reliance on fossil fuels. In current study, the different part of sugarcane bagasse, were analyzed for their feasibility for microbial ethanol production. The feedstock underwent an initial physical pretreatment where the sugarcane bagasse was physically separated into outer dried, cut pieces, and inner dried ground fraction. Further, the three different parts of bagasse were dried and sieved into fine powder material, and coarse residue material. Following physical pre-treatment, we used 1% and 3% sulfuric acid hydrolysis to release fermentable sugars from the bagasse and to extract it, where we adjusted the pH to 5.5, and ultimately sterilized the material. The pretreated solutions, was inoculated with *Saccharomyces cerevisiae*, that fed upon the sugar in the feedstock solutions. The sugar content was estimated using DNS method, along with protein concentration by Lowry method and ethanol content by Dichromate spectrophotometry method of fermented sample after interval of 24 h. The highest ethanol yields came from the inner fine powder fraction of sugarcane bagasse. The result shows the importance of proper pretreatment for maximizing ethanol yields. This is a promising and sustainable way to turn various waste materials into valuable biofuels.

Keywords: Bioethanol, *Saccharomyces cerevisiae*, pretreatment, sugarcane bagasse, yield

OP 45:

The Impact of DNA Fingerprinting in Forensics

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Abstract

The multidisciplinary field of forensic science uses scientific methods and ideas to solve crimes and aid the legal system. Genetic fingerprinting, sometimes referred to as DNA profiling, is one of the most revolutionary developments in forensic science. This method makes it possible to identify people by their distinct genetic composition. Since its inception in the 1980s, DNA profiling has emerged as a vital instrument in situations involving missing individuals, paternity testing, criminal investigations, and disaster victim identification. The procedure entails examining particular DNA segments known as short tandem repeats (STRs), which differ significantly between people. Investigators can determine the statistical probability of identity with great accuracy by comparing those regions in DNA samples taken from the crime scene with those of suspects. Under many circumstances, genetic fingerprinting offers a biological record that is significantly less vulnerable to tampering and deterioration than standard fingerprinting, which depends on physical prints. Additionally, it has been crucial in clearing people who were falsely charged or convicted thanks to the efforts of groups like the Innocence Project. But using DNA evidence also brings up moral and legal issues, especially with regard to privacy, the possible abuse of genetic databases, and the guidelines for gathering and preserving genetic material. The criminal justice system's capacities have been greatly expanded by forensic science and genetic fingerprinting. The accuracy, effectiveness, and moral implications of these techniques are constantly changing due to technological advancements, which makes DNA profiling a vital tool in contemporary forensic investigations.

Keywords: Short tandem repeats (STRs), DNA evidence, forensic investigations, DNA profiling, genetic fingerprinting

OP 46:

Proteogenomic Analysis of Breast Cancer Markers for Targeting with Natural Phytocompounds via Molecular Docking

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Abstract

Breast cancer remains one of the leading causes of cancer-related mortality globally, highlighting the urgent need for novel and effective therapeutic approaches. Phytochemicals—naturally occurring bioactive compounds in plants—have gained attention for their potential role in cancer treatment. These compounds can modulate key molecular pathways involved in carcinogenesis, including carcinogen inactivation, cell cycle arrest, apoptosis induction, antioxidant activity enhancement, and immune system regulation. Widely used in traditional herbal medicine, phytochemicals offer a promising and accessible avenue for cancer therapy. This study aimed to evaluate the anticancer potential of ten selected phytocompounds—Genistein, Epigallocatechin gallate, Curcumin, Apigenin, Resveratrol, Gingerol, Biochanin A, Emodin, Tetrandrine, and Vinca alkaloids—against four breast cancer-related targets: CCL5, IL24, H3C1, and APOE. These target genes were translated into proteins using the ExPasy translation tool, and molecular docking simulations were conducted using AutoDock Vina to assess ligand-receptor interactions. Among all combinations, Tetrandrine demonstrated the strongest binding affinity with the APOE protein, achieving a binding energy of -7.4 kcal/mol, indicating a high potential for inhibitory action. Other phytochemicals, including Curcumin and Resveratrol, also exhibited notable interactions with different targets, supporting their broad-spectrum anticancer potential. In conclusion, Tetrandrine emerged as the most promising candidate against APOE, suggesting its potential utility in breast cancer therapy. These findings reinforce the therapeutic value of plant derived compounds and encourage further exploration. Future directions include in vitro and in vivo studies to validate the biological efficacy and safety of these phytochemicals, paving the way for their development into natural anticancer agents.

Keywords: Phytochemicals, carcinogen, ExPasy, AutoDock Vina, anticancer

OP 47:

**Exploring the Impact of
Methicillin-Resistant Staphylococcus aureus (MRSA)
on Cancer Cell Behavior in a Co-culture Model**

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Abstract

Microbial pathogens, particularly antibiotic-resistant strains like Methicillin-Resistant *Staphylococcus aureus* (MRSA), have emerged as influential players in modulating host immune responses and potentially affecting cancer progression. This study investigates the interaction between MRSA and HeLa cervical cancer cells using a controlled in vitro co-culture model to explore MRSA's impact on cancer cell viability, morphology, and response to antibacterial treatment. To define experimental multiplicities of infection (MOIs), bacterial growth was controlled with both optical density and colony-forming unit (CFU) determinations. A high correlation was found, confirming OD-based MOI estimations. The bacterium was cultured to the exponential phase and normalized to $OD_{600}=0.1$, then MOI-specific suspensions were prepared (0.5:1, 1:1, 10:1, and 100:1). After a 3-hour MRSA-HeLa co-incubation, extracellular bacteria were removed and treated with gentamicin (250-750 $\mu\text{g}/\text{mL}$) to ensure only intracellular bacteria persisted. CFU counting before and after antibiotic treatment validated dose-dependent lowering of bacterial survival, with stronger antibiotic intervention needed at higher MOIs. Suspension based and adherence assays also supported this trend. Cell viability profiling with the MTT assay detected variable cytotoxic effects at different time points (24-72 hours), which indicated disparate host responses. Propidium iodide staining revealed enhanced membrane damage at greater MOIs and towards MRSA lysate and supernatant, suggesting the involvement of bacterial toxins in cell death. Further, Raman spectroscopy showed that there were significant biochemical changes in HeLa cells after exposure to MRSA, including variations in nucleic acid, lipid, and protein content. This evidence indicates that MRSA and secreted factors are capable of modulating cancer cell viability and integrity via direct infection and paracrine actions.

This research offers new understanding of the interaction of antibiotic-resistant pathogens such as MRSA with cancer cells and highlights the importance of taking into account microbial effects in cancer biology and therapeutic response. The co-culture platform developed herein represents a useful model for extended investigation of host-pathogen-tumor interactions.

Keywords: MRSA, HeLa, Cancer-bacteria interaction, cell viability, Raman spectroscopy

OP 48:

Gene Expression Profiling to Identify Biomarkers in Oral Squamous Cell Carcinoma (OSCC)

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Abstract

Oral squamous cell carcinoma (OSCC) remains one of the most prevalent and deadly malignancies worldwide, with a poor prognosis due to late detection and limited biomarker-driven interventions. This study employed a comprehensive bioinformatics pipeline using publicly available microarray datasets (GSE30784, GSE37991) to identify differentially expressed genes (DEGs) between OSCC and normal tissues. GEO2R was utilized for DEG selection (adj. $p < 0.05$, $|\log_2FC| > 1.5$), followed by pathway enrichment via Enrichr, and protein interaction network analysis using STRING. A focused literature-based comparison was carried out to align and evaluate consistency with previously reported OSCC biomarkers. Among the identified DEGs of GSE30784 were, MMP13, LAMC2, and COL1A1 and for GSE37991 were BMP1, LAMA3, and PPARG emerged as consistent hub genes involved in cell proliferation, immune regulation, and metastasis. KEGG pathway enrichment revealed dysregulation in the PI3K-Akt, p53, and cytokine signaling pathways. These findings support the potential of using network-based gene prioritization for biomarker screening in OSCC. Expression validation and survival analysis through GEPIA2 confirmed clinical relevance. The study highlights MMP9 and CXCL8 as robust candidate biomarkers, contributing to early detection strategies and targeted therapies.

Keywords: microarray datasets, differentially expressed genes, pathway enrichment, hub genes, survival analysis

OP 49:

Advanced AI Model for Predictive Modelling of Wound Healing Using Wound Image Datasets

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Abstract

In the growing era of Artificial Intelligence and its implications in various aspects of human life, we particularly emphasize its role in healthcare and telemedicine. We propose developing an AI model for predictive modelling of wound image datasets to predict wound healing outcomes and its comparison to expert human assessments. This will include the utilization of these models by the military and their edge in remote areas, where healthcare services are not available. This study provides a framework for evaluating AI-based digital wound assessment tools that can be extended to automated measurements of other wound features or adapted to evaluate other AI-based digital image diagnostic tools. With the increasing use of artificial intelligence (AI) technologies and portable devices such as smartphones, it is now timely to develop remote and intelligent diagnosis and prognosis systems for wound care. It is inclusive of tracing wound healing patterns and providing predictions for wound healing and care, by analyzing the patterns with AI. Artificial intelligent system can be extremely beneficial for wound care in many ways improved precision, reduced workload and financial burden, standardized diagnosis and management, and higher quality of patient care. To this end, this research work emphasizes computational methodologies behind wound diagnosis with the latest AI technologies.

Keywords: Artificial intelligence, convolutional neural network, healthcare, prediction, tissue, wound healing

OP 50:

Bioactive Compounds and Medicinal Applications of *Centella asiatica*

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Abstract

Centella asiatica, commonly known as Gotu kola, is a prominent herb in the Indian Ayurvedic system, revered for its wide-ranging therapeutic applications. This herbaceous plant, belonging to the Mackinlayaceae family, has long been employed in traditional medicine to address ailments such as skin disorders, leprosy, fever, gastrointestinal issues, mental health conditions, and neurodegenerative diseases. It is especially valued for its capacity to enhance cognitive function, memory, and overall mental clarity, making it a popular remedy for age-related cognitive decline and learning difficulties in children.

The plant's aerial parts and roots are rich in bioactive compounds, particularly triterpenoid saponins like Asiatic acid, Asiaticoside, Madecassoside, and Centelloside, which contribute to its diverse pharmacological profile. These constituents exhibit significant antioxidant, anti-inflammatory, antibacterial, antiviral, antileptotic, anticancer, neuroprotective, and wound-healing properties. Scientific studies have confirmed the efficacy of many of these compounds, reinforcing the herb's potential in modern pharmaceutical development.

In addition to treating chronic illnesses, *C. asiatica* is used to manage conditions like headaches, asthma, and ulcers, and is believed to promote longevity and intelligence. Emerging research also suggests that it may improve synaptic activity and neurogenesis, offering promising insights into its role in brain health and repair. Its traditional use, now supported by modern science, positions *Centella asiatica* as a vital link between ancient wisdom and contemporary medicine.

Keywords: Neuroprotective, Gotu kola, Chronic illness, Bioactive compounds, Ayurvedic medicine

OP 51:

Targeting Throat Cancer Biomarkers Identified via Proteogenomics Using Natural Phytochemicals: A Molecular Docking Approach

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Abstract

Throat cancer remains a significant clinical challenge due to late-stage diagnosis and limited targeted therapies. This study presents an integrative approach combining proteogenomics, natural phytochemicals, and molecular docking to identify and evaluate potential therapeutic agents for throat cancer. Proteogenomic analysis enables the simultaneous examination of genomic and proteomic profiles, allowing for the precise identification of disease-specific biomarkers and protein targets critical to cancer progression. Leveraging this data, we screened a curated library of natural phytochemicals—renowned for their anticancer and low-toxicity profiles—against key overexpressed or mutated proteins in throat cancer. Molecular docking techniques were employed to predict and analyze the binding interactions between these phytochemicals and the identified protein targets, offering insights into their potential as inhibitors or modulators. Several compounds demonstrated high binding affinities and stable interactions, indicating promising therapeutic potential. Furthermore, proteomic insights contributed to understanding protein expression dynamics and signaling pathway alterations, reinforcing the relevance of the selected targets. This multifaceted strategy not only accelerates the identification of effective drug candidates but also enhances the precision of targeted therapy development. Our findings underscore the potential of integrating proteogenomics with natural product screening and *in silico* modeling to innovate throat cancer therapeutics and improve clinical outcomes.

Keywords: Proteogenomics, Phytochemicals, Throat Cancer, Molecular Docking, Biomarkers

OP 52:

Nanotechnology for Environmental and Medical Application

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Abstract

Nanotechnology plays crucial role in Environmental and biomedical. Nanoparticles means the particles ranges from (1 to 100nm). These nanoparticles are characterized using techniques like FT-IR, SEM, TEM, DLS, IR Spectroscopy, UV-visible spectroscopy, and XRD to ensure their quality and their functions. In medicine, nanomaterials and nano sensors have enabled earlier and more accurate disease diagnosis, highly targeted drug delivery, and advanced therapies for cancer, heart disease, protein lipid cancer therapy, vaccine development, covid vaccine, Covid shield, also get researched by nanotechnology often improving treatment outcomes and reducing side effects on human. Nanofibers and smart nanomaterials are being developed for drug delivery, tissue engineering, and biosensing, while also supporting the creation of more efficient and multifunctional medical devices. In environmental protection, engineered nanomaterials are used for cleaning up pollutants in water, air, and soil, monitoring environmental quality, and supporting sustainable waste management, often with greater efficiency than tradition methods. Nanotechnology also plays a role in food safety, agriculture, and cosmetics, further broadening its impact. Despite these advances, there are important concerns about the safety and long-term environmental effects of nanomaterials, as their small size and high reactivity can pose risks to ecosystems and human health. Researchers are now focusing on developing sustainable nanomaterials and adopting “Safe- and Sustainable-by-Design” approaches to minimize risks and ensure responsible use. Regulatory frameworks and public education are also needed to address ethical, privacy, and safety issues as nanotechnology becomes more widely used. For environmental cleanup, nanomaterials help remove toxic substances from water and soil. In electronics and computer science, nanomaterials have made it faster, and more effective. Overall, nanotechnology has brought new, efficient, and sustainable solutions to health, food, energy, environment, and industry, leading to big changes in everyday life. Nanotechnology has emerged as a powerful tool with wide-ranging applications in medicine, agriculture, environmental protection, electronics, and industry. Overall, nanotechnology has brought significant benefits to healthcare and environmental management, but its continued success depends on careful research, clear regulations, and a strong commitment to safety and sustainability.

Keywords: Nanotechnology, FT-IR, SEM, Covid shield, sustainable nanomaterials

OP 53:

Investigation of Structural, Optical, Thermal and Electrical Properties of Hydrothermally Synthesized WO₃: SiO₂ Composite

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Abstract

Tungsten trioxide–silicon dioxide (WO₃:SiO₂) composites were synthesized via a hydrothermal method using varying weight ratios (1:1, 1:2, 2:1). The structural, thermal, morphological, and optical properties of the resulting nanocomposites were systematically investigated. X-ray diffraction (XRD) confirmed the formation of crystalline composite phases, while UV–Visible spectroscopy revealed compositional influence on optical absorption behavior. Raman spectroscopy provided insight into bonding interactions and structural modifications within the composite matrix. Differential scanning calorimetry (DSC) indicated enhanced thermal stability, and high-resolution transmission electron microscopy (HR-TEM) showed well-defined nanostructures with uniform dispersion of SiO₂ in the WO₃ matrix. Impedance spectroscopy was employed to evaluate the electrical properties, revealing frequency-dependent dielectric behavior and improved conductivity with optimized composition. These results highlight the potential of WO₃: SiO₂ composites as functional materials for advanced sensing and electronic applications.

Keywords: Hydrothermal synthesis, Tungsten Trioxide, Silicon oxide, WO₃: SiO₂ composite, XRD

OP 54:

Circular Economy Business Models: A Commerce Perspective on Waste-to-Wealth Innovations

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Abstract

The global economy is witnessing a transformative shift from the traditional linear model of “take-make-dispose” to a circular economy that emphasizes reusing, recycling, and regenerating materials” model towards a circular system that prioritizes sustainability by promoting reuse, recycling, and material regeneration. This abstract explores how circular economy principles are being embedded into modern commerce through innovative business models that convert waste into wealth. It investigates how various sectors—such as plastic recycling, e-waste management, and agro-waste utilization—are creating sustainable value chains that generate both economic returns and environmental benefits. From a commerce perspective, this study identifies the financial viability and market adaptability of circular startups and enterprises. The paper emphasizes the integration of circular principles in the supply chain, supported by green financing, consumer behavior shifts, and supportive government schemes like Swachh Bharat Abhiyan and Startup India. It highlights the role of digital tools such as blockchain and IoT in improving transparency and traceability in waste-to-wealth initiatives. The research uses secondary data, industry examples, and Indian case studies to demonstrate how circular business models are driving inclusive growth, employment generation, and climate resilience. This study concludes that adopting circular economy strategies not only conserves resources but also opens new opportunities for economic development and sustainable entrepreneurship.

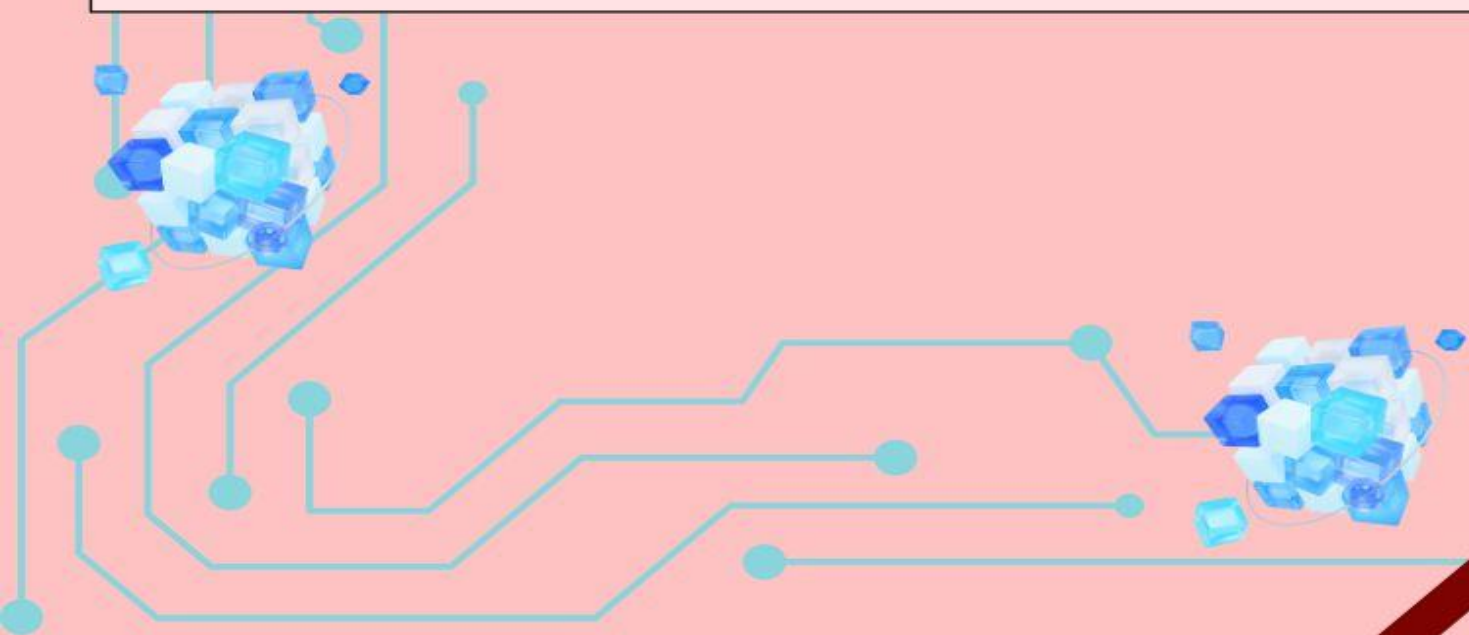
Keywords: Circular Economy, Green Commerce, Waste-to-Wealth, Sustainable Innovation, Business Models

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