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MIT ART, DESIGN AND TECHNOLOGY UNIVERSITY, PUNE
MIT ADTU School of Bioengineering Sciences & Research

8th INTERNATIONAL CONFERENCE
ON

RECENT TRENDS IN BIOENGINEERING

(ICRTB 2025)

Friday, January 31st - Saturday, February 1st, 2025

ABSTRACTS

Sponsored by DST-SERB(ANRF)
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About ICRTB 2025

International Conference on Recent Trends in Bioengineering (ICRTB) is an annual flagship event, organized by MIT ADTU School of Bioengineering Sciences & Research, Pune. This conference is sponsored by DST-SERB, Anusandhan National Research Foundation (ANRF), Government of India. The main objective is to bring together engineers, researchers, practicing clinicians, academicians, industry luminaries and government agencies to discuss the latest research in bioengineering and allied fields. The organising committee of ICRTB 2025 is pleased to invite prospective authors to submit their original abstracts to icrtb@mituniversity.edu.in for oral and poster presentations. Selected abstracts will be considered for oral presentation and proceeding will be published as a special issue in John Wiley Journal of Biotechnology and Applied Biochemistry. Prizes will be awarded for the best oral and poster presentations.

Conference Theme Areas

- Biosensors
- Environment Engineering
- Ecosystem Health
- Environmental Health
- Urbanization and Public Health
- One Health Policy and Governance
- Biofertilizers & Biopesticides
- Bio-inspired materials
- Antimicrobial Resistance (AMR)
- Water Conservation
- Biomedical imaging
- Bioremediation
- Medical wearable devices and Diagnostics
- Bioinformatics
- Microfluidics
- Drug Delivery Systems
- Climate Change

ANRF DST SERB Sponsored

8th International Conference

on

Recent Trends in Bioengineering (ICRTB-2025)

Editors

Prof. Vinayak Ghaisas

Dr. Renu Vyas

Organized by

Breathe Life into Engineering Career!

MIT ADTU School of Bioengineering Sciences & Research

MIT Art, Design and Technology University, Pune - 412201

India

First Impression: January 2025

8thInternational Conference on Recent Trends in Bioengineering (ICRTB 2025)

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8TH INTERNATIONAL CONFERENCE ON RECENT TRENDS IN BIOENGINEERING (ICRTB-2025)

(January 31- February 01, 2025)

Detailed Schedule

Day 01: January 31, 2025 (Friday)

Venue: Urmilatai Karad Auditorium,

MIT Art, Design and Technology University, Pune

Inauguration	
8.30 am to 9.30 am	Spot registrations, arrival of guests, speakers and delegates and breakfast
9.30 am to 10.30 am	Inaugural program presided by Hon Vishwanath Karad sir, Founder MIT Group of Institutes and President MIT-Art, Design and Technology University
9.30 am to 9.35 am	Welcome of audience by the anchors, World Peace prayer and lamp lighting by dignitaries on the dais
9.35 am to 9.40 am	Introduction of guests and conference theme by Dr. Renu Vyas, Convenor,
9.40 am to 9.45 am	Welcome speech by Prof. Vinayak Ghaisas, Executive Director and Founder, MIT ADTU School of Bioengineering Sciences & Research Trustee, MAEER, Pune
9.45 am to 9.50 am	Felicitation of guests by dignitaries
9.50 am to 09.55 am	Release of abstract book by dignitaries on the dais
09.55 am to 10.40 am	Brief remarks by the Chief Guest and Guest of honor
10:40 am to 10:45 am	Vote of Thanks
10:45 am to 11.15 am	Tea break and group photo
11.15 am to 1 pm	Keynote Addresses (Venue: Urmilatai Karad Auditorium)

	Session Chair: **Dr. Renu Vyas**
11.30 am to 12.00 pm	**Prof. Anil Kaul** Vice Chancellor, PH FI/IPHS University, Director, Indian Institute of Public Health, Hyderabad, Former Senior Public Health Advisor, US Department of State
12.00 pm to 12.30 pm	**Dr Kirsten Rosselot** Director, Process Profiles, California USA
12.30 pm to 1.00 pm	**Dr. Aparna Sharma** Chief Manager-Technical Department, Biotechnology Industry Research Assistance (BIRAC)
1.00 pm to 2.00 pm	Lunch Break, poster session and Industry Expo
2.00 pm to 4 pm	Plenary Session I Session chair: **Dr Czarny Bertrand**
2.00 pm to 2.30 pm	**Dr. Dhanashekaran Shanmugam** CSIR NCL Pune
2.30 pm to 3.00 pm	**Dr. Federico Lauro** Associate Professor, NTU Singapore
3.00 pm to 3.30 pm	**Dr. Dasmit Singh** Pediatric Surgeon, B.J. Medical College & Sassoon Hospital, Pune
3.30 pm to 4.00 pm	**Dr Aedin Culhane** Professor Cancer Genomics, Director of the Limerick Digital Cancer Research Centre, University of Limerick, Ireland
4.30 pm to 5.00 pm	**Dr Anusha Dargashetti,** Life Sciences, Wiley
5.00 pm to 6.15 pm	Oral/Poster sessions by delegates (parallel sessions) (MIT Bioengineering Auditoriums)
6.30 pm	Day One conclusion

Day 02: February 01, 2025, Saturday

8.00 am to 8.30 am	Tea and Breakfast
8.30 am to 10.30 am	Plenary Session II Session chair: **Dr. Mahesh Kulkarni**
8.30 am to 9.00 am	**Dr. Mark Prausnitz** Regents' Professor, Chemical and Biomolecular Engineering, Georgia Institute of Technology USA
9.00 am to 9.30 am	**Dr. Uta Griesenbach** Professor at National Heart and Lung Institute, Imperial College London
9.30 am to 10.00 am	**Dr Kavita Reginald** Sunway University Malaysia
10.00 am to 10.30 am	**Dr Ahmed Elbidewy** Dept. Of Biomolecular Sciences, Kingston University, London, UK
10.30 am to 11.00 am	Plenary Session III (Tea break) Session Chair: **Dr Uta Griesenbach**
11.00 am to 11.30 am	**Dr. Jonathan Goodman** Cambridge University UK
11.30 am to 12.00 pm	**Dr. Justin Dauwels** TuDelft, Netherlands
12.00 pm to 12.30 pm	**Dr. Mahesh Kulkarni** Chair, Biochemical Division, Senior Principal Scientist, CSIR NCL, India
12.30 pm to 01.00 pm	**Prof. Czarny Bertrand** Nanomedicine, NTU, Singapore
01.00 pm to 1.30 pm	Lunch break
1.30 pm to 4.00 pm	Plenary Session IV Session Chair: **Dr. Federico Lauro**
1.30 pm to 2.00 pm	**Suhas Tamras** CEO, Johari Digital Health Care Ltd., Pune
2.00 pm to 2.30 pm	**Dr. Reshma Puranik** Medical Oncologist Ruby Hospital Pune

2.30 pm to 3.00 pm	**Dr. Ramakrishnan Venugopalan** Amrita Institute of Medical Sciences, Kochi, India
4:30 pm to 4.45 pm	Tea break
4.45 pm to 5.30 pm	Oral/Poster sessions by delegates (parallel sessions) (MIT Bioengineering Auditoriums)
5.45 pm to 6:15 pm	Valedictory function, announcement of Prizes, concluding remarks by guests and Executive Director
6:15 pm	National Anthem

Kindly note all timings are in IST.

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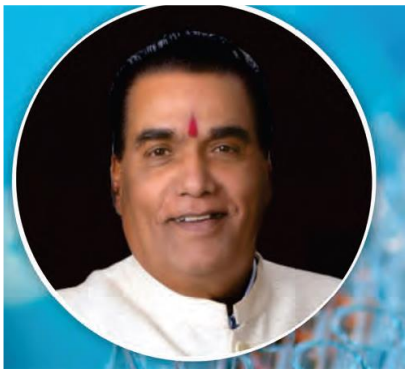
Messages



Hon. Prof. Dr. Vishwanath Karad

It gives me immense pleasure to see that MITADTU School of Bioengineering Sciences & Research is organizing its 8th International Conference on Recent Trends in Bioengineering from 31st January -1st February 2025. One Health occupies a very important place in the development of the society and nation. I am sure the conference will successfully highlight the various issues the globe is facing and devise sustainable solutions for healthcare and the environment.

My heartiest congratulations to the organizers for creating this amazing platform for exchange of ideas. My best wishes for the event!

Hon. Prof. (Dr.) Vishwanath D. Karad
Founder, MIT Group of Institutions
President, MIT Art, Design and Technology University, Pune

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Late Dr. Suresh Ghaisas

Dedicated in loving memory of Hon'ble Dr. Suresh Ghaisas whose blessings shall always stay with us.

Sir,
Your life was an inspiration,
Your good deeds our guiding path,
An epitome of generosity and gentleness
Bless us as always with your loving warmth.

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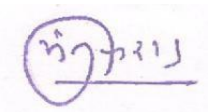
Hon. Dr. Mangesh Karad

Dear Delegates & Speakers,

A warm welcome to the 8th International Conference on Recent Trends in Bioengineering. I am sure that this conference will be very successful like the previous ones and will catalyze research and innovation at our university in general and School of Bioengineering in particular.

It is widely believed that the major solutions in healthcare environment will emerge from interdisciplinary research and at the interface of the disciplines. The Bioengineering Institute of our University is one such example of an interdisciplinary curriculum with a unique blend of biology and technology.

I recognize the contribution of Bioengineering institute in initiating and enhancing research at the University level and congratulate the staff of Bioengineering for diligently organizing this annual conference. Hope all delegates will like our beautiful campus and warm hospitality.



Hon. Dr. Mangesh Karad
Executive President
MIT Art, Design and Technology University, Pune

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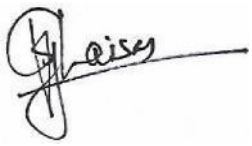
Prof. Vinayak Ghaisas

It is with great pleasure and anticipation that we welcome you to the 8th International Conference on Recent Trends in Bioengineering. This conference serves as a critical platform for scholars and eminent professionals from around the world to come together and engage in meaningful discussions. The conference represents our collective commitment to provide a strong research framework and innovation guide to the future generations. We hope that the sustained efforts will lead to the development of useful technologies in healthcare and environment to achieve our vision to build a society free from diseases and disabilities.

I am eager to meet all the participants, presenters, and speakers who will be bringing the unique expertise, enthusiasm and experience to this amazing event. Once again welcome you all to the conference.



Prof. Vinayak Ghaisas
Founder & Executive Director
MIT ADTU School of Bioengineering Sciences & Research
Trustee, MAEER's MIT Group of Institutions, Pune

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Dr. Renu Vyas

It is with profound sense of purpose that we welcome you to our annual flagship event - the 8th International Conference on Recent Trends in Bioengineering (ICRTB 2025). This unique conference is a humble effort in the pursuit of a clean environment and a healthy life and an integrated approach signified by the term "One Health". We bring together researchers, engineers, clinicians, environmentalists, policy makers, and industry professionals from diverse backgrounds to network, advocate, and implement the concept of "One Health". The main objective of ICRTB 2025 is to disseminate knowledge for adoption of the best practices in the creation of sustainable solutions and green technologies.

Our sincere thanks to the speakers, local organizing team members, and the delegates for providing high quality support in terms of timely submission of synopsis of talks, abstracts etc. for oral and poster presentations in the conference. Our deep sense of gratitude to ANRF DST SERB for financial assistance and John Wiley for being our publishing partner.

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Let us convene to address the challenges that lie ahead and unite for a common goal as we continue our journey towards a sustainable and resilient future.

On behalf of MIT School of Bioengineering Sciences & Research, welcome you all to participate enthusiastically in the conference and immensely benefit from the two days of intense deliberations.

Dr. Renu Vyas
Principal,
MIT ADTU School of Bioengineering Sciences & Research
Convenor, ICRTB 2025

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Eminent Speakers

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Prof. Anil Kaul

Vice Chancellor, PH FI/IPHS University
Director, Indian Institute of Public Health, Hyderabad
Former Senior Public Health Advisor, US Department of State

Profile:

Dr. Anil Kaul is a physician-scientist with over 35 years of experience in infectious diseases and women's health. He holds degrees in Medicine from Madras Medical College, Dentistry from King George's Medical College, and Public Health Administration from the University of Minnesota. Dr. Kaul served as Clinical Professor and Program Director for Global Health at Oklahoma State University, where he established and directed the High-Complexity Infectious Diseases laboratory. During the COVID-19 pandemic, he led testing efforts and was clinical director for the Oklahoma Pandemic Center for Innovation and Excellence. He has worked with the Defense Threat Reduction Agency, USAID, and served as a Senior Health Advisor for the U.S. Department of State. Dr. Kaul is listed among the World's Top 2% most cited scientists by Stanford University and has over 100 publications and 200 presentations. He holds six U.S. patents and has received numerous awards for his contributions.

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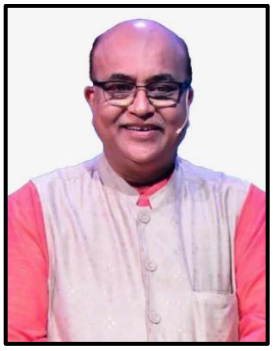

Dr. Shirshendu Mukherjee

Managing Director
Wadhwani Innovation Network

Profile:

Dr. Shirshendu Mukherjee is the Managing Director of Wadhwani Innovation Network and a microbiologist with over 30 years of experience across academia, pharma, and funding agencies. He has made significant contributions to the innovation ecosystem both in India and internationally. Dr. Mukherjee is a Registered Technology Transfer Professional (RTTP), certified by the Alliance of Technology Transfer Professionals (ATTP). He serves as an Honorary Scientific Advisor to the Indian Patent Office and as the Country Ambassador for the Royal Society of Tropical Medicine & Hygiene (RSTMH) in India. Additionally, he is the General Secretary of the Society for Technology Management (STEM) and a Board member of the Indo-US Science and Technology Forum. Dr. Mukherjee holds a Ph.D. in Microbiology, a law degree, and has completed leadership programs at the University of Oxford's Said Business School and the London School of Hygiene & Tropical Medicine (LSHTM).

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Prof. Uta Griesenbach

Professor, Molecular Medicine
National Heart and Lung Institute
Imperial College London

Profile:

Uta Griesenbach is a Professor of Molecular Medicine and has over 25 years' experience in developing advanced therapeutic medicines. Her research interests are related to the development of gene and cell therapy-based treatments for cystic fibrosis (CF) and other lung diseases. She has overseen vector and biomarker development, toxicology studies, as well as vector manufacturing and has been a Co-I on several clinical trials. Uta is a member of the UK Respiratory Gene Therapy Consortium (GTC) strategy group and a co-founder of AlveoGene (Imperial College Spinout) with the remit of developing gene therapy for rare respiratory diseases. Uta is a non-executive director of the Cell and gene Therapy Catapult and was President of the British Society for Gene and Cell therapy (2017-2021). In addition to her research activities she has an active role in education and workforce development related to advanced therapeutics in the UK.

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Dr. Mark Prausnitz
Regents' Professor
Chemical and Biomolecular Engineering
Georgia Institute of Technology
Atlanta, Georgia, USA

Profile:

Mark R. Prausnitz is Regents' Professor, Regents' Entrepreneur and J. Erskine Love, Jr. Chair in Chemical & Biomolecular Engineering at the Georgia Institute of Technology in Atlanta, Georgia, USA. He carries out research on biophysical methods of drug delivery using microneedles, lasers, ionic liquids and other microdevices for transdermal, ocular and intracellular delivery of drugs and vaccines. He has published more than 340 journal articles, invented more than 75 US patents, was elected to the National Academy of Engineering, National Academy of Medicine, and National Academy of Inventors, and has co-founded nine start-up companies.

Synopsis of the talk:

Most biomarkers used in research and clinical medicine are collected from the blood. Although blood is a relatively easy fluid to access, it represents less than one tenth of bodily fluid. Interstitial fluid (ISF), which is the extracellular fluid found in tissues, represents almost a quarter of fluid in the body. Because ISF is derived from fluid leakage from the vasculature, it has biomarkers found in

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the blood. And because ISF is in contact with cells in tissues, it has biomarkers from cellular metabolism. In addition, ISF does not clot, thereby facilitating continuous biomarker monitoring. Glucose is the only biomarker routinely measured in ISF, but it requires implantation of a biosensor in the subcutaneous space. To access ISF more easily, we have developed a method that uses microneedles to puncture microscopic pores in the skin, without bleeding, combined with suction to extract microliter quantities of ISF from the skin. We found that suction-based sampling was more effective than ISF collection by diffusion, capillary action, or osmosis, because pressure-driven flow not only provides a driving force for fluid flow through microneedle pores, but also through the surrounding tissue. Among the >10,000 biomarkers measured in a small human study (n=22 subjects), 69% of the biomarkers were found in both plasma and ISF, 17% were found only in ISF, and 11% were found only in plasma. On-going research seeks to further simplify ISF collection methods to enable routine ISF sampling for research and future clinical use.

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Dr. Justin Dauwels
Associate Professor
TU Delft (Signals and Systems group, Department of Microelectronics)
co-Director, Safety and Security Institute at the TU Delft

Profile:

Dr. Justin Dauwels is an Associate Professor at the TU Delft (Signals and Systems, Department of Microelectronics), and serves as co-Director of the Safety and Security Institute at the TU Delft. He was an Associate Professor of the School of Electrical and Electronic Engineering at the Nanyang Technological University (NTU) in Singapore till the end of 2020. At the TU Delft, he serves as scientific lead of the Model-Driven Decisions Lab (MoDDL), a first lab for the Knowledge Building program between the police and the TU Delft. He also serves as Chairperson of the EE Board of Studies at the TU Delft, and is a board member of the Co van Ledden Hulsebosch Center (Netherlands Center for Forensic Science and Medicine).

His research interests are in data analytics with applications to predictions problems (e.g., nowcasting of precipitation, remaining-useful-lifetime (RUL) prediction of electronic components), intelligent transportation systems, autonomous systems, and analysis of human behavior and physiology. He obtained his PhD degree in electrical engineering at the Swiss Polytechnical Institute of Technology (ETH) in Zurich in December 2005. Moreover, he was a postdoctoral fellow at the RIKEN Brain Science Institute (2006-2007) and a research scientist at the Massachusetts Institute of Technology (2008-2010).

He has been elected as IEEE SPS 2024 - 2025 Distinguished Lecturer. He served as Chairman of the IEEE CIS Chapter in Singapore from 2018 to 2020, and served as Associate Editor of the IEEE Transactions on Signal Processing (2018 - 2023), and serves currently as Associate Editor (2021-2023) and Subject Editor (since 2023) of the Elsevier journal Signal Processing, Area Editor C&F for the IEEE Signal Processing Magazine (since 2023), member of the Editorial Advisory Board of the International Journal of Neural Systems (since 2021), and organizer of IEEE conferences and special sessions. He was also Elected Member of the IEEE Signal Processing Theory and Methods Technical Committee and IEEE Biomedical Signal Processing Technical Committee (both in 2018-2023), and is currently Elected

Member of the IEEE Machine Learning for Signal Processing Technical Committee and the IEEE Emerging Transportation Technology Testing (ET3) Technical Committee. He has been a JSPS postdoctoral fellow (2007), a BAEF fellow (2008), a Henri-Benedictus Fellow of the King Baudouin Foundation (2008), and a JSPS invited fellow (2010, 2011). His research team has won several best paper awards at international conferences and journals.

His research on intelligent transportation systems has been featured by the BBC, Channel 5, Straits Times, Lianhe Zaobao, and other national newspapers worldwide, and numerous technology websites. Besides his academic efforts, the team of Dr. Justin Dauwels also collaborates intensely with local start-ups, SMEs, and agencies, in addition to MNCs, in the field of data-driven transportation, logistics, and medical data analytics. His academic lab has spawned four startups across a range of industries, ranging from AI for healthcare to autonomous vehicles.

Synopsis of the talk:

Extreme precipitation nowcasting using deep generative models

Extreme weather events, such as the floods recently in Valencia, Spain, have led to substantial impacts, including loss of life and major economic losses. Therefore, weather forecasts need to become more reliable, especially for extreme weather events. There has been a recent breakthrough in precipitation nowcasting, which is precipitation forecasting for the next few hours: Machine learning models, particularly deep generative models, can provide improved forecast quality compared to the state-of-the-art nowcasting and physics-based models. However, these new models are not adequate for extreme weather events. In our team, we are developing new deep generative models specifically for nowcasting extreme precipitation. Concretely, we are designing transformer-based generative models, in particular, VideoGPT with Extreme Value Loss (EVL) regularization. Leveraging a comprehensive dataset from the Royal Netherlands Meteorological Institute (KNMI), we aim to predict short-term extreme precipitation with high accuracy. We introduce a novel method for computing EVL without assuming fixed extreme representations, addressing the limitations of current models in capturing extreme weather events. Currently, we are also validating our deep generative nowcasting models on datasets from the US, Singapore, and India. We will present both qualitative and quantitative analyses, demonstrating the superior performance of the proposed VideoGPT-EVL in generating accurate precipitation forecasts, especially when dealing with extreme precipitation events.

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Ramakrishna P. Venugopalan (Rama P. Venu)
Gastroenterologist
Amrita Institute of Medical Sciences and Research Centre, Kochi
Diplomate, American Board of Internal Medicine

Profile:

Dr. Ramakrishna P. Venugopalan, also known as Rama P. Venu, is a distinguished gastroenterologist with an extensive career spanning clinical practice, research, and teaching. Holding an MD and multiple prestigious fellowships (FACP, FACG, FASGE, AGAF), Dr. Venugopalan is a Senior Consultant in Gastroenterology at Sri Ramakrishna Ashrama Charitable Hospital in Trivandrum and a retired professor and head of the Department of Gastroenterology at AIMS Kochi. He has also served as the Chief of Hepatobiliary Endoscopy at the University of Illinois, Chicago. A prolific researcher, Dr. Venugopalan has published 165 peer-reviewed articles in high-impact journals, including *NEJM*, *Gastroenterology*, and *JAMA*, and authored 20 textbook chapters. His research interests span colorectal cancer prevention, chronic pancreatitis, and advancements in endoscopic therapies. He has been recognized for his expertise, receiving the ASGE's "Master Endoscopist" award in 2005, and has contributed to numerous national and international research initiatives, including studies on polyp detection using artificial intelligence. Dr. Venugopalan's career is also marked by his roles as a visiting professor at esteemed institutions such as Harvard, Mayo Clinic, and Johns Hopkins. His contributions to gastroenterology and hepatobiliary medicine continue to shape the field.

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Synopsis of the talk:

ONE HEALTH, AI and Gastroenterology

ONE HEALTH envisions the goal of integrating and unifying a sustainable balance of the health of people, animals, and the environment. It has captured the imagination of people all over the world, from laymen to biologists and scientists to Green Earth advocates. Advances in biotechnology and its application have demonstrated measurable progress in achieving the lofty goal of ONE HEALTH. The influence of ONE HEALTH is also visible in human health and diseases. This is especially true in various branches of medicine, particularly in gastroenterology. The interaction between the microbiome and the human gastrointestinal system has become the subject of extensive research. The microbial ecosystem provides an extended "farm" for us. Besides the synthesis of short-chain fatty acids, the microbiome manufactures several micronutrients for us. The imbalance of the microbiome landscape, called dysbiosis, can lead to several GI disorders such as irritable bowel syndrome, inflammatory bowel disease, metabolic-associated fatty liver disease, and even colorectal cancer.

Dysbiosis has been implicated in causing oncogenic mutations. Such mutations might convert normal colonocytes into cancer cells by upregulating cellular proliferation. Dysbiosis might affect the epithelial tight junction, allowing microbes to penetrate the mucosa, invoking an inflammatory response and altered immunity. This complex mechanism may result in "leaky bowel syndrome," a common underlying mechanism for IBD and MAFLD.

Artificial intelligence has emerged as an important tool for evaluating the microbiome landscape. DNA sequencing can enrich our dataset of the microbiome. This can provide new insights into dysbiosis. Incorporating AI has played a major role in this regard. A new treatment approach is already in practice, i.e., probiotics. This so-called healthy or "for life" microbiome is currently in use for GI disorders such as IBS, IBD, travelers' diarrhea, and MAFLD.

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When it comes to CRC, dysbiosis has been implicated as the underlying mechanism causing oncogenic mutation, propelling uncontrolled cellular proliferation. The upregulated cellular proliferation of the colonocyte can cause colorectal adenoma or adenomatous polyps. These polyps are precancerous lesions. Detection and removal of adenomatous polyps have been established as the best way to prevent CRC by the National Polyp Study (NPS). Thus, the Adenoma Detection Rate (ADR) during colonoscopy has emerged as the best metric for a successful screening colonoscopy. By incorporating AI software in the computer, Computer-Assisted Diagnosis (CADe) has become a reality. By employing CADe, ADR can be enhanced, thus preventing CRC.

In summary, AI has emerged as an excellent tool in understanding the microbial ecosystem and its interaction with humans. This has opened a new way of looking at our environment, improving our health, and treating certain health disorders arising from imbalances in the microbial ecosystem.

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Dr. Kirsten Sinclair Rosselot
Director, Process Profiles,
California, USA

Profile:

Kirsten Rosselot is an environmental performance consultant with decades of experience collaborating with non-profits, academia, government agencies, and industry on projects ranging from life-cycle assessments to integrated energy efficiency evaluations. A licensed professional chemical engineer in California, she worked as a staff research associate at UCLA before founding her consulting business in 1995. She taught an upper-division/graduate elective on pollution prevention in the chemical engineering department at California State University, Long Beach, and has co-authored numerous handbooks, textbooks, peer-reviewed articles, and educational materials promoting sustainability and green engineering practices. As a panelist on The Balance Point Podcast, she seeks to address misconceptions about climate science.

Synopsis of the talk:

Reducing indirect health impacts across the life cycle of bioengineered products

Bioengineering is revolutionizing human health outcomes by curing disease, reducing disability, improving health marker monitoring, and more. The human health impacts of bioengineering extend beyond the medical field, and include addressing challenges in the production of adequate nutritious food via bioengineered pest control and aids to regenerative agriculture. This talk focuses not on the direct health impacts of bioengineered products and materials, but on limiting ill effects from exposure to substances that are used to produce and deliver them, and that may arise upon

disposal. The most advantageous opportunity for minimizing the potential for harm while preserving innovation and profitability is during the early stages of process development, when cost, market, and performance factors are being evaluated. Informed decision-making is facilitated by integrating a systematic approach to assessing toxicity and other negative factors. An overview of health-related metrics, where to find values for these metrics, and the challenges associated with weighing and interpreting their implications will be given. An example scheme for evaluating substances for toxicity and other negative factors will be described.

ISBN: 978-93-341-9591-0

Dr. Ahmed Elbediwy
Senior Lecturer
Kingston University, London
Dept. of Biomolecular Sciences, Kingston University, London, UK

Profile:

Dr. Ahmed Elbediwy is a Senior Lecturer at Kingston University, London. He joined the university in late 2018 after a successful research career at the Francis Crick Institute and earning his PhD from University College London. Dr. Elbediwy has made significant contributions to the field of cancer signalling, with numerous high-impact publications focussing on how cancer initiation and development arises. At Kingston University, he quickly established himself as an integral part of the Biomolecular Science teaching team. He became the course leader for BSc Biochemistry in 2020 and for BSc Biological Sciences in 2023. Dr. Elbediwy is known for his innovative teaching techniques, which has earned him numerous awards and countless nominations.

Synopsis of the talk:

How the control of growth is essential in cancer prevention

The regulation of organ growth and maintaining tissue homeostasis by controlling cell proliferation, differentiation, and apoptosis is an essential component of an organism. This process ensures that organs grow to their correct size and function properly. Dysregulation of this pathway can lead to uncontrolled cell growth and cancer initiation. In this talk we will investigate a key pathway involved in this process and how manipulation of this pathway can lead to severe consequences.

ISBN: 978-93-341-9591-0

Dr Bertrand Czarny
School of Materials Science & Engineering
Nanyang Technological University (NTU), Singapore

Profile:

Dr Bertrand Czarny joined the French governmental agency CEA (Atomic Energy Commission) in 2001. For more than 10 years, Dr Czarny was responsible for the studies conducted in Bio distribution, drug delivery and toxicology of nanoparticles as a Team Leader. During this period, he received a Ph.D. degree in structural and functional engineering of biomolecules from the University of Paris Descartes, Pharmacy Paris V (France). Following his PhD, Dr Czarny developed preclinical studies on different inflammatory diseases using nanoparticles drug formulations at Utrecht University (UU) Netherlands, at the National University of Singapore (NUS) or at Nanyang Technical University (NTU) as Research Fellow. Now, Dr Czarny is currently an assistant Professor of nanomedicine the School of Material Sciences and Engineering (MSE) and the Lee Kong Chian School of Medicine (LKC). His research is focused on the development of nanomedicines with large emphasis on extracellular vesicles mimetic and in vivo pre-clinical studies to deliver drugs, genes or act as a

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vaccine. The research activities aim to understand the mechanisms of actions of these engineered vesicles and the interaction with the different cells. His research is highly translational, and is broadly applicable to many pathological conditions. Bertrand published more than 60 research/review articles, and some book chapters and patents.

Synopsis of the talk:

Advance vesicular system, their role in nanomedicine from drug delivery to vaccine application

We developed a robust and inexpensive method for production, isolation and characterization of extracellular vesicles mimetics from eukaryote cells. These extracellular vesicles mimetics are mainly investigated in the context of tissue remodelling for various applications but also used as drug delivery system. Based on this approach, we also produced bacterial extracellular vesicles mimetics (BEVMs) and used for the development of new vaccines targeting life-threatening bacterial infections but also for the treatment of inflammatory conditions or as drug delivery systems.

Like their eukaryotic counterparts, bacterial extracellular vesicles (BEVs) are very difficult to isolate and therefore to characterize, rendering their study and therapeutic use challenging. Promising nano-formulations of eukaryotic and prokaryotic extracellular vesicles mimetic are evaluated invitro and in pilot preclinical trials in our lab. During this seminar, to illustrate this concept, I will discuss about the engineering of nanovesicles system from eukaryotic and prokaryotic cells used in these different contexts.

ISBN: 978-93-341-9591-0

Mr. Suhas Tamras
CEO, Johari Digital Health Care Ltd., Pune

Profile:

Mr Tamras is currently the CEO of Syrma Johari Medtech Ltd which is a Design Led manufacturing company for medical devices and IVD. He is responsible for driving the vision, the strategy, and the growth of the company to become a leading name in MedTech innovation, design and manufacturing. Throughout his career spanning about 27 years, he has been a transformational leader who leverages technology, strategies, and relationships to develop innovative solutions for the MedTech industry. He has deep experience in design, development, and commercialization of medical devices across various segments such as cardiology, monitoring vitals, and *in vitro* diagnostics. He has held leadership positions in large multinational companies like Tata Elxsi and Capgemini.

Synopsis of the talk:

The rise of Indian Medtech Industry

The talk will focus on the transformation of the Indian medtech industry, from being an import focused to an indigenous R&D and manufacturing focused industry. In the recent years, industry is driven by innovation, digital integration, and government initiatives. Few cases of innovation, product launches, and successful startups will be presented.

ISBN: 978-93-341-9591-0

Prof. Jonathan Goodman
Professor, Department of Chemistry, University of Cambridge

Profile:

Jonathan Goodman is a professor of Chemistry at the University of Cambridge. His research focuses on areas such as chemical biology, catalysis, and molecular recognition. Professor Goodman is known for his work in the development of new chemical tools and techniques that can have significant applications in medicine and drug development. His research often integrates concepts from organic chemistry, biochemistry, and materials science, aiming to bridge the gap between chemical synthesis and biological systems.

In addition to his research contributions, Professor Goodman is involved in teaching and mentoring students at Cambridge, helping to shape the next generation of chemists. His work is highly regarded in the field of chemical research, and he has published extensively in scientific journals.

Synopsis of the talk

All molecules are interesting

Molecules are the underlying basis of all of bioengineering. How can we understand their properties well enough to mechanise our understanding of molecular properties? We are developing methods for the automated interpretation of analytical data and for predicting the products of reactions. This will be needed if we are going to analyse reactions as quickly as we will be able to perform reactions with robotic systems. As we get better at these analyses, we should be able to design and make the molecules with properties we need faster and more effectively.

ISBN: 978-93-341-9591-0

Dr. Aparna Sharma

Project Manager
Biotechnology Industry Research Assistance Council (BIRAC)
India

Profile:

Dr. Aparna Sharma is an accomplished professional with a diverse background in both research and project management within the biotechnology and healthcare sectors. She is currently a Project Manager at the Biotechnology Industry Research Assistance Council (BIRAC), where she contributes to driving innovation and supporting startups within India's growing biotechnology landscape. In her role at BIRAC, she has been instrumental in managing and overseeing projects that foster the development of biotech solutions and their commercialization.

Before her tenure at BIRAC, Aparna completed her postdoctoral research at the prestigious National Institute of Mental Health and Neuro Sciences (NIMHANS) in Bangalore. During her time at NIMHANS, she focused on mental health and neuro sciences research, contributing valuable insights into the field. With her strong academic background and expertise in both research and project management, Aparna has become a key figure in promoting the intersection of biotechnology and mental health, playing a significant role in the advancement of both fields through her work at BIRAC.

ISBN: 978-93-341-9591-0

Dr. Dhanasekaran Shanmugam
Biochemical Science Division
CSIR-National Chemical Laboratory

Profile:

Dr. Dhanashekharan Shanmugan is a scientist at the CSIR-National Chemical Laboratory (NCL) in Pune, India, where he has been working since 2012. His research focuses on molecular parasitology, comparative genomics, biochemistry, and cell biology, with an emphasis on neglected diseases and drug discovery. Shanmugan earned his Ph.D. at the Indian Institute of Science, Bangalore, under Prof. G. Padmanaban, and completed his postdoctoral work at the University of Pennsylvania with Prof. David S. Roos, studying parasitic organisms and their potential therapeutic targets.

Shanmugan's work includes significant contributions to the genomics of parasites like *Toxoplasma gondii* and *Neospora caninum*, offering insights into their evolutionary adaptations and strategies for disease control. He has co-authored numerous publications in high-impact journals, such as *PLOS Pathogens* and *Genome Biology*, focusing on drug discovery and identifying new therapeutic targets for parasitic and helminthic infections.

Through his research, Shanmugan has made valuable contributions to the understanding of parasitic diseases and continues to advance efforts in the development of innovative treatments for neglected tropical diseases. His interdisciplinary approach to genomics and biochemistry has positioned him as a key figure in global health research.

ISBN: 978-93-341-9591-0

Dr. Federico Lauro
Associate Professor
Nanyang Technological University (NTU), Singapore

Profile:

Professor Federico Lauro is a distinguished academic and researcher at Nanyang Technological University (NTU) in Singapore, with a strong focus on microbiology, bioinformatics, and environmental sciences. Born and raised in Venice, Italy, he graduated from the University of Padua before earning his PhD at the Scripps Institute of Oceanography (SIO) at UC San Diego. Lauro's research primarily investigates how microorganisms evolve, adapt, and contribute to ecological processes essential for the health of marine environments.

Lauro combines expertise in both experimental and computational sciences, specializing in deep-sea microbiology and cutting-edge "omic" technologies. He is highly skilled in microbial genomics and bioinformatics, having developed tools for analyzing large datasets, utilizing PERL programming and open-source software to model microbial communities and ecosystem functions. His work extends from marine microbial ecosystems to the air microbiome, broadening our understanding of microbial environments.

In addition to his scientific achievements, Lauro is a passionate sailor. He has won the Australian and Italian National Championships and placed fourth in the 2012 World Championships in Ynglings. With over 20,000 nautical miles and a Yachtmaster Ocean Captain's License, Lauro has competed in numerous long-distance, multi-day open ocean regattas, demonstrating his versatility and determination both in science and sport.

ISBN: 978-93-341-9591-0

Dr. Dasmit Singh
Pediatric Surgeon
B.J. Medical College & Sassoon Hospital
Pune

Profile:
Dr. Dasmit Singh is a highly experienced and respected Paediatric Surgeon currently serving as the Director of Pediatric Surgery at Surya Hospital, Wakad. With over 38 years of experience, Dr. Singh has worked as an expert Paediatrician across multiple cities in India, gaining recognition for his skill in handling complex medical cases. He is particularly known for his precision in diagnosis and his compassionate, empathetic approach to patient care.

Dr. Singh's specialties include appendectomy, circumcision, the treatment of birth defects, and inguinal hernia repair, among others. He has performed numerous successful surgeries, becoming a trusted name in the field. He completed his MBBS from B J Medical College and Sassoon General Hospital, Pune, in 1984, followed by an MS in General Surgery from the same institution in 1989. He later pursued MCh in Paediatric Surgery from Grant Medical College and Sir J J Group of Hospitals, Mumbai, in 1993.

Throughout his career, Dr. Singh has been actively involved in research and has published several papers in the field of Paediatrics. He has also participated in various workshops, furthering his knowledge and expertise. His contributions to Paediatric Surgery have been recognized with awards, cementing his reputation as a leading surgeon in his field.

ISBN: 978-93-341-9591-0

Dr Aedin Culhane
Professor, Cancer Genomics
Director, Limerick Digital Cancer Research Centre
University of Limerick, Ireland

Profile:

Dr. Aedin Culhane is a distinguished Professor of Biomedical Sciences (Cancer Genomics) in the UL School of Medicine at the University of Limerick, Ireland. A computational oncologist with over 20 years of experience in cancer genomics, she specializes in multi-omics data integration, statistical genomics, clinical bioinformatics, and genomics in oncology. Dr. Culhane's career includes more than 15 years at the Dana-Farber Cancer Institute and Harvard T.H. Chan School of Public Health in Boston, USA, where she advanced her expertise in cancer research.

Her current research focuses on developing algorithms and integrative data analysis for single-cell molecular data in cancer, aiming to identify regulatory molecules that can be targeted during tumor development, progression, drug response, and resistance. Dr. Culhane is a member of the Human Cell Atlas project and plays a leading role in the Bioconductor community, an open-source platform for genomic data analysis. She is a strong advocate for open-source science and collaboration in computational biology.

Dr. Culhane holds a Ph.D. from the University of Manchester, UK, and a B.Sc. in Industrial Biochemistry from the University of Limerick. She has held numerous prestigious roles, including senior positions at Harvard and Dana-Farber. She is actively involved in various professional societies, including the International Society for Computational Biology and the American Association for Cancer Research.

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Dr Anusha Dargashetti
Life Sciences, Wiley

Profile:

Anushka Daragshetti is a seasoned professional in the field of scientific research and publishing, currently serving as a Content Acquisition Specialist at Wiley, where she has been working since October 2023. With a background in biomedical research and a focus on scientific content, she plays a key role in identifying and facilitating research publications within Wiley's Life Science portfolio.

Anushka began her career in research as a Project Intern at Jain University, where she studied the role of nano-NF doped Titania in photo-degradation. She further honed her expertise as a Project Intern at the University of Manchester, working on immune responses to gut infections. Later, she worked as an R&D Executive at Novel Tissues Pvt Ltd and contributed to the establishment of labs and research in immunology and cell culture at KLES Dr. Prabhakar Kore Hospital.

Her experience also includes roles as a Quality Analyst at Ulatus (Crimson Interactive), a Content Review Associate, and a Research Officer at Accutest Research Laboratories. Anushka's research interests have included immunology, cell culture, and cancer genomics, and she is now contributing her knowledge to the scientific publishing world, helping researchers find the right platforms for their work.

ISBN: 978-93-341-9591-0

Dr. Mahesh Kulkarni

Chair, Biochemical Division
Senior Principal Scientist
CSIR NCL, India

Profile:

Dr. Mahesh Kulkarni is a distinguished scientist at CSIR-National Chemical Laboratory (NCL), Pune, India, specializing in mass spectrometry-based proteomics and metabolomics. His research focuses on post-translational modifications, protein glycation in diabetes, and bioinformatics, with significant contributions to understanding the molecular mechanisms underlying disease and therapeutic intervention. He is also involved in the study of biotherapeutics, using advanced proteomic techniques to explore protein dynamics and their role in health and disease.

Dr. Kulkarni earned his Ph.D. in Crop Physiology from the University of Agricultural Sciences, Bangalore, and has had an extensive academic career. He held a Raman Research Fellowship at the University of Turku, Finland, and worked as a post-doctoral fellow at the Genome Institute of Singapore. Earlier in his career, he was a research associate at the Center for Cellular and Molecular Biology, Hyderabad, and a scientist-consultant at Monsanto Research Centre, Bangalore.

An active academic leader, Dr. Kulkarni is currently the Head of the Biochemical Sciences Division at NCL (2023-2026) and has previously served as the Associate Dean of Biological Sciences at AcSIR. He is an editorial board member of several proteomics journals and holds memberships in esteemed scientific societies such as the Royal Society of Chemistry. His work has earned him multiple awards, including the Chellaram Diabetes Institute Special Recognition Award in 2018.

ISBN: 978-93-341-9591-0

Dr. Reshma Puranik

Medical Oncologist
Ruby Hospital, Pune

Profile:

Dr. Reshma Puranik is an experienced Medical Oncologist and Haemato-oncologist based in Wakad, Pune, with over 11 years of expertise in cancer care. She currently practices at Lakshya Cancer Care Center in Wakad, Pune. Dr. Puranik completed her MBBS from DR D Y Patil College for Women, Pune, in 2008, followed by a DNB in General Medicine from the National Board of Examination in 2013. She further specialized by earning her DM in Oncology from The Gujarat Cancer and Research Institute in 2018.

Dr. Puranik is known for her comprehensive experience in managing a variety of cancers, including head & neck, lung, breast, gastrointestinal, genitourinary, sarcomas, and skin cancers. She has a particular interest in treating malignancies in females, such as breast and cervical cancers, and is committed to raising awareness and promoting early diagnosis and prevention in women. Additionally, she has expertise in treating hematological malignancies, including leukemias, lymphomas, and multiple myeloma.

As a member of the Indian Medical Association (IMA), Dr. Puranik is dedicated to advancing cancer care, with a special focus on screening and preventive oncology, to improve outcomes for her patients.

ISBN: 978-93-341-9591-0

Dr Kavita Reginald
Associate Professor
Sunway University Malaysia

Profile:

Dr. Kavita Reginald is a distinguished academic and researcher, currently serving as the Head of the Department of Biological Sciences at Sunway University, Malaysia. She completed her PhD in Biology at the National University of Singapore in 2006, focusing on the molecular mechanisms of allergies. Prior to her doctoral studies, she earned her BSc (Hons) in Biotechnology from Universiti Putra Malaysia in 2001.

Dr. Reginald's research interests are centered around immunology, with a strong focus on allergy mechanisms, immunotherapy, and the development of novel therapeutic strategies for allergy treatment. She further honed her expertise during post-doctoral training in Austria and France, where she explored cellular signaling and the molecular pathways driving allergic responses. After returning to Malaysia, Dr. Reginald established the Allergy Research Laboratory, where she investigates genetic factors contributing to allergy susceptibility, the molecular processes involved in allergic reactions, and the development of safe and effective allergy therapeutics.

Her contributions to the field of immunology and allergy have been significant, with numerous publications in top-tier scientific journals. Dr. Reginald continues to advance the understanding of immune responses and therapeutic interventions, significantly influencing both academic research and clinical approaches in allergy management.

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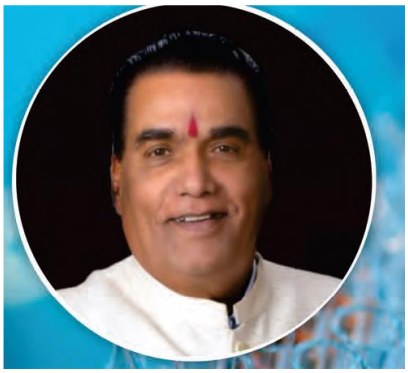
Messages



Hon. Prof. Dr. Vishwanath Karad

It gives me immense pleasure to see that MITADTU School of Bioengineering Sciences & Research is organizing its 8th International Conference on Recent Trends in Bioengineering from 31st January -1st February 2025. One Health occupies a very important place in the development of the society and nation. I am sure the conference will successfully highlight the various issues the globe is facing and devise sustainable solutions for healthcare and the environment.

My heartiest congratulations to the organizers for creating this amazing platform for exchange of ideas. My best wishes for the event!

Hon. Prof. (Dr.) Vishwanath D. Karad
Founder, MIT Group of Institutions
President, MIT Art, Design and Technology University, Pune

ISBN: 978-93-341-9591-0

Late Dr. Suresh Ghaisas

Dedicated in loving memory of Hon'ble Dr. Suresh Ghaisas whose blessings shall always stay with us.

Sir,
Your life was an inspiration,
Your good deeds our guiding path,
An epitome of generosity and gentleness
Bless us as always with your loving warmth.

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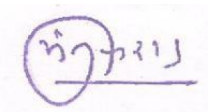
Hon. Dr. Mangesh Karad

Dear Delegates & Speakers,

A warm welcome to the 8th International Conference on Recent Trends in Bioengineering. I am sure that this conference will be very successful like the previous ones and will catalyze research and innovation at our university in general and School of Bioengineering in particular.

It is widely believed that the major solutions in healthcare environment will emerge from interdisciplinary research and at the interface of the disciplines. The Bioengineering Institute of our University is one such example of an interdisciplinary curriculum with a unique blend of biology and technology.

I recognize the contribution of Bioengineering institute in initiating and enhancing research at the University level and congratulate the staff of Bioengineering for diligently organizing this annual conference. Hope all delegates will like our beautiful campus and warm hospitality.



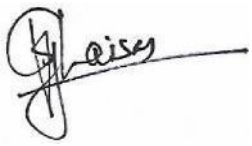
Hon. Dr. Mangesh Karad
Executive President
MIT Art, Design and Technology University, Pune

ISBN: 978-93-341-9591-0

Prof. Vinayak Ghaisas

It is with great pleasure and anticipation that we welcome you to the 8th International Conference on Recent Trends in Bioengineering. This conference serves as a critical platform for scholars and eminent professionals from around the world to come together and engage in meaningful discussions. The conference represents our collective commitment to provide a strong research framework and innovation guide to the future generations. We hope that the sustained efforts will lead to the development of useful technologies in healthcare and environment to achieve our vision to build a society free from diseases and disabilities.

I am eager to meet all the participants, presenters, and speakers who will be bringing the unique expertise, enthusiasm and experience to this amazing event. Once again welcome you all to the conference.



Prof. Vinayak Ghaisas
Founder & Executive Director
MIT ADTU School of Bioengineering Sciences & Research
Trustee, MAEER's MIT Group of Institutions, Pune

ISBN: 978-93-341-9591-0

Dr. Renu Vyas

It is with profound sense of purpose that we welcome you to our annual flagship event - the 8th International Conference on Recent Trends in Bioengineering (ICRTB 2025). This unique conference is a humble effort in the pursuit of a clean environment and a healthy life and an integrated approach signified by the term "One Health". We bring together researchers, engineers, clinicians, environmentalists, policy makers, and industry professionals from diverse backgrounds to network, advocate, and implement the concept of "One Health". The main objective of ICRTB 2025 is to disseminate knowledge for adoption of the best practices in the creation of sustainable solutions and green technologies.

Our sincere thanks to the speakers, local organizing team members, and the delegates for providing high quality support in terms of timely submission of synopsis of talks, abstracts etc. for oral and poster presentations in the conference. Our deep sense of gratitude to ANRF DST SERB for financial assistance and John Wiley for being our publishing partner.

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Let us convene to address the challenges that lie ahead and unite for a common goal as we continue our journey towards a sustainable and resilient future.

On behalf of MIT School of Bioengineering Sciences & Research, welcome you all to participate enthusiastically in the conference and immensely benefit from the two days of intense deliberations.

Dr. Renu Vyas
Principal,
MIT ADTU School of Bioengineering Sciences & Research
Convenor, ICRTB 2025

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Eminent Speakers

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Prof. Anil Kaul

Vice Chancellor, PH FI/IPHS University
Director, Indian Institute of Public Health, Hyderabad
Former Senior Public Health Advisor, US Department of State

Profile:

Dr. Anil Kaul is a physician-scientist with over 35 years of experience in infectious diseases and women's health. He holds degrees in Medicine from Madras Medical College, Dentistry from King George's Medical College, and Public Health Administration from the University of Minnesota. Dr. Kaul served as Clinical Professor and Program Director for Global Health at Oklahoma State University, where he established and directed the High-Complexity Infectious Diseases laboratory. During the COVID-19 pandemic, he led testing efforts and was clinical director for the Oklahoma Pandemic Center for Innovation and Excellence. He has worked with the Defense Threat Reduction Agency, USAID, and served as a Senior Health Advisor for the U.S. Department of State. Dr. Kaul is listed among the World's Top 2% most cited scientists by Stanford University and has over 100 publications and 200 presentations. He holds six U.S. patents and has received numerous awards for his contributions.

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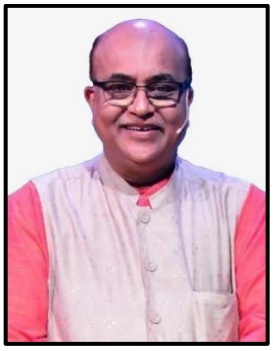

Dr. Shirshendu Mukherjee

Managing Director
Wadhwani Innovation Network

Profile:

Dr. Shirshendu Mukherjee is the Managing Director of Wadhwani Innovation Network and a microbiologist with over 30 years of experience across academia, pharma, and funding agencies. He has made significant contributions to the innovation ecosystem both in India and internationally. Dr. Mukherjee is a Registered Technology Transfer Professional (RTTP), certified by the Alliance of Technology Transfer Professionals (ATTP). He serves as an Honorary Scientific Advisor to the Indian Patent Office and as the Country Ambassador for the Royal Society of Tropical Medicine & Hygiene (RSTMH) in India. Additionally, he is the General Secretary of the Society for Technology Management (STEM) and a Board member of the Indo-US Science and Technology Forum. Dr. Mukherjee holds a Ph.D. in Microbiology, a law degree, and has completed leadership programs at the University of Oxford's Said Business School and the London School of Hygiene & Tropical Medicine (LSHTM).

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Prof. Uta Griesenbach

Professor, Molecular Medicine
National Heart and Lung Institute
Imperial College London

Profile:

Uta Griesenbach is a Professor of Molecular Medicine and has over 25 years' experience in developing advanced therapeutic medicines. Her research interests are related to the development of gene and cell therapy-based treatments for cystic fibrosis (CF) and other lung diseases. She has overseen vector and biomarker development, toxicology studies, as well as vector manufacturing and has been a Co-I on several clinical trials. Uta is a member of the UK Respiratory Gene Therapy Consortium (GTC) strategy group and a co-founder of AlveoGene (Imperial College Spinout) with the remit of developing gene therapy for rare respiratory diseases. Uta is a non-executive director of the Cell and gene Therapy Catapult and was President of the British Society for Gene and Cell therapy (2017-2021). In addition to her research activities she has an active role in education and workforce development related to advanced therapeutics in the UK.

ISBN: 978-93-341-9591-0

Dr. Mark Prausnitz
Regents' Professor
Chemical and Biomolecular Engineering
Georgia Institute of Technology
Atlanta, Georgia, USA

Profile:

Mark R. Prausnitz is Regents' Professor, Regents' Entrepreneur and J. Erskine Love, Jr. Chair in Chemical & Biomolecular Engineering at the Georgia Institute of Technology in Atlanta, Georgia, USA. He carries out research on biophysical methods of drug delivery using microneedles, lasers, ionic liquids and other microdevices for transdermal, ocular and intracellular delivery of drugs and vaccines. He has published more than 340 journal articles, invented more than 75 US patents, was elected to the National Academy of Engineering, National Academy of Medicine, and National Academy of Inventors, and has co-founded nine start-up companies.

Synopsis of the talk:

Most biomarkers used in research and clinical medicine are collected from the blood. Although blood is a relatively easy fluid to access, it represents less than one tenth of bodily fluid. Interstitial fluid (ISF), which is the extracellular fluid found in tissues, represents almost a quarter of fluid in the body. Because ISF is derived from fluid leakage from the vasculature, it has biomarkers found in

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the blood. And because ISF is in contact with cells in tissues, it has biomarkers from cellular metabolism. In addition, ISF does not clot, thereby facilitating continuous biomarker monitoring. Glucose is the only biomarker routinely measured in ISF, but it requires implantation of a biosensor in the subcutaneous space. To access ISF more easily, we have developed a method that uses microneedles to puncture microscopic pores in the skin, without bleeding, combined with suction to extract microliter quantities of ISF from the skin. We found that suction-based sampling was more effective than ISF collection by diffusion, capillary action, or osmosis, because pressure-driven flow not only provides a driving force for fluid flow through microneedle pores, but also through the surrounding tissue. Among the >10,000 biomarkers measured in a small human study (n=22 subjects), 69% of the biomarkers were found in both plasma and ISF, 17% were found only in ISF, and 11% were found only in plasma. On-going research seeks to further simplify ISF collection methods to enable routine ISF sampling for research and future clinical use.

ISBN: 978-93-341-9591-0

Dr. Justin Dauwels
Associate Professor
TU Delft (Signals and Systems group, Department of Microelectronics)
co-Director, Safety and Security Institute at the TU Delft

Profile:

Dr. Justin Dauwels is an Associate Professor at the TU Delft (Signals and Systems, Department of Microelectronics), and serves as co-Director of the Safety and Security Institute at the TU Delft. He was an Associate Professor of the School of Electrical and Electronic Engineering at the Nanyang Technological University (NTU) in Singapore till the end of 2020. At the TU Delft, he serves as scientific lead of the Model-Driven Decisions Lab (MoDDL), a first lab for the Knowledge Building program between the police and the TU Delft. He also serves as Chairperson of the EE Board of Studies at the TU Delft, and is a board member of the Co van Ledden Hulsebosch Center (Netherlands Center for Forensic Science and Medicine).

His research interests are in data analytics with applications to predictions problems (e.g., nowcasting of precipitation, remaining-useful-lifetime (RUL) prediction of electronic components), intelligent transportation systems, autonomous systems, and analysis of human behavior and physiology. He obtained his PhD degree in electrical engineering at the Swiss Polytechnical Institute of Technology (ETH) in Zurich in December 2005. Moreover, he was a postdoctoral fellow at the RIKEN Brain Science Institute (2006-2007) and a research scientist at the Massachusetts Institute of Technology (2008-2010).

He has been elected as IEEE SPS 2024 - 2025 Distinguished Lecturer. He served as Chairman of the IEEE CIS Chapter in Singapore from 2018 to 2020, and served as Associate Editor of the IEEE Transactions on Signal Processing (2018 - 2023), and serves currently as Associate Editor (2021-2023) and Subject Editor (since 2023) of the Elsevier journal Signal Processing, Area Editor C&F for the IEEE Signal Processing Magazine (since 2023), member of the Editorial Advisory Board of the International Journal of Neural Systems (since 2021), and organizer of IEEE conferences and special sessions. He was also Elected Member of the IEEE Signal Processing Theory and Methods Technical Committee and IEEE Biomedical Signal Processing Technical Committee (both in 2018-2023), and is currently Elected

Member of the IEEE Machine Learning for Signal Processing Technical Committee and the IEEE Emerging Transportation Technology Testing (ET3) Technical Committee. He has been a JSPS postdoctoral fellow (2007), a BAEF fellow (2008), a Henri-Benedictus Fellow of the King Baudouin Foundation (2008), and a JSPS invited fellow (2010, 2011). His research team has won several best paper awards at international conferences and journals.

His research on intelligent transportation systems has been featured by the BBC, Channel 5, Straits Times, Lianhe Zaobao, and other national newspapers worldwide, and numerous technology websites. Besides his academic efforts, the team of Dr. Justin Dauwels also collaborates intensely with local start-ups, SMEs, and agencies, in addition to MNCs, in the field of data-driven transportation, logistics, and medical data analytics. His academic lab has spawned four startups across a range of industries, ranging from AI for healthcare to autonomous vehicles.

Synopsis of the talk:

Extreme precipitation nowcasting using deep generative models

Extreme weather events, such as the floods recently in Valencia, Spain, have led to substantial impacts, including loss of life and major economic losses. Therefore, weather forecasts need to become more reliable, especially for extreme weather events. There has been a recent breakthrough in precipitation nowcasting, which is precipitation forecasting for the next few hours: Machine learning models, particularly deep generative models, can provide improved forecast quality compared to the state-of-the-art nowcasting and physics-based models. However, these new models are not adequate for extreme weather events. In our team, we are developing new deep generative models specifically for nowcasting extreme precipitation. Concretely, we are designing transformer-based generative models, in particular, VideoGPT with Extreme Value Loss (EVL) regularization. Leveraging a comprehensive dataset from the Royal Netherlands Meteorological Institute (KNMI), we aim to predict short-term extreme precipitation with high accuracy. We introduce a novel method for computing EVL without assuming fixed extreme representations, addressing the limitations of current models in capturing extreme weather events. Currently, we are also validating our deep generative nowcasting models on datasets from the US, Singapore, and India. We will present both qualitative and quantitative analyses, demonstrating the superior performance of the proposed VideoGPT-EVL in generating accurate precipitation forecasts, especially when dealing with extreme precipitation events.

ISBN: 978-93-341-9591-0

Ramakrishna P. Venugopalan (Rama P. Venu)
Gastroenterologist
Amrita Institute of Medical Sciences and Research Centre, Kochi
Diplomate, American Board of Internal Medicine

Profile:

Dr. Ramakrishna P. Venugopalan, also known as Rama P. Venu, is a distinguished gastroenterologist with an extensive career spanning clinical practice, research, and teaching. Holding an MD and multiple prestigious fellowships (FACP, FACG, FASGE, AGAF), Dr. Venugopalan is a Senior Consultant in Gastroenterology at Sri Ramakrishna Ashrama Charitable Hospital in Trivandrum and a retired professor and head of the Department of Gastroenterology at AIMS Kochi. He has also served as the Chief of Hepatobiliary Endoscopy at the University of Illinois, Chicago. A prolific researcher, Dr. Venugopalan has published 165 peer-reviewed articles in high-impact journals, including *NEJM*, *Gastroenterology*, and *JAMA*, and authored 20 textbook chapters. His research interests span colorectal cancer prevention, chronic pancreatitis, and advancements in endoscopic therapies. He has been recognized for his expertise, receiving the ASGE's "Master Endoscopist" award in 2005, and has contributed to numerous national and international research initiatives, including studies on polyp detection using artificial intelligence. Dr. Venugopalan's career is also marked by his roles as a visiting professor at esteemed institutions such as Harvard, Mayo Clinic, and Johns Hopkins. His contributions to gastroenterology and hepatobiliary medicine continue to shape the field.

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Synopsis of the talk:

ONE HEALTH, AI and Gastroenterology

ONE HEALTH envisions the goal of integrating and unifying a sustainable balance of the health of people, animals, and the environment. It has captured the imagination of people all over the world, from laymen to biologists and scientists to Green Earth advocates. Advances in biotechnology and its application have demonstrated measurable progress in achieving the lofty goal of ONE HEALTH. The influence of ONE HEALTH is also visible in human health and diseases. This is especially true in various branches of medicine, particularly in gastroenterology. The interaction between the microbiome and the human gastrointestinal system has become the subject of extensive research. The microbial ecosystem provides an extended "farm" for us. Besides the synthesis of short-chain fatty acids, the microbiome manufactures several micronutrients for us. The imbalance of the microbiome landscape, called dysbiosis, can lead to several GI disorders such as irritable bowel syndrome, inflammatory bowel disease, metabolic-associated fatty liver disease, and even colorectal cancer.

Dysbiosis has been implicated in causing oncogenic mutations. Such mutations might convert normal colonocytes into cancer cells by upregulating cellular proliferation. Dysbiosis might affect the epithelial tight junction, allowing microbes to penetrate the mucosa, invoking an inflammatory response and altered immunity. This complex mechanism may result in "leaky bowel syndrome," a common underlying mechanism for IBD and MAFLD.

Artificial intelligence has emerged as an important tool for evaluating the microbiome landscape. DNA sequencing can enrich our dataset of the microbiome. This can provide new insights into dysbiosis. Incorporating AI has played a major role in this regard. A new treatment approach is already in practice, i.e., probiotics. This so-called healthy or "for life" microbiome is currently in use for GI disorders such as IBS, IBD, travelers' diarrhea, and MAFLD.

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When it comes to CRC, dysbiosis has been implicated as the underlying mechanism causing oncogenic mutation, propelling uncontrolled cellular proliferation. The upregulated cellular proliferation of the colonocyte can cause colorectal adenoma or adenomatous polyps. These polyps are precancerous lesions. Detection and removal of adenomatous polyps have been established as the best way to prevent CRC by the National Polyp Study (NPS). Thus, the Adenoma Detection Rate (ADR) during colonoscopy has emerged as the best metric for a successful screening colonoscopy. By incorporating AI software in the computer, Computer-Assisted Diagnosis (CADe) has become a reality. By employing CADe, ADR can be enhanced, thus preventing CRC.

In summary, AI has emerged as an excellent tool in understanding the microbial ecosystem and its interaction with humans. This has opened a new way of looking at our environment, improving our health, and treating certain health disorders arising from imbalances in the microbial ecosystem.

ISBN: 978-93-341-9591-0

Dr. Kirsten Sinclair Rosselot
Director, Process Profiles,
California, USA

Profile:

Kirsten Rosselot is an environmental performance consultant with decades of experience collaborating with non-profits, academia, government agencies, and industry on projects ranging from life-cycle assessments to integrated energy efficiency evaluations. A licensed professional chemical engineer in California, she worked as a staff research associate at UCLA before founding her consulting business in 1995. She taught an upper-division/graduate elective on pollution prevention in the chemical engineering department at California State University, Long Beach, and has co-authored numerous handbooks, textbooks, peer-reviewed articles, and educational materials promoting sustainability and green engineering practices. As a panelist on The Balance Point Podcast, she seeks to address misconceptions about climate science.

Synopsis of the talk:

Reducing indirect health impacts across the life cycle of bioengineered products

Bioengineering is revolutionizing human health outcomes by curing disease, reducing disability, improving health marker monitoring, and more. The human health impacts of bioengineering extend beyond the medical field, and include addressing challenges in the production of adequate nutritious food via bioengineered pest control and aids to regenerative agriculture. This talk focuses not on the direct health impacts of bioengineered products and materials, but on limiting ill effects from exposure to substances that are used to produce and deliver them, and that may arise upon

disposal. The most advantageous opportunity for minimizing the potential for harm while preserving innovation and profitability is during the early stages of process development, when cost, market, and performance factors are being evaluated. Informed decision-making is facilitated by integrating a systematic approach to assessing toxicity and other negative factors. An overview of health-related metrics, where to find values for these metrics, and the challenges associated with weighing and interpreting their implications will be given. An example scheme for evaluating substances for toxicity and other negative factors will be described.

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Dr. Ahmed Elbediwy
Senior Lecturer
Kingston University, London
Dept. of Biomolecular Sciences, Kingston University, London, UK

Profile:

Dr. Ahmed Elbediwy is a Senior Lecturer at Kingston University, London. He joined the university in late 2018 after a successful research career at the Francis Crick Institute and earning his PhD from University College London. Dr. Elbediwy has made significant contributions to the field of cancer signalling, with numerous high-impact publications focussing on how cancer initiation and development arises. At Kingston University, he quickly established himself as an integral part of the Biomolecular Science teaching team. He became the course leader for BSc Biochemistry in 2020 and for BSc Biological Sciences in 2023. Dr. Elbediwy is known for his innovative teaching techniques, which has earned him numerous awards and countless nominations.

Synopsis of the talk:

How the control of growth is essential in cancer prevention

The regulation of organ growth and maintaining tissue homeostasis by controlling cell proliferation, differentiation, and apoptosis is an essential component of an organism. This process ensures that organs grow to their correct size and function properly. Dysregulation of this pathway can lead to uncontrolled cell growth and cancer initiation. In this talk we will investigate a key pathway involved in this process and how manipulation of this pathway can lead to severe consequences.

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Dr Bertrand Czarny
School of Materials Science & Engineering
Nanyang Technological University (NTU), Singapore

Profile:

Dr Bertrand Czarny joined the French governmental agency CEA (Atomic Energy Commission) in 2001. For more than 10 years, Dr Czarny was responsible for the studies conducted in Bio distribution, drug delivery and toxicology of nanoparticles as a Team Leader. During this period, he received a Ph.D. degree in structural and functional engineering of biomolecules from the University of Paris Descartes, Pharmacy Paris V (France). Following his PhD, Dr Czarny developed preclinical studies on different inflammatory diseases using nanoparticles drug formulations at Utrecht University (UU) Netherlands, at the National University of Singapore (NUS) or at Nanyang Technical University (NTU) as Research Fellow. Now, Dr Czarny is currently an assistant Professor of nanomedicine the School of Material Sciences and Engineering (MSE) and the Lee Kong Chian School of Medicine (LKC). His research is focused on the development of nanomedicines with large emphasis on extracellular vesicles mimetic and in vivo pre-clinical studies to deliver drugs, genes or act as a

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vaccine. The research activities aim to understand the mechanisms of actions of these engineered vesicles and the interaction with the different cells. His research is highly translational, and is broadly applicable to many pathological conditions. Bertrand published more than 60 research/review articles, and some book chapters and patents.

Synopsis of the talk:

Advance vesicular system, their role in nanomedicine from drug delivery to vaccine application

We developed a robust and inexpensive method for production, isolation and characterization of extracellular vesicles mimetics from eukaryote cells. These extracellular vesicles mimetics are mainly investigated in the context of tissue remodelling for various applications but also used as drug delivery system. Based on this approach, we also produced bacterial extracellular vesicles mimetics (BEVMs) and used for the development of new vaccines targeting life-threatening bacterial infections but also for the treatment of inflammatory conditions or as drug delivery systems.

Like their eukaryotic counterparts, bacterial extracellular vesicles (BEVs) are very difficult to isolate and therefore to characterize, rendering their study and therapeutic use challenging. Promising nano-formulations of eukaryotic and prokaryotic extracellular vesicles mimetic are evaluated invitro and in pilot preclinical trials in our lab. During this seminar, to illustrate this concept, I will discuss about the engineering of nanovesicles system from eukaryotic and prokaryotic cells used in these different contexts.

ISBN: 978-93-341-9591-0

Mr. Suhas Tamras
CEO, Johari Digital Health Care Ltd., Pune

Profile:

Mr Tamras is currently the CEO of Syrma Johari Medtech Ltd which is a Design Led manufacturing company for medical devices and IVD. He is responsible for driving the vision, the strategy, and the growth of the company to become a leading name in MedTech innovation, design and manufacturing. Throughout his career spanning about 27 years, he has been a transformational leader who leverages technology, strategies, and relationships to develop innovative solutions for the MedTech industry. He has deep experience in design, development, and commercialization of medical devices across various segments such as cardiology, monitoring vitals, and *in vitro* diagnostics. He has held leadership positions in large multinational companies like Tata Elxsi and Capgemini.

Synopsis of the talk:

The rise of Indian Medtech Industry

The talk will focus on the transformation of the Indian medtech industry, from being an import focused to an indigenous R&D and manufacturing focused industry. In the recent years, industry is driven by innovation, digital integration, and government initiatives. Few cases of innovation, product launches, and successful startups will be presented.

ISBN: 978-93-341-9591-0

Prof. Jonathan Goodman
Professor, Department of Chemistry, University of Cambridge

Profile:

Jonathan Goodman is a professor of Chemistry at the University of Cambridge. His research focuses on areas such as chemical biology, catalysis, and molecular recognition. Professor Goodman is known for his work in the development of new chemical tools and techniques that can have significant applications in medicine and drug development. His research often integrates concepts from organic chemistry, biochemistry, and materials science, aiming to bridge the gap between chemical synthesis and biological systems.

In addition to his research contributions, Professor Goodman is involved in teaching and mentoring students at Cambridge, helping to shape the next generation of chemists. His work is highly regarded in the field of chemical research, and he has published extensively in scientific journals.

Synopsis of the talk

All molecules are interesting

Molecules are the underlying basis of all of bioengineering. How can we understand their properties well enough to mechanise our understanding of molecular properties? We are developing methods for the automated interpretation of analytical data and for predicting the products of reactions. This will be needed if we are going to analyse reactions as quickly as we will be able to perform reactions with robotic systems. As we get better at these analyses, we should be able to design and make the molecules with properties we need faster and more effectively.

ISBN: 978-93-341-9591-0

Dr. Aparna Sharma

Project Manager
Biotechnology Industry Research Assistance Council (BIRAC)
India

Profile:

Dr. Aparna Sharma is an accomplished professional with a diverse background in both research and project management within the biotechnology and healthcare sectors. She is currently a Project Manager at the Biotechnology Industry Research Assistance Council (BIRAC), where she contributes to driving innovation and supporting startups within India's growing biotechnology landscape. In her role at BIRAC, she has been instrumental in managing and overseeing projects that foster the development of biotech solutions and their commercialization.

Before her tenure at BIRAC, Aparna completed her postdoctoral research at the prestigious National Institute of Mental Health and Neuro Sciences (NIMHANS) in Bangalore. During her time at NIMHANS, she focused on mental health and neuro sciences research, contributing valuable insights into the field. With her strong academic background and expertise in both research and project management, Aparna has become a key figure in promoting the intersection of biotechnology and mental health, playing a significant role in the advancement of both fields through her work at BIRAC.

ISBN: 978-93-341-9591-0

Dr. Dhanasekaran Shanmugam
Biochemical Science Division
CSIR-National Chemical Laboratory

Profile:

Dr. Dhanashekharan Shanmugan is a scientist at the CSIR-National Chemical Laboratory (NCL) in Pune, India, where he has been working since 2012. His research focuses on molecular parasitology, comparative genomics, biochemistry, and cell biology, with an emphasis on neglected diseases and drug discovery. Shanmugan earned his Ph.D. at the Indian Institute of Science, Bangalore, under Prof. G. Padmanaban, and completed his postdoctoral work at the University of Pennsylvania with Prof. David S. Roos, studying parasitic organisms and their potential therapeutic targets.

Shanmugan's work includes significant contributions to the genomics of parasites like *Toxoplasma gondii* and *Neospora caninum*, offering insights into their evolutionary adaptations and strategies for disease control. He has co-authored numerous publications in high-impact journals, such as *PLOS Pathogens* and *Genome Biology*, focusing on drug discovery and identifying new therapeutic targets for parasitic and helminthic infections.

Through his research, Shanmugan has made valuable contributions to the understanding of parasitic diseases and continues to advance efforts in the development of innovative treatments for neglected tropical diseases. His interdisciplinary approach to genomics and biochemistry has positioned him as a key figure in global health research.

ISBN: 978-93-341-9591-0

Dr. Federico Lauro
Associate Professor
Nanyang Technological University (NTU), Singapore

Profile:

Professor Federico Lauro is a distinguished academic and researcher at Nanyang Technological University (NTU) in Singapore, with a strong focus on microbiology, bioinformatics, and environmental sciences. Born and raised in Venice, Italy, he graduated from the University of Padua before earning his PhD at the Scripps Institute of Oceanography (SIO) at UC San Diego. Lauro's research primarily investigates how microorganisms evolve, adapt, and contribute to ecological processes essential for the health of marine environments.

Lauro combines expertise in both experimental and computational sciences, specializing in deep-sea microbiology and cutting-edge "omic" technologies. He is highly skilled in microbial genomics and bioinformatics, having developed tools for analyzing large datasets, utilizing PERL programming and open-source software to model microbial communities and ecosystem functions. His work extends from marine microbial ecosystems to the air microbiome, broadening our understanding of microbial environments.

In addition to his scientific achievements, Lauro is a passionate sailor. He has won the Australian and Italian National Championships and placed fourth in the 2012 World Championships in Ynglings. With over 20,000 nautical miles and a Yachtmaster Ocean Captain's License, Lauro has competed in numerous long-distance, multi-day open ocean regattas, demonstrating his versatility and determination both in science and sport.

ISBN: 978-93-341-9591-0

Dr. Dasmit Singh
Pediatric Surgeon
B.J. Medical College & Sassoon Hospital
Pune

Profile:
Dr. Dasmit Singh is a highly experienced and respected Paediatric Surgeon currently serving as the Director of Pediatric Surgery at Surya Hospital, Wakad. With over 38 years of experience, Dr. Singh has worked as an expert Paediatrician across multiple cities in India, gaining recognition for his skill in handling complex medical cases. He is particularly known for his precision in diagnosis and his compassionate, empathetic approach to patient care.

Dr. Singh's specialties include appendectomy, circumcision, the treatment of birth defects, and inguinal hernia repair, among others. He has performed numerous successful surgeries, becoming a trusted name in the field. He completed his MBBS from B J Medical College and Sassoon General Hospital, Pune, in 1984, followed by an MS in General Surgery from the same institution in 1989. He later pursued MCh in Paediatric Surgery from Grant Medical College and Sir J J Group of Hospitals, Mumbai, in 1993.

Throughout his career, Dr. Singh has been actively involved in research and has published several papers in the field of Paediatrics. He has also participated in various workshops, furthering his knowledge and expertise. His contributions to Paediatric Surgery have been recognized with awards, cementing his reputation as a leading surgeon in his field.

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Dr Aedin Culhane
Professor, Cancer Genomics
Director, Limerick Digital Cancer Research Centre
University of Limerick, Ireland

Profile:

Dr. Aedin Culhane is a distinguished Professor of Biomedical Sciences (Cancer Genomics) in the UL School of Medicine at the University of Limerick, Ireland. A computational oncologist with over 20 years of experience in cancer genomics, she specializes in multi-omics data integration, statistical genomics, clinical bioinformatics, and genomics in oncology. Dr. Culhane's career includes more than 15 years at the Dana-Farber Cancer Institute and Harvard T.H. Chan School of Public Health in Boston, USA, where she advanced her expertise in cancer research.

Her current research focuses on developing algorithms and integrative data analysis for single-cell molecular data in cancer, aiming to identify regulatory molecules that can be targeted during tumor development, progression, drug response, and resistance. Dr. Culhane is a member of the Human Cell Atlas project and plays a leading role in the Bioconductor community, an open-source platform for genomic data analysis. She is a strong advocate for open-source science and collaboration in computational biology.

Dr. Culhane holds a Ph.D. from the University of Manchester, UK, and a B.Sc. in Industrial Biochemistry from the University of Limerick. She has held numerous prestigious roles, including senior positions at Harvard and Dana-Farber. She is actively involved in various professional societies, including the International Society for Computational Biology and the American Association for Cancer Research.

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Dr Anusha Dargashetti
Life Sciences, Wiley

Profile:

Anushka Daragshetti is a seasoned professional in the field of scientific research and publishing, currently serving as a Content Acquisition Specialist at Wiley, where she has been working since October 2023. With a background in biomedical research and a focus on scientific content, she plays a key role in identifying and facilitating research publications within Wiley's Life Science portfolio.

Anushka began her career in research as a Project Intern at Jain University, where she studied the role of nano-NF doped Titania in photo-degradation. She further honed her expertise as a Project Intern at the University of Manchester, working on immune responses to gut infections. Later, she worked as an R&D Executive at Novel Tissues Pvt Ltd and contributed to the establishment of labs and research in immunology and cell culture at KLES Dr. Prabhakar Kore Hospital.

Her experience also includes roles as a Quality Analyst at Ulatus (Crimson Interactive), a Content Review Associate, and a Research Officer at Accutest Research Laboratories. Anushka's research interests have included immunology, cell culture, and cancer genomics, and she is now contributing her knowledge to the scientific publishing world, helping researchers find the right platforms for their work.

ISBN: 978-93-341-9591-0

Dr. Mahesh Kulkarni

Chair, Biochemical Division
Senior Principal Scientist
CSIR NCL, India

Profile:

Dr. Mahesh Kulkarni is a distinguished scientist at CSIR-National Chemical Laboratory (NCL), Pune, India, specializing in mass spectrometry-based proteomics and metabolomics. His research focuses on post-translational modifications, protein glycation in diabetes, and bioinformatics, with significant contributions to understanding the molecular mechanisms underlying disease and therapeutic intervention. He is also involved in the study of biotherapeutics, using advanced proteomic techniques to explore protein dynamics and their role in health and disease.

Dr. Kulkarni earned his Ph.D. in Crop Physiology from the University of Agricultural Sciences, Bangalore, and has had an extensive academic career. He held a Raman Research Fellowship at the University of Turku, Finland, and worked as a post-doctoral fellow at the Genome Institute of Singapore. Earlier in his career, he was a research associate at the Center for Cellular and Molecular Biology, Hyderabad, and a scientist-consultant at Monsanto Research Centre, Bangalore.

An active academic leader, Dr. Kulkarni is currently the Head of the Biochemical Sciences Division at NCL (2023-2026) and has previously served as the Associate Dean of Biological Sciences at AcSIR. He is an editorial board member of several proteomics journals and holds memberships in esteemed scientific societies such as the Royal Society of Chemistry. His work has earned him multiple awards, including the Chellaram Diabetes Institute Special Recognition Award in 2018.

ISBN: 978-93-341-9591-0

Dr. Reshma Puranik

Medical Oncologist
Ruby Hospital, Pune

Profile:

Dr. Reshma Puranik is an experienced Medical Oncologist and Haemato-oncologist based in Wakad, Pune, with over 11 years of expertise in cancer care. She currently practices at Lakshya Cancer Care Center in Wakad, Pune. Dr. Puranik completed her MBBS from DR D Y Patil College for Women, Pune, in 2008, followed by a DNB in General Medicine from the National Board of Examination in 2013. She further specialized by earning her DM in Oncology from The Gujarat Cancer and Research Institute in 2018.

Dr. Puranik is known for her comprehensive experience in managing a variety of cancers, including head & neck, lung, breast, gastrointestinal, genitourinary, sarcomas, and skin cancers. She has a particular interest in treating malignancies in females, such as breast and cervical cancers, and is committed to raising awareness and promoting early diagnosis and prevention in women. Additionally, she has expertise in treating hematological malignancies, including leukemias, lymphomas, and multiple myeloma.

As a member of the Indian Medical Association (IMA), Dr. Puranik is dedicated to advancing cancer care, with a special focus on screening and preventive oncology, to improve outcomes for her patients.

ISBN: 978-93-341-9591-0

Dr Kavita Reginald
Associate Professor
Sunway University Malaysia

Profile:

Dr. Kavita Reginald is a distinguished academic and researcher, currently serving as the Head of the Department of Biological Sciences at Sunway University, Malaysia. She completed her PhD in Biology at the National University of Singapore in 2006, focusing on the molecular mechanisms of allergies. Prior to her doctoral studies, she earned her BSc (Hons) in Biotechnology from Universiti Putra Malaysia in 2001.

Dr. Reginald's research interests are centered around immunology, with a strong focus on allergy mechanisms, immunotherapy, and the development of novel therapeutic strategies for allergy treatment. She further honed her expertise during post-doctoral training in Austria and France, where she explored cellular signaling and the molecular pathways driving allergic responses. After returning to Malaysia, Dr. Reginald established the Allergy Research Laboratory, where she investigates genetic factors contributing to allergy susceptibility, the molecular processes involved in allergic reactions, and the development of safe and effective allergy therapeutics.

Her contributions to the field of immunology and allergy have been significant, with numerous publications in top-tier scientific journals. Dr. Reginald continues to advance the understanding of immune responses and therapeutic interventions, significantly influencing both academic research and clinical approaches in allergy management.

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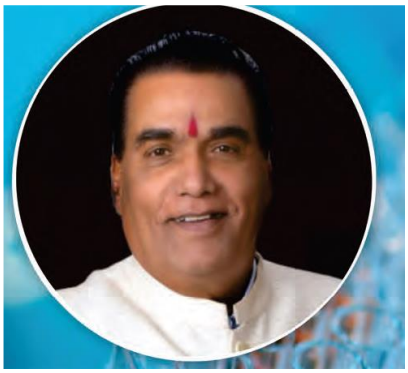
Messages



Hon. Prof. Dr. Vishwanath Karad

It gives me immense pleasure to see that MITADTU School of Bioengineering Sciences & Research is organizing its 8th International Conference on Recent Trends in Bioengineering from 31st January -1st February 2025. One Health occupies a very important place in the development of the society and nation. I am sure the conference will successfully highlight the various issues the globe is facing and devise sustainable solutions for healthcare and the environment.

My heartiest congratulations to the organizers for creating this amazing platform for exchange of ideas. My best wishes for the event!

Hon. Prof. (Dr.) Vishwanath D. Karad
Founder, MIT Group of Institutions
President, MIT Art, Design and Technology University, Pune

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Late Dr. Suresh Ghaisas

Dedicated in loving memory of Hon'ble Dr. Suresh Ghaisas whose blessings shall always stay with us.

Sir,
Your life was an inspiration,
Your good deeds our guiding path,
An epitome of generosity and gentleness
Bless us as always with your loving warmth.

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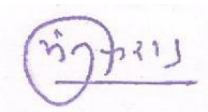
Hon. Dr. Mangesh Karad

Dear Delegates & Speakers,

A warm welcome to the 8th International Conference on Recent Trends in Bioengineering. I am sure that this conference will be very successful like the previous ones and will catalyze research and innovation at our university in general and School of Bioengineering in particular.

It is widely believed that the major solutions in healthcare environment will emerge from interdisciplinary research and at the interface of the disciplines. The Bioengineering Institute of our University is one such example of an interdisciplinary curriculum with a unique blend of biology and technology.

I recognize the contribution of Bioengineering institute in initiating and enhancing research at the University level and congratulate the staff of Bioengineering for diligently organizing this annual conference. Hope all delegates will like our beautiful campus and warm hospitality.



Hon. Dr. Mangesh Karad
Executive President
MIT Art, Design and Technology University, Pune

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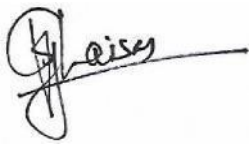
Prof. Vinayak Ghaisas

It is with great pleasure and anticipation that we welcome you to the 8th International Conference on Recent Trends in Bioengineering. This conference serves as a critical platform for scholars and eminent professionals from around the world to come together and engage in meaningful discussions. The conference represents our collective commitment to provide a strong research framework and innovation guide to the future generations. We hope that the sustained efforts will lead to the development of useful technologies in healthcare and environment to achieve our vision to build a society free from diseases and disabilities.

I am eager to meet all the participants, presenters, and speakers who will be bringing the unique expertise, enthusiasm and experience to this amazing event. Once again welcome you all to the conference.



Prof. Vinayak Ghaisas
Founder & Executive Director
MIT ADTU School of Bioengineering Sciences & Research
Trustee, MAEER's MIT Group of Institutions, Pune

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Dr. Renu Vyas

It is with profound sense of purpose that we welcome you to our annual flagship event - the 8th International Conference on Recent Trends in Bioengineering (ICRTB 2025). This unique conference is a humble effort in the pursuit of a clean environment and a healthy life and an integrated approach signified by the term "One Health". We bring together researchers, engineers, clinicians, environmentalists, policy makers, and industry professionals from diverse backgrounds to network, advocate, and implement the concept of "One Health". The main objective of ICRTB 2025 is to disseminate knowledge for adoption of the best practices in the creation of sustainable solutions and green technologies.

Our sincere thanks to the speakers, local organizing team members, and the delegates for providing high quality support in terms of timely submission of synopsis of talks, abstracts etc. for oral and poster presentations in the conference. Our deep sense of gratitude to ANRF DST SERB for financial assistance and John Wiley for being our publishing partner.

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Let us convene to address the challenges that lie ahead and unite for a common goal as we continue our journey towards a sustainable and resilient future.

On behalf of MIT School of Bioengineering Sciences & Research, welcome you all to participate enthusiastically in the conference and immensely benefit from the two days of intense deliberations.

Dr. Renu Vyas
Principal,
MIT ADTU School of Bioengineering Sciences & Research
Convenor, ICRTB 2025

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Eminent Speakers

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Prof. Anil Kaul

Vice Chancellor, PH FI/IPHS University
Director, Indian Institute of Public Health, Hyderabad
Former Senior Public Health Advisor, US Department of State

Profile:

Dr. Anil Kaul is a physician-scientist with over 35 years of experience in infectious diseases and women's health. He holds degrees in Medicine from Madras Medical College, Dentistry from King George's Medical College, and Public Health Administration from the University of Minnesota. Dr. Kaul served as Clinical Professor and Program Director for Global Health at Oklahoma State University, where he established and directed the High-Complexity Infectious Diseases laboratory. During the COVID-19 pandemic, he led testing efforts and was clinical director for the Oklahoma Pandemic Center for Innovation and Excellence. He has worked with the Defense Threat Reduction Agency, USAID, and served as a Senior Health Advisor for the U.S. Department of State. Dr. Kaul is listed among the World's Top 2% most cited scientists by Stanford University and has over 100 publications and 200 presentations. He holds six U.S. patents and has received numerous awards for his contributions.

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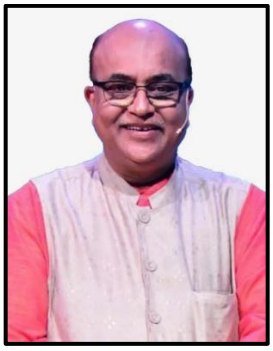

Dr. Shirshendu Mukherjee

Managing Director
Wadhwani Innovation Network

Profile:

Dr. Shirshendu Mukherjee is the Managing Director of Wadhwani Innovation Network and a microbiologist with over 30 years of experience across academia, pharma, and funding agencies. He has made significant contributions to the innovation ecosystem both in India and internationally. Dr. Mukherjee is a Registered Technology Transfer Professional (RTTP), certified by the Alliance of Technology Transfer Professionals (ATTP). He serves as an Honorary Scientific Advisor to the Indian Patent Office and as the Country Ambassador for the Royal Society of Tropical Medicine & Hygiene (RSTMH) in India. Additionally, he is the General Secretary of the Society for Technology Management (STEM) and a Board member of the Indo-US Science and Technology Forum. Dr. Mukherjee holds a Ph.D. in Microbiology, a law degree, and has completed leadership programs at the University of Oxford's Said Business School and the London School of Hygiene & Tropical Medicine (LSHTM).

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Prof. Uta Griesenbach

Professor, Molecular Medicine
National Heart and Lung Institute
Imperial College London

Profile:

Uta Griesenbach is a Professor of Molecular Medicine and has over 25 years' experience in developing advanced therapeutic medicines. Her research interests are related to the development of gene and cell therapy-based treatments for cystic fibrosis (CF) and other lung diseases. She has overseen vector and biomarker development, toxicology studies, as well as vector manufacturing and has been a Co-I on several clinical trials. Uta is a member of the UK Respiratory Gene Therapy Consortium (GTC) strategy group and a co-founder of AlveoGene (Imperial College Spinout) with the remit of developing gene therapy for rare respiratory diseases. Uta is a non-executive director of the Cell and gene Therapy Catapult and was President of the British Society for Gene and Cell therapy (2017-2021). In addition to her research activities she has an active role in education and workforce development related to advanced therapeutics in the UK.

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Dr. Mark Prausnitz
Regents' Professor
Chemical and Biomolecular Engineering
Georgia Institute of Technology
Atlanta, Georgia, USA

Profile:

Mark R. Prausnitz is Regents' Professor, Regents' Entrepreneur and J. Erskine Love, Jr. Chair in Chemical & Biomolecular Engineering at the Georgia Institute of Technology in Atlanta, Georgia, USA. He carries out research on biophysical methods of drug delivery using microneedles, lasers, ionic liquids and other microdevices for transdermal, ocular and intracellular delivery of drugs and vaccines. He has published more than 340 journal articles, invented more than 75 US patents, was elected to the National Academy of Engineering, National Academy of Medicine, and National Academy of Inventors, and has co-founded nine start-up companies.

Synopsis of the talk:

Most biomarkers used in research and clinical medicine are collected from the blood. Although blood is a relatively easy fluid to access, it represents less than one tenth of bodily fluid. Interstitial fluid (ISF), which is the extracellular fluid found in tissues, represents almost a quarter of fluid in the body. Because ISF is derived from fluid leakage from the vasculature, it has biomarkers found in

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the blood. And because ISF is in contact with cells in tissues, it has biomarkers from cellular metabolism. In addition, ISF does not clot, thereby facilitating continuous biomarker monitoring. Glucose is the only biomarker routinely measured in ISF, but it requires implantation of a biosensor in the subcutaneous space. To access ISF more easily, we have developed a method that uses microneedles to puncture microscopic pores in the skin, without bleeding, combined with suction to extract microliter quantities of ISF from the skin. We found that suction-based sampling was more effective than ISF collection by diffusion, capillary action, or osmosis, because pressure-driven flow not only provides a driving force for fluid flow through microneedle pores, but also through the surrounding tissue. Among the >10,000 biomarkers measured in a small human study (n=22 subjects), 69% of the biomarkers were found in both plasma and ISF, 17% were found only in ISF, and 11% were found only in plasma. On-going research seeks to further simplify ISF collection methods to enable routine ISF sampling for research and future clinical use.

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Dr. Justin Dauwels
Associate Professor
TU Delft (Signals and Systems group, Department of Microelectronics)
co-Director, Safety and Security Institute at the TU Delft

Profile:

Dr. Justin Dauwels is an Associate Professor at the TU Delft (Signals and Systems, Department of Microelectronics), and serves as co-Director of the Safety and Security Institute at the TU Delft. He was an Associate Professor of the School of Electrical and Electronic Engineering at the Nanyang Technological University (NTU) in Singapore till the end of 2020. At the TU Delft, he serves as scientific lead of the Model-Driven Decisions Lab (MoDDL), a first lab for the Knowledge Building program between the police and the TU Delft. He also serves as Chairperson of the EE Board of Studies at the TU Delft, and is a board member of the Co van Ledden Hulsebosch Center (Netherlands Center for Forensic Science and Medicine).

His research interests are in data analytics with applications to predictions problems (e.g., nowcasting of precipitation, remaining-useful-lifetime (RUL) prediction of electronic components), intelligent transportation systems, autonomous systems, and analysis of human behavior and physiology. He obtained his PhD degree in electrical engineering at the Swiss Polytechnical Institute of Technology (ETH) in Zurich in December 2005. Moreover, he was a postdoctoral fellow at the RIKEN Brain Science Institute (2006-2007) and a research scientist at the Massachusetts Institute of Technology (2008-2010).

He has been elected as IEEE SPS 2024 - 2025 Distinguished Lecturer. He served as Chairman of the IEEE CIS Chapter in Singapore from 2018 to 2020, and served as Associate Editor of the IEEE Transactions on Signal Processing (2018 - 2023), and serves currently as Associate Editor (2021-2023) and Subject Editor (since 2023) of the Elsevier journal Signal Processing, Area Editor C&F for the IEEE Signal Processing Magazine (since 2023), member of the Editorial Advisory Board of the International Journal of Neural Systems (since 2021), and organizer of IEEE conferences and special sessions. He was also Elected Member of the IEEE Signal Processing Theory and Methods Technical Committee and IEEE Biomedical Signal Processing Technical Committee (both in 2018-2023), and is currently Elected

Member of the IEEE Machine Learning for Signal Processing Technical Committee and the IEEE Emerging Transportation Technology Testing (ET3) Technical Committee. He has been a JSPS postdoctoral fellow (2007), a BAEF fellow (2008), a Henri-Benedictus Fellow of the King Baudouin Foundation (2008), and a JSPS invited fellow (2010, 2011). His research team has won several best paper awards at international conferences and journals.

His research on intelligent transportation systems has been featured by the BBC, Channel 5, Straits Times, Lianhe Zaobao, and other national newspapers worldwide, and numerous technology websites. Besides his academic efforts, the team of Dr. Justin Dauwels also collaborates intensely with local start-ups, SMEs, and agencies, in addition to MNCs, in the field of data-driven transportation, logistics, and medical data analytics. His academic lab has spawned four startups across a range of industries, ranging from AI for healthcare to autonomous vehicles.

Synopsis of the talk:

Extreme precipitation nowcasting using deep generative models

Extreme weather events, such as the floods recently in Valencia, Spain, have led to substantial impacts, including loss of life and major economic losses. Therefore, weather forecasts need to become more reliable, especially for extreme weather events. There has been a recent breakthrough in precipitation nowcasting, which is precipitation forecasting for the next few hours: Machine learning models, particularly deep generative models, can provide improved forecast quality compared to the state-of-the-art nowcasting and physics-based models. However, these new models are not adequate for extreme weather events. In our team, we are developing new deep generative models specifically for nowcasting extreme precipitation. Concretely, we are designing transformer-based generative models, in particular, VideoGPT with Extreme Value Loss (EVL) regularization. Leveraging a comprehensive dataset from the Royal Netherlands Meteorological Institute (KNMI), we aim to predict short-term extreme precipitation with high accuracy. We introduce a novel method for computing EVL without assuming fixed extreme representations, addressing the limitations of current models in capturing extreme weather events. Currently, we are also validating our deep generative nowcasting models on datasets from the US, Singapore, and India. We will present both qualitative and quantitative analyses, demonstrating the superior performance of the proposed VideoGPT-EVL in generating accurate precipitation forecasts, especially when dealing with extreme precipitation events.

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Ramakrishna P. Venugopalan (Rama P. Venu)
Gastroenterologist
Amrita Institute of Medical Sciences and Research Centre, Kochi
Diplomate, American Board of Internal Medicine

Profile:

Dr. Ramakrishna P. Venugopalan, also known as Rama P. Venu, is a distinguished gastroenterologist with an extensive career spanning clinical practice, research, and teaching. Holding an MD and multiple prestigious fellowships (FACP, FACG, FASGE, AGAF), Dr. Venugopalan is a Senior Consultant in Gastroenterology at Sri Ramakrishna Ashrama Charitable Hospital in Trivandrum and a retired professor and head of the Department of Gastroenterology at AIMS Kochi. He has also served as the Chief of Hepatobiliary Endoscopy at the University of Illinois, Chicago. A prolific researcher, Dr. Venugopalan has published 165 peer-reviewed articles in high-impact journals, including *NEJM*, *Gastroenterology*, and *JAMA*, and authored 20 textbook chapters. His research interests span colorectal cancer prevention, chronic pancreatitis, and advancements in endoscopic therapies. He has been recognized for his expertise, receiving the ASGE's "Master Endoscopist" award in 2005, and has contributed to numerous national and international research initiatives, including studies on polyp detection using artificial intelligence. Dr. Venugopalan's career is also marked by his roles as a visiting professor at esteemed institutions such as Harvard, Mayo Clinic, and Johns Hopkins. His contributions to gastroenterology and hepatobiliary medicine continue to shape the field.

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Synopsis of the talk:

ONE HEALTH, AI and Gastroenterology

ONE HEALTH envisions the goal of integrating and unifying a sustainable balance of the health of people, animals, and the environment. It has captured the imagination of people all over the world, from laymen to biologists and scientists to Green Earth advocates. Advances in biotechnology and its application have demonstrated measurable progress in achieving the lofty goal of ONE HEALTH. The influence of ONE HEALTH is also visible in human health and diseases. This is especially true in various branches of medicine, particularly in gastroenterology. The interaction between the microbiome and the human gastrointestinal system has become the subject of extensive research. The microbial ecosystem provides an extended "farm" for us. Besides the synthesis of short-chain fatty acids, the microbiome manufactures several micronutrients for us. The imbalance of the microbiome landscape, called dysbiosis, can lead to several GI disorders such as irritable bowel syndrome, inflammatory bowel disease, metabolic-associated fatty liver disease, and even colorectal cancer.

Dysbiosis has been implicated in causing oncogenic mutations. Such mutations might convert normal colonocytes into cancer cells by upregulating cellular proliferation. Dysbiosis might affect the epithelial tight junction, allowing microbes to penetrate the mucosa, invoking an inflammatory response and altered immunity. This complex mechanism may result in "leaky bowel syndrome," a common underlying mechanism for IBD and MAFLD.

Artificial intelligence has emerged as an important tool for evaluating the microbiome landscape. DNA sequencing can enrich our dataset of the microbiome. This can provide new insights into dysbiosis. Incorporating AI has played a major role in this regard. A new treatment approach is already in practice, i.e., probiotics. This so-called healthy or "for life" microbiome is currently in use for GI disorders such as IBS, IBD, travelers' diarrhea, and MAFLD.

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When it comes to CRC, dysbiosis has been implicated as the underlying mechanism causing oncogenic mutation, propelling uncontrolled cellular proliferation. The upregulated cellular proliferation of the colonocyte can cause colorectal adenoma or adenomatous polyps. These polyps are precancerous lesions. Detection and removal of adenomatous polyps have been established as the best way to prevent CRC by the National Polyp Study (NPS). Thus, the Adenoma Detection Rate (ADR) during colonoscopy has emerged as the best metric for a successful screening colonoscopy. By incorporating AI software in the computer, Computer-Assisted Diagnosis (CADe) has become a reality. By employing CADe, ADR can be enhanced, thus preventing CRC.

In summary, AI has emerged as an excellent tool in understanding the microbial ecosystem and its interaction with humans. This has opened a new way of looking at our environment, improving our health, and treating certain health disorders arising from imbalances in the microbial ecosystem.

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Dr. Kirsten Sinclair Rosselot
Director, Process Profiles,
California, USA

Profile:

Kirsten Rosselot is an environmental performance consultant with decades of experience collaborating with non-profits, academia, government agencies, and industry on projects ranging from life-cycle assessments to integrated energy efficiency evaluations. A licensed professional chemical engineer in California, she worked as a staff research associate at UCLA before founding her consulting business in 1995. She taught an upper-division/graduate elective on pollution prevention in the chemical engineering department at California State University, Long Beach, and has co-authored numerous handbooks, textbooks, peer-reviewed articles, and educational materials promoting sustainability and green engineering practices. As a panelist on The Balance Point Podcast, she seeks to address misconceptions about climate science.

Synopsis of the talk:

Reducing indirect health impacts across the life cycle of bioengineered products

Bioengineering is revolutionizing human health outcomes by curing disease, reducing disability, improving health marker monitoring, and more. The human health impacts of bioengineering extend beyond the medical field, and include addressing challenges in the production of adequate nutritious food via bioengineered pest control and aids to regenerative agriculture. This talk focuses not on the direct health impacts of bioengineered products and materials, but on limiting ill effects from exposure to substances that are used to produce and deliver them, and that may arise upon

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disposal. The most advantageous opportunity for minimizing the potential for harm while preserving innovation and profitability is during the early stages of process development, when cost, market, and performance factors are being evaluated. Informed decision-making is facilitated by integrating a systematic approach to assessing toxicity and other negative factors. An overview of health-related metrics, where to find values for these metrics, and the challenges associated with weighing and interpreting their implications will be given. An example scheme for evaluating substances for toxicity and other negative factors will be described.

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Dr. Ahmed Elbediwy
Senior Lecturer
Kingston University, London
Dept. of Biomolecular Sciences, Kingston University, London, UK

Profile:

Dr. Ahmed Elbediwy is a Senior Lecturer at Kingston University, London. He joined the university in late 2018 after a successful research career at the Francis Crick Institute and earning his PhD from University College London. Dr. Elbediwy has made significant contributions to the field of cancer signalling, with numerous high-impact publications focussing on how cancer initiation and development arises. At Kingston University, he quickly established himself as an integral part of the Biomolecular Science teaching team. He became the course leader for BSc Biochemistry in 2020 and for BSc Biological Sciences in 2023. Dr. Elbediwy is known for his innovative teaching techniques, which has earned him numerous awards and countless nominations.

Synopsis of the talk:

How the control of growth is essential in cancer prevention

The regulation of organ growth and maintaining tissue homeostasis by controlling cell proliferation, differentiation, and apoptosis is an essential component of an organism. This process ensures that organs grow to their correct size and function properly. Dysregulation of this pathway can lead to uncontrolled cell growth and cancer initiation. In this talk we will investigate a key pathway involved in this process and how manipulation of this pathway can lead to severe consequences.

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Dr Bertrand Czarny
School of Materials Science & Engineering
Nanyang Technological University (NTU), Singapore

Profile:

Dr Bertrand Czarny joined the French governmental agency CEA (Atomic Energy Commission) in 2001. For more than 10 years, Dr Czarny was responsible for the studies conducted in Bio distribution, drug delivery and toxicology of nanoparticles as a Team Leader. During this period, he received a Ph.D. degree in structural and functional engineering of biomolecules from the University of Paris Descartes, Pharmacy Paris V (France). Following his PhD, Dr Czarny developed preclinical studies on different inflammatory diseases using nanoparticles drug formulations at Utrecht University (UU) Netherlands, at the National University of Singapore (NUS) or at Nanyang Technical University (NTU) as Research Fellow. Now, Dr Czarny is currently an assistant Professor of nanomedicine the School of Material Sciences and Engineering (MSE) and the Lee Kong Chian School of Medicine (LKC). His research is focused on the development of nanomedicines with large emphasis on extracellular vesicles mimetic and in vivo pre-clinical studies to deliver drugs, genes or act as a

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vaccine. The research activities aim to understand the mechanisms of actions of these engineered vesicles and the interaction with the different cells. His research is highly translational, and is broadly applicable to many pathological conditions. Bertrand published more than 60 research/review articles, and some book chapters and patents.

Synopsis of the talk:

Advance vesicular system, their role in nanomedicine from drug delivery to vaccine application

We developed a robust and inexpensive method for production, isolation and characterization of extracellular vesicles mimetics from eukaryote cells. These extracellular vesicles mimetics are mainly investigated in the context of tissue remodelling for various applications but also used as drug delivery system. Based on this approach, we also produced bacterial extracellular vesicles mimetics (BEVMs) and used for the development of new vaccines targeting life-threatening bacterial infections but also for the treatment of inflammatory conditions or as drug delivery systems.

Like their eukaryotic counterparts, bacterial extracellular vesicles (BEVs) are very difficult to isolate and therefore to characterize, rendering their study and therapeutic use challenging. Promising nano-formulations of eukaryotic and prokaryotic extracellular vesicles mimetic are evaluated invitro and in pilot preclinical trials in our lab. During this seminar, to illustrate this concept, I will discuss about the engineering of nanovesicles system from eukaryotic and prokaryotic cells used in these different contexts.

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Mr. Suhas Tamras
CEO, Johari Digital Health Care Ltd., Pune

Profile:

Mr Tamras is currently the CEO of Syrma Johari Medtech Ltd which is a Design Led manufacturing company for medical devices and IVD. He is responsible for driving the vision, the strategy, and the growth of the company to become a leading name in MedTech innovation, design and manufacturing. Throughout his career spanning about 27 years, he has been a transformational leader who leverages technology, strategies, and relationships to develop innovative solutions for the MedTech industry. He has deep experience in design, development, and commercialization of medical devices across various segments such as cardiology, monitoring vitals, and *in vitro* diagnostics. He has held leadership positions in large multinational companies like Tata Elxsi and Capgemini.

Synopsis of the talk:

The rise of Indian Medtech Industry

The talk will focus on the transformation of the Indian medtech industry, from being an import focused to an indigenous R&D and manufacturing focused industry. In the recent years, industry is driven by innovation, digital integration, and government initiatives. Few cases of innovation, product launches, and successful startups will be presented.

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Prof. Jonathan Goodman
Professor, Department of Chemistry, University of Cambridge

Profile:

Jonathan Goodman is a professor of Chemistry at the University of Cambridge. His research focuses on areas such as chemical biology, catalysis, and molecular recognition. Professor Goodman is known for his work in the development of new chemical tools and techniques that can have significant applications in medicine and drug development. His research often integrates concepts from organic chemistry, biochemistry, and materials science, aiming to bridge the gap between chemical synthesis and biological systems.

In addition to his research contributions, Professor Goodman is involved in teaching and mentoring students at Cambridge, helping to shape the next generation of chemists. His work is highly regarded in the field of chemical research, and he has published extensively in scientific journals.

Synopsis of the talk

All molecules are interesting

Molecules are the underlying basis of all of bioengineering. How can we understand their properties well enough to mechanise our understanding of molecular properties? We are developing methods for the automated interpretation of analytical data and for predicting the products of reactions. This will be needed if we are going to analyse reactions as quickly as we will be able to perform reactions with robotic systems. As we get better at these analyses, we should be able to design and make the molecules with properties we need faster and more effectively.

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Dr. Aparna Sharma

Project Manager
Biotechnology Industry Research Assistance Council (BIRAC)
India

Profile:

Dr. Aparna Sharma is an accomplished professional with a diverse background in both research and project management within the biotechnology and healthcare sectors. She is currently a Project Manager at the Biotechnology Industry Research Assistance Council (BIRAC), where she contributes to driving innovation and supporting startups within India's growing biotechnology landscape. In her role at BIRAC, she has been instrumental in managing and overseeing projects that foster the development of biotech solutions and their commercialization.

Before her tenure at BIRAC, Aparna completed her postdoctoral research at the prestigious National Institute of Mental Health and Neuro Sciences (NIMHANS) in Bangalore. During her time at NIMHANS, she focused on mental health and neuro sciences research, contributing valuable insights into the field. With her strong academic background and expertise in both research and project management, Aparna has become a key figure in promoting the intersection of biotechnology and mental health, playing a significant role in the advancement of both fields through her work at BIRAC.

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Dr. Dhanasekaran Shanmugam
Biochemical Science Division
CSIR-National Chemical Laboratory

Profile:

Dr. Dhanashekharan Shanmugan is a scientist at the CSIR-National Chemical Laboratory (NCL) in Pune, India, where he has been working since 2012. His research focuses on molecular parasitology, comparative genomics, biochemistry, and cell biology, with an emphasis on neglected diseases and drug discovery. Shanmugan earned his Ph.D. at the Indian Institute of Science, Bangalore, under Prof. G. Padmanaban, and completed his postdoctoral work at the University of Pennsylvania with Prof. David S. Roos, studying parasitic organisms and their potential therapeutic targets.

Shanmugan's work includes significant contributions to the genomics of parasites like *Toxoplasma gondii* and *Neospora caninum*, offering insights into their evolutionary adaptations and strategies for disease control. He has co-authored numerous publications in high-impact journals, such as *PLOS Pathogens* and *Genome Biology*, focusing on drug discovery and identifying new therapeutic targets for parasitic and helminthic infections.

Through his research, Shanmugan has made valuable contributions to the understanding of parasitic diseases and continues to advance efforts in the development of innovative treatments for neglected tropical diseases. His interdisciplinary approach to genomics and biochemistry has positioned him as a key figure in global health research.

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Dr. Federico Lauro
Associate Professor
Nanyang Technological University (NTU), Singapore

Profile:

Professor Federico Lauro is a distinguished academic and researcher at Nanyang Technological University (NTU) in Singapore, with a strong focus on microbiology, bioinformatics, and environmental sciences. Born and raised in Venice, Italy, he graduated from the University of Padua before earning his PhD at the Scripps Institute of Oceanography (SIO) at UC San Diego. Lauro's research primarily investigates how microorganisms evolve, adapt, and contribute to ecological processes essential for the health of marine environments.

Lauro combines expertise in both experimental and computational sciences, specializing in deep-sea microbiology and cutting-edge "omic" technologies. He is highly skilled in microbial genomics and bioinformatics, having developed tools for analyzing large datasets, utilizing PERL programming and open-source software to model microbial communities and ecosystem functions. His work extends from marine microbial ecosystems to the air microbiome, broadening our understanding of microbial environments.

In addition to his scientific achievements, Lauro is a passionate sailor. He has won the Australian and Italian National Championships and placed fourth in the 2012 World Championships in Ynglings. With over 20,000 nautical miles and a Yachtmaster Ocean Captain's License, Lauro has competed in numerous long-distance, multi-day open ocean regattas, demonstrating his versatility and determination both in science and sport.

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Dr. Dasmit Singh
Pediatric Surgeon
B.J. Medical College & Sassoon Hospital
Pune

Profile:
Dr. Dasmit Singh is a highly experienced and respected Paediatric Surgeon currently serving as the Director of Pediatric Surgery at Surya Hospital, Wakad. With over 38 years of experience, Dr. Singh has worked as an expert Paediatrician across multiple cities in India, gaining recognition for his skill in handling complex medical cases. He is particularly known for his precision in diagnosis and his compassionate, empathetic approach to patient care.

Dr. Singh's specialties include appendectomy, circumcision, the treatment of birth defects, and inguinal hernia repair, among others. He has performed numerous successful surgeries, becoming a trusted name in the field. He completed his MBBS from B J Medical College and Sassoon General Hospital, Pune, in 1984, followed by an MS in General Surgery from the same institution in 1989. He later pursued MCh in Paediatric Surgery from Grant Medical College and Sir J J Group of Hospitals, Mumbai, in 1993.

Throughout his career, Dr. Singh has been actively involved in research and has published several papers in the field of Paediatrics. He has also participated in various workshops, furthering his knowledge and expertise. His contributions to Paediatric Surgery have been recognized with awards, cementing his reputation as a leading surgeon in his field.

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Dr Aedin Culhane
Professor, Cancer Genomics
Director, Limerick Digital Cancer Research Centre
University of Limerick, Ireland

Profile:

Dr. Aedin Culhane is a distinguished Professor of Biomedical Sciences (Cancer Genomics) in the UL School of Medicine at the University of Limerick, Ireland. A computational oncologist with over 20 years of experience in cancer genomics, she specializes in multi-omics data integration, statistical genomics, clinical bioinformatics, and genomics in oncology. Dr. Culhane's career includes more than 15 years at the Dana-Farber Cancer Institute and Harvard T.H. Chan School of Public Health in Boston, USA, where she advanced her expertise in cancer research.

Her current research focuses on developing algorithms and integrative data analysis for single-cell molecular data in cancer, aiming to identify regulatory molecules that can be targeted during tumor development, progression, drug response, and resistance. Dr. Culhane is a member of the Human Cell Atlas project and plays a leading role in the Bioconductor community, an open-source platform for genomic data analysis. She is a strong advocate for open-source science and collaboration in computational biology.

Dr. Culhane holds a Ph.D. from the University of Manchester, UK, and a B.Sc. in Industrial Biochemistry from the University of Limerick. She has held numerous prestigious roles, including senior positions at Harvard and Dana-Farber. She is actively involved in various professional societies, including the International Society for Computational Biology and the American Association for Cancer Research.

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Dr Anusha Dargashetti
Life Sciences, Wiley

Profile:

Anushka Daragshetti is a seasoned professional in the field of scientific research and publishing, currently serving as a Content Acquisition Specialist at Wiley, where she has been working since October 2023. With a background in biomedical research and a focus on scientific content, she plays a key role in identifying and facilitating research publications within Wiley's Life Science portfolio.

Anushka began her career in research as a Project Intern at Jain University, where she studied the role of nano-NF doped Titania in photo-degradation. She further honed her expertise as a Project Intern at the University of Manchester, working on immune responses to gut infections. Later, she worked as an R&D Executive at Novel Tissues Pvt Ltd and contributed to the establishment of labs and research in immunology and cell culture at KLES Dr. Prabhakar Kore Hospital.

Her experience also includes roles as a Quality Analyst at Ulatus (Crimson Interactive), a Content Review Associate, and a Research Officer at Accutest Research Laboratories. Anushka's research interests have included immunology, cell culture, and cancer genomics, and she is now contributing her knowledge to the scientific publishing world, helping researchers find the right platforms for their work.

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Dr. Mahesh Kulkarni

Chair, Biochemical Division
Senior Principal Scientist
CSIR NCL, India

Profile:

Dr. Mahesh Kulkarni is a distinguished scientist at CSIR-National Chemical Laboratory (NCL), Pune, India, specializing in mass spectrometry-based proteomics and metabolomics. His research focuses on post-translational modifications, protein glycation in diabetes, and bioinformatics, with significant contributions to understanding the molecular mechanisms underlying disease and therapeutic intervention. He is also involved in the study of biotherapeutics, using advanced proteomic techniques to explore protein dynamics and their role in health and disease.

Dr. Kulkarni earned his Ph.D. in Crop Physiology from the University of Agricultural Sciences, Bangalore, and has had an extensive academic career. He held a Raman Research Fellowship at the University of Turku, Finland, and worked as a post-doctoral fellow at the Genome Institute of Singapore. Earlier in his career, he was a research associate at the Center for Cellular and Molecular Biology, Hyderabad, and a scientist-consultant at Monsanto Research Centre, Bangalore.

An active academic leader, Dr. Kulkarni is currently the Head of the Biochemical Sciences Division at NCL (2023-2026) and has previously served as the Associate Dean of Biological Sciences at AcSIR. He is an editorial board member of several proteomics journals and holds memberships in esteemed scientific societies such as the Royal Society of Chemistry. His work has earned him multiple awards, including the Chellaram Diabetes Institute Special Recognition Award in 2018.

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Dr. Reshma Puranik

Medical Oncologist
Ruby Hospital, Pune

Profile:

Dr. Reshma Puranik is an experienced Medical Oncologist and Haemato-oncologist based in Wakad, Pune, with over 11 years of expertise in cancer care. She currently practices at Lakshya Cancer Care Center in Wakad, Pune. Dr. Puranik completed her MBBS from DR D Y Patil College for Women, Pune, in 2008, followed by a DNB in General Medicine from the National Board of Examination in 2013. She further specialized by earning her DM in Oncology from The Gujarat Cancer and Research Institute in 2018.

Dr. Puranik is known for her comprehensive experience in managing a variety of cancers, including head & neck, lung, breast, gastrointestinal, genitourinary, sarcomas, and skin cancers. She has a particular interest in treating malignancies in females, such as breast and cervical cancers, and is committed to raising awareness and promoting early diagnosis and prevention in women. Additionally, she has expertise in treating hematological malignancies, including leukemias, lymphomas, and multiple myeloma.

As a member of the Indian Medical Association (IMA), Dr. Puranik is dedicated to advancing cancer care, with a special focus on screening and preventive oncology, to improve outcomes for her patients.

ISBN: 978-93-341-9591-0

Dr Kavita Reginald
Associate Professor
Sunway University Malaysia

Profile:

Dr. Kavita Reginald is a distinguished academic and researcher, currently serving as the Head of the Department of Biological Sciences at Sunway University, Malaysia. She completed her PhD in Biology at the National University of Singapore in 2006, focusing on the molecular mechanisms of allergies. Prior to her doctoral studies, she earned her BSc (Hons) in Biotechnology from Universiti Putra Malaysia in 2001.

Dr. Reginald's research interests are centered around immunology, with a strong focus on allergy mechanisms, immunotherapy, and the development of novel therapeutic strategies for allergy treatment. She further honed her expertise during post-doctoral training in Austria and France, where she explored cellular signaling and the molecular pathways driving allergic responses. After returning to Malaysia, Dr. Reginald established the Allergy Research Laboratory, where she investigates genetic factors contributing to allergy susceptibility, the molecular processes involved in allergic reactions, and the development of safe and effective allergy therapeutics.

Her contributions to the field of immunology and allergy have been significant, with numerous publications in top-tier scientific journals. Dr. Reginald continues to advance the understanding of immune responses and therapeutic interventions, significantly influencing both academic research and clinical approaches in allergy management.

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Oral presentations

OP-01

In silico vaccine designing the effective multi-epitope vaccine to fortify against Nipah virus: A plausible strategy

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Abstract: The Nipah virus causes subclinical infection to severe respiratory infection and fatal encephalitis. -Due to the Skimpiness of regins to cure of disease and eliminate the viral disease. There is an ongoing need to extend in-silico immune-informatics to design best peptide based vaccine. In this study we will proposing to design multi epitope based vaccine against the Nipah virus infection by targeting its proteins and look at its efficaciousness by using the various immunoinformatics platforms as IEDB B-cell epitope prediction website, NetMHCpan 4.1, NETMHCIIpan 4.3 website, Vaxijen, AllerTop, ToxinPred and IFNepitope, IL4Pred and IL10Pred web servers. The Psipred tool, I-TASSER, GALAXY REFINE, and PROCHECK SERVER predicted the secondary and 3D structure, refinement, and validation of the produced vaccine candidate.TLR-5 used for molecular docking with HADDOCK–v-2.4 server. The molecular dynamic simulation and immune simulation conducted by Desmond software and C-IMMSIM program. The codon adaptation for expression in *E. coli* strain K12 sub-sub-strain MG1655 by OPTIMIZER tool for constructed vaccine candidate. The Nipah virus vaccine inserted in pET28a(+) vector by using restriction cloning module of Snap Gene software that help in better prediction of Nipah vaccine candidate. The population coverage by selected vaccine candidate has 82.59% of world population. The designing of vaccine against virus reduced could disease burden, healthcare cost and time efficient.

Keywords: *Nipah virus, B-cell Epitope, T-cell Epitope, Multi-epitope Nipah vaccine, Molecular Docking, MD simulation.*

OP-02

Enhancing drug-target affinity prediction through advanced deep learning techniques

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Abstract: Integrating artificial intelligence (AI) and deep learning (DL) has significantly transformed drug discovery by reducing development timelines and costs. A critical component of this advancement is the accurate prediction of drug-target affinity (DTA), which evaluates the strength of interaction between drug molecules and target proteins. This capability enables rapid *in silico* screening of vast chemical libraries, facilitating the identification of promising drug candidates and predicting potential adverse effects. Recent advancements in DL architectures—such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), transformers, and graph neural networks (GNNs)—have demonstrated superior performance in DTA prediction. These models leverage diverse data representations, including molecular graphs, protein sequences, and 3D structural information, to improve prediction accuracy. However, significant challenges persist, including the demand for high-quality datasets, the black-box nature of many DL models, and the complexity of integrating these approaches into existing drug discovery workflows. This review explores the state-of-the-art DL models applied to DTA prediction, their unique advantages, and associated challenges. We highlight the need for interpretable AI frameworks, innovative data augmentation strategies, and hybrid models that bridge traditional computational methods and modern DL techniques. Addressing these challenges will further accelerate drug discovery and improve therapeutic outcomes.

Keywords*: Drug discovery, artificial intelligence, deep learning, drug target affinity, potential adverse effects.*

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OP-03

Development of the lung-on-a-chip device

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Abstract: The necessity for newer and faster drug discoveries has led to development of numerous drugs. Although, animal models have been traditionally used for efficacy and toxicity testing of drugs, almost 80% of the drugs tested in animal models, fail during human trails due to the genetic and immunologic differences. Such failures are time- and cost-intensive and raise ethical issues as well. Currently, countries across the world are formulating new policies to encourage the use of animal-free, human-relevant alternative models to replace the animal models. The alternative models emulate the 3D environment and architecture *in vivo*.

We have developed a lung-on-a-chip device that emulates the lung-alveolar interface. The device consists of three chambers. The central chamber comprises of a selectively permeable, biocompatible, elastic membrane that mimics the alveolar membrane *in vivo*. Further, the membrane divides the central chamber into 2 parts that recapitulates the alveoli and vasculature on either side of the membrane where cells can grow. Air and liquid can be perfused through the upper and lower chambers simultaneously to recapitulate the sheer stress *in vivo*. The vacuum chambers aid in cyclic stretching-relaxing of the central membrane, in length, to simulate breathing.

The device can serve as an alternative model for comprehending the physiology of the organ, drug testing, disease modeling etc. Additionally, patient-derived cells can be cultured in the model to test the effect of drugs facilitating personalized medicine.

Keywords*: organ-on-a-chip, lung-on-a-chip, 3D model, membrane, alveoli, transport, interface, disease modeling.*

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OP-04

Comparative evaluation of advanced oxidation processes (AOPs) for reducing SARS-CoV-2 viral load from sewage water: A one health perspective

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Abstract: The presence of SARS-CoV-2 in wastewater poses significant public health and ecological risks, especially when untreated sewage enters rivers and other water bodies that serve as vital resources for human and animal populations. Effective treatment of sewage water is essential to safeguard public health and environmental sustainability, aligning with the One Health approach that recognizes the interdependence of human, animal, and ecosystem health. In the present study, various advanced oxidation processes (AOPs) were evaluated for their efficiency in disinfecting SARS-CoV-2 from sewage water collected from the inlet of a sewage treatment plant (STP). The sewage water was subjected to ten AOPs, which include Ozone (O_3), Hydrodynamic cavitation (HC), Ultraviolet radiation (UV), and their hybrid combinations like HC/O_3, HC/O_3/ H_2O_2, HC/H_2O_2, O_3/UV, UV/H_2O_2, UV/H_2O_2/O_3, and O_3/H_2O_2 to reduce SARS-CoV-2 viral load. Further, AOP treated sewage water was subjected to total nucleic acid isolation followed by RT-qPCR for viral load estimation. The sewage water treatment techniques were evaluated based on their viral concentration-reducing efficiency. It was found that ozone and ozone-coupled hybrid AOPs showed the most promising result with more than 98% SARS-CoV-2 viral load reducing efficiency from sewage water. Interestingly, the best six AOPs used in this study significantly reduced both the SARS-CoV-2 and PMMoV (fecal indicator) viral load and improved water quality in terms of increasing DO and decreasing TOC. These findings underscore the potential of AOPs as a sustainable and effective strategy for mitigating viral contamination in wastewater, thereby contributing to the One Health objective of reducing pathogen transmission across environmental, human, and animal domains.

Keywords: *AOPs and hybrid AOPs, Ozonation, Hydrodynamic cavitation, SARS-CoV-2, PMMoV, Sewage water treatment, one health, sustainability.*

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OP-05

Affordable and accessible spirometry: A review of portable and AI-driven solutions

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Abstract: Chronic respiratory diseases (CRDs) pose a significant global health burden, necessitating accessible and affordable diagnostic tools for early detection and effective management. Spirometry, the gold standard for assessing lung function, is crucial for diagnosing CRDs like COPD and asthma. However, traditional spirometry relies on expensive, bulky equipment and trained personnel, limiting its availability, especially in low-resource settings. This review examines advancements in portable and AI-driven spirometry designed to overcome these limitations. We explore the evolution of portable spirometers, encompassing smartphone-based systems, novel sensor modalities (e.g., Fiber Bragg Grating sensors, Electrical Impedance Plethysmography), and the integration of AI for enhanced data analysis and disease classification. Smartphone integration has revolutionized spirometry by leveraging ubiquitous smartphone technology for cost-effective and accessible lung function testing. AI algorithms further enhance accuracy by addressing inter- and intra-subject variability, effectively utilizing suboptimal efforts, and mitigating noise and artifacts. AI also automates spirometry data interpretation, classifying lung function patterns and predicting disease probability, thereby streamlining the diagnostic process. This review critically assesses the advantages and disadvantages of each approach, focusing on cost-effectiveness, accuracy, and ease of use. We discuss challenges such as data quality, model interpretability, and clinical validation, while highlighting future directions including advanced sensor technologies, robust AI algorithms, and seamless integration with healthcare systems. Portable spirometry has the potential to revolutionize respiratory care, especially in resource-limited settings, improving diagnosis, treatment, and patient outcomes globally.

Keywords: *Spirometry, AI, Portable, Smartphone, Lung Function, Diagnosis, CRDs, Sensors.*

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OP-06

Studies on lipid profile and cardiac biomarkers of cardiac patients

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Abstract: Cardiovascular diseases (CVD) represent a critical public health challenge, particularly in rapidly urbanizing regions like central India. This comprehensive study investigates the intricate relationships between lipid profiles, cardiac biomarkers, and cardiovascular risk among 200 hospital-admitted cardiac patients, offering novel insights into metabolic health dynamics. Employing a prospective observational design, the research analyzed comprehensive biochemical parameters across diverse demographic segments. Blood samples from patients were rigorously examined for lipid profiles (total cholesterol, LDL, HDL, triglycerides) and critical cardiac biomarkers (SGOT, SGPT, GGT, ALP), revealing significant metabolic interactions beyond traditional diagnostic approaches.

Key findings highlighted alarming trends: consistently elevated LDL and triglyceride levels across patient groups, dramatically reduced HDL concentrations, and abnormal cardiac biomarker profiles. Notably, the study uncovered a critical correlation between lipid metabolic disorders and potential hepatic dysfunction, suggesting a more complex interplay between cardiovascular and metabolic health than previously recognized. The research contributes crucial population-specific insights, demonstrating that cardiovascular risks in this region are characterized by multifaceted metabolic disruptions. These findings underscore the urgent need for integrated, personalized healthcare strategies that address comprehensive metabolic risk factors rather than isolated cardiac markers. By bridging clinical observations with emerging metabolic understanding, this study provides a foundational framework for targeted cardiovascular prevention and management strategies tailored to urban Indian populations.

Keywords: *Cardiovascular Risk, Lipid Metabolism, Cardiac Biomarkers, Urban Health, Metabolic Screening.*

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OP-07

Exploring the potential of *Ficus religiosa* as an effective biosorbent for removal of Auramine dye

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Abstract: The treatment of dyes remains a significant challenge for industries, as many dyes are difficult to degrade and often bypass conventional wastewater treatment methods, leading to their persistence in the environment. Biosorption is a passive, surface-mediated process where natural materials, such as plant fibers, adsorb pollutants from aqueous solutions, offering a more sustainable and cost-effective alternative to conventional wastewater treatment methods. Auramine O is a highly toxic and persistent dye commonly found in industrial effluents, posing significant environmental and health risks, necessitating effective treatment methods. This study aims to determine the adsorption efficiency along with optimizing the dye adsorption of auramine o with *Ficus religiosa* as an adsorbent. The effects of several parameters, including dye concentration, adsorbent dosage, solution pH, and contact time, were investigated by varying individual factor. *Ficus religiosa* was found to be an effective bio adsorbent for removal of auramine-o dye. The adsorption isotherm was also studied in order to understand the mechanism exhibited by *Ficus religiosa*. This study attempts to demonstrates the effectiveness of *Ficus religiosa* as a sustainable biosorbent for the removal of Auramine dye, providing a viable solution for wastewater treatment, particularly in the context of industrial effluent management.

Keywords: *Biosorption, Auramine o, wastewater, Ficus religiosa, contact time, dosage.*

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OP-08

A distensible peritoneum-on-chip to investigate ovarian cancer metastasis

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Abstract: Ovarian cancer is the most lethal gynecological malignancy, due to early, undetected metastasis causing late diagnosis.[1,2] Dissemination occurs via exfoliation of transformed ovarian and fallopian cells into the peritoneal fluid (malignant ascites) followed by colonization of secondary sites including mesentery, omentum and liver.[3,4] Mechanical factors including ascitic fluid pressure & shear, leading to peritoneal stretching, regulate the metastatic cascade like stemness and chemoresistance.[5,6,7] While *in vitro* 2D cultures fail to recapitulate *in vivo* pathology,[8] animal models cannot accommodate measurement of cellular-molecular dynamics in real-time.[9] An organ-on-chip[10,11] platform integrating human peritoneal architecture, shear acting on malignant ovarian spheroids and mesothelial stretching due to ascites, can overcome these limitations. The microfluidic device is fabricated by 3D printing the inverse micropatterned mold using SLA printer, followed by soft lithography. To mimic the *in vivo* peritoneal architecture, mesothelial cells are cultured over a PDMS thin-film membrane coated with laminin-rich basement membrane (lr-BM). The mesothelial cells are mechanically stretched in real-time by maintaining a hydrodynamic pressure over the membrane causing it to distend. A dynamic long-term culture is achieved by continuously perfusing the microchannels with fresh media. Using this artificial peritoneal model, influence of mechanical deformation i.e., peritoneal stretching during malignant ascites, on morpho-physiology of mesothelial cells e.g., integrity of monolayer, presence of tight junctions can be monitored. More importantly, the effect of mechanically altered mesothelia, on adhesion and tropism of disseminated ovarian clusters, is explored to discover novel targets for advanced stage therapy and thereby prolong 5-year survival period.

Keywords: *organ-on-chip, artificial peritoneum, distensible, ovarian cancer, microfluidics, mechanical deformation, metastasis, real-time.*

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OP-09

Engineering endolysin to improve membrane permeability and antimicrobial effectiveness against *E. coli*

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Abstract: Antimicrobial resistance (AMR), a natural consequence of microbial evolution, threatens decades of medical progress, leading to a looming post-antibiotic era where treating common infections could become perilous. The WHO identifies ESKAPE pathogens—*Enterococcus faecium, Staphylococcus aureus, Acinetobacter baumannii, Pseudomonas aeruginosa, Klebsiella pneumoniae*, and other *Enterobacteriaceae*—as major threats. *E. coli*, both a commensal and serious pathogen, causes various diseases such as diarrhea, urinary tract infections (UTIs), and meningitis. This crisis underscores the urgent need for alternative antimicrobials. Endolysins, peptidoglycan hydrolases, are promising antibacterial agents with therapeutic potential as alternatives or supplements to traditional antibiotics, as they selectively targets the bacteria. While effective against Gram-positive bacteria, their efficacy against Gram-negative bacteria is limited by the outer membrane barrier. Permeabilizers like EDTA and citric acid can enhance endolysin activity, suggesting that if the barrier is crossed endolysin have the therapeutic properties, however, these are unsuitable for in vivo use. However, some endolysins have shown a limited intrinsic activity to destabilize the outer membrane by virtue of their protein segment sharing properties to that of cationic peptide, but still, in comparison to Gram-positive endolysin, they require a higher dose for killing. To improve the bactericidal effectiveness of endolysins different engineering strategies has been employed like fusing cationic peptide or parts of bacteriocin, increasing net charge at C-ter etc. We have identified an endolysin from *E. coli* genome with limited intrinsic activity and fused a peptide at N-Ter. In contrast to the wild-type endolysin that demonstrated >7-log reduction at 11.65 μM, the engineered endolysin achieved samilar reduction at <0.5 μM without the aid of any outer membrane permeabilizer. Furthermore, the engineered endolysin exhibited activity against various ESBL-producing mastitic strains, with a minimum inhibitory concentration (MIC) ranging from 0.5 to 1.1 μM. This could solve the problem of antimicrobial resistance fast developing in pathogenic bacteria because of overusage of antibiotics. The engineered endolysin could find application against MDR *E. coli* to treat the infections.

Keywords: *Endolysin, Antimicrobial Resistance, Gram-negative bacteria, E. coli, Extended-spectrum beta-lactamase ESBL, Minimum Inhibitory Concentration (MIC), Endolysin engineering.*

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OP-10

Bioinformatics investigation of the Zika virus (ZIKV) NS5 protein for potential drug development

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Abstract: Zika virus (ZIKV), an emerging arbovirus, poses a significant global health threat with its capacity to cause severe neurological and congenital disorders. Despite advances in virology and therapeutics, effective treatment options for ZIKV remain limited. *Calotropis procera*, commonly known as the "giant milkweed," has a long-standing reputation in traditional medicine for its antiviral properties, though its molecular mechanisms of action against ZIKV remain elusive. This study utilizes an integrated network pharmacology approach to elucidate the active phytochemicals of *C. procera* and their therapeutic mechanisms against ZIKV. Bioactive compounds were identified from phytochemical databases and published literature, while target genes were predicted using SwissTargetPrediction. ZIKV-associated genes were retrieved from DisGeNET and GeneCards databases. A Venn analysis was performed to identify overlapping genes between *C. procera* targets and ZIKV-related genes. A compound-target-disease interaction network was constructed using Cytoscape to visualize potential therapeutic pathways. Functional enrichment analyses, including GO and KEGG pathway studies, were conducted to identify critical biological processes and signalling pathways. Molecular docking and dynamics simulations were employed to validate the interactions between *C. procera* compounds and ZIKV target proteins.

Keywords: *Calotropis procera, Zika virus (ZIKV) NS5 Protein, Network pharmacology, Phytochemicals, Molecular docking, SwissTargetPrediction, GO and KEGG enrichment analysis, Compound-target-disease network.*

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OP-11

Harnessing endophytic bacteria from mangrove ecosystems for enhanced tannase production: A biotechnological perspective

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Abstract: The investigation of endophytic bacteria from mangrove ecosystems for tannase enzyme production holds significant promise for various biotechnological applications. This study emphasizes the qualitative screening of endophytic bacteria isolated from mangrove samples, specifically targeting their ability to produce tannase, an enzyme with diverse industrial uses. A total of 20 bacterial isolates were assessed for tannase production using tannic acid as a substrate. The screening process involved culturing the bacteria on tannic acid medium and monitoring growth, along with colour changes in the media, which indicated positive enzymatic activity. Several endophytes from this ecosystem exhibited substantial tannase activity, underscoring their potential utility in industrial processes such as bioremediation of tannin-rich waste, food processing, and the synthesis of bioactive compounds. The remarkable adaptability of these bacteria to the challenging saline conditions of mangrove environments highlights their significance as a source of biocatalysts. This study not only enhances our understanding of the potential applications of tannase but also showcases the value of endophytic bacteria as biomaterials in biotechnology. Further research is recommended to optimize enzyme production and explore the genetic mechanisms underlying tannase synthesis. By harnessing these microbial resources, we can develop sustainable solutions for industrial challenges while promoting environmental conservation through the utilization of natural biocatalysts.

Keywords: *Tannase, mangroves, endophytes, tannic acid.*

OP-12

In silico modeling and molecular docking insights of natural compounds on MTA1 protein

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Abstract: Progression of cancer to next stage, *i.e.*, distant metastasis is the main cause of death in many types of cancers. Up regulation of MTA1 (Metastasis Associated Protein – 1) expression is tightly correlated with tumor progression and metastasis in many cancers like breast, colorectal, gastric and esophageal cancers. The mechanism by which MTA1 induces metastasis in tumor cells still remains unclear. MTA1 is a component of NuRD (Nucleosome Remodelling histone Deacetylation) complex that play an important role in acetylation and deacetylation of histone proteins there by controlling transcription of different genes. MTA1 acts by repressing the transcription of few genes that induce apoptosis/ cell adhesion/ tumor progression. The possible mechanisms by which MTA1 brings about metastasis is through acetylation of P53 gene rendering it inactive there by surpassing apoptosis leading to tumor progression, and inhibiting the function of TJP1/ZO1 protein that play a very important role in maintaining stability at tight junctions and cell adhesion. The present study focused on screening of natural compounds and their synthetic analogs that have a potential to inhibit the transcription of MTA1 protein by blocking the transcription factors and up regulation of P53 gene expression which will induce apoptosis and arrest cell cycle using molecular docking and Computer Aided Drug Design. 20 different natural compounds along with their pharmacophore derivatives will be screened for their potential to act against MTA1 TF's, at present amygdalins showed best binding with minimal energy, screening of remaining natural compounds is under process, further the expression of MTA1 gene will be studied among different cancer diagnosed patients and cancer survivors this may serve as a molecular marker for diagnosis of cancer. This study could be useful to develop effective medications and diagnosis of cancer in future.

Keywords: *Cancer, auto-dock, metastasis, P53 gene, metastasis inhibitors.*

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OP-13

Optimizing leaf extract-mediated biosynthesis of *Moringa oleifera* derived silver nanoparticles for enhanced antimicrobial potential

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Abstract: Spread of infections is a pressing issue, greatly impacting healthcare system due to emerging antimicrobial resistance. Use of nanotechnology and various nanoparticles has shown promising results in reducing the usage of antibiotics by making them more efficient. To mitigate this problem biosynthesis of silver nanoparticles from leaves of *Moringa oleifera* was performed. *Moringa oleifera* possesses antimicrobial, antifungal, anti-diabetic, and anti-inflammatory qualities, according to epidemiological research. The leaves of this plant are valuable and ecofriendly source for biosynthesis having medicinal, preventive, and nutritional properties. These bioactive compounds act as reducing and stabilizing agents in silver nanoparticles biosynthesis. The nanoparticles were characterized by UV visible spectroscopy, FTIR, TEM and found to be spherical in shape. Various parameters such as temperature, salt concentration, leaf extract was optimized and used further for antimicrobial assay against *Escherichia coli* and *Staphylococcus aureus* which are most common cause of infections. *Moringa* leaf-mediated silver nanoparticles could synergistically inhibit the growth of bacteria.

Keywords: *Moringa oleifera, biosynthesis, silver nanoparticles, antimicrobial resistance.*

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OP-14

Retting and pulping of banana pseudostem fibre using *Bacillus* strains: A sustainable route to high-performance textile biomaterial

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Abstract The significant use of chemicals and widespread wastewater discharge make the textile sector one of the most polluting. A sustainable solution is provided by biopulping, a biotechnological substitute for traditional chemical and mechanical procedures. In this work, *Bacillus licheniformis*, *Bacillus subtilis*, and *Bacillus aryabhattai* are used to treat banana pseudostem (BP) fibers in order to delignify them. These enzymatic methods successfully decreased the amount of lignin (up to 8.73% with 5N HCl and 11.4% with *Bacillus aryabhattai*) while maintaining the molecular weight, degree of polymerization, and purity of the cellulose. Tensile strength (warp: 831.15 N, weft: 577.40 N), fabric weight (257.07 g/m2), and crease recovery angle (156°) were among the improved mechanical characteristics of the resultant pulp. Water permeability (71.21 mm/s) and air permeability (185.33 $cm^3/cm^2/sec$) also increased, demonstrating the feasibility of BP as a non-wood resource for textile applications. The study next assessed how bacterial and chemical softening treatments (NaOH, HCl) affected the BP fibers. When compared to untreated fibers, treated fibers shown notable improvements in tenacity (6.33 g/tex with *Bacillus licheniformis*), elongation (8.2% with *Bacillus subtilis*), and decreased lignin concentration. The structural and chemical alterations brought about by treatments were confirmed by characterization using SEM and FTIR. This two-pronged strategy highlights BP fibers' potential for eco-friendly textile uses. In order to promote environmental and economic sustainability, this research provides a technique to replace wood resources with renewable, biodegradable banana pseudostem by combining biopulping and fiber softening technologies.

Keywords: *Banana pseudostem(BP) fibre, Biopulp, Biofiber, Biomaterial, Scanning electron microscope (SEM) & FTIR.*

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OP-15

Preventable blindness in India: leveraging rapid assessment tools for targeted interventions and comprehensive prevention strategies

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Abstract: Preventable blindness is a serious public health issue in India, putting a significant strain on both people and the healthcare system. Rapid assessment approaches have developed as critical tools for analysing the prevalence and underlying causes of avoidable blindness, allowing for more focused treatments and better resource allocation. This abstract investigates the panorama of avoidable blindness in India, emphasizing the problems caused by numerous socioeconomic conditions and limited healthcare infrastructure. It also looks at how quick assessment tools, including as community-based surveys, technology breakthroughs, and data analytics, may be used to identify at-risk groups and drive evidence-based treatments. The abstract also explores the possible influence of preventative strategies such as health education campaigns, access to cheap therapies, and governmental reforms on reducing the prevalence of avoidable blindness. This abstract highlights the need of focused efforts towards complete blindness prevention measures in India by combining current research and empirical evidence, highlighting the critical significance of quick assessment approaches in reaching this aim.

Keywords*: Preventable blindness, India, Rapid evaluation, Public health, Community-based surveys, Healthcare infrastructure, Socio-economic factors, Technological innovation, Data analytics, At-risk populations, Evidence-based interventions, Health education campaigns, Affordable treatments, Policy reforms, Comprehensive prevention strategies.*

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OP-16

Isolation and characterization of lactic acid bacteria from Indian pickles and analysis of their food-related and probiotic properties

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Abstract: Lactic Acid Bacteria (LAB) are found in diverse habitats such as plants, the human GI tract, and fermented foods and are also known for their probiotic properties. Indian pickles are not much explored for isolation of LAB and their characterization for potential applications. The aim of this work was to isolate LAB from Indian pickles and study their probiotic, food-related, and genomic properties. A total of 39 homemade pickle samples were collected from different regions of Maharashtra, and a total of 252 putative LAB were isolated. Five different species of LAB was identified using 16S rRNA gene sequencing, viz., *Leuconostoc mesenteroids*, *Lactiplantibacillus plantarum*, *Lactobacillus delbrueckii subsp. bulgaricus*, *Lacticaseibacillus rhamnosus*, and *Weissella confusa*. A set of 15 unique *L. plantarum* strains was subjected to further characterization. All strains were bile and acid tolerant, were able to acidify the skim milk, lacked hemolytic activity, and exhibited potential antibacterial activity against three food borne pathogens, *Escherichia coli*, *Listeria monocytogenes, and Enterococcus faecalis*. All strains were susceptible to ampicillin, azithromycin, gentamicin, penicillin, and streptomycin; one strain was susceptible to trimethoprim, and two stains were susceptible to co-trimoxazole and tetracycline. These *L. plantarum* strains were next assessed for their ability to ferment mango juice to understand their metabolomic influence by GC-MS analyses. Various value-added volatile and non-volatile antioxidants, antimicrobials, and aroma chemicals were found to be generated during fermentation in a strain-dependent manner. Whole genome sequencing of the strains revealed the presence of genetic determinants of hydroxybenzoic acid and hydroxycinnamic acid metabolism in 11 strains of *L. plantarum*. Further analyses for establishing genotype-phenotype correlations are in progress. Our work can provide novel indigenous *L. plantarum* strains for the possible development of probiotic and functional foods.

Keywords: *Indian pickles, L. plantarum, functional foods, mango juice, metabolites.*

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OP-17

Optimization of fermentation conditions for enhanced production of antigenic capsular polysaccharide from *Streptococcus pneumoniae* to develop a vaccine against pneumonia

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Abstract: *Streptococcus pneumoniae* is significant global pathogen responsible for invasive pneumococcal disease (IPD) worldwide, infecting the humans across all age group. The emergence of antibiotic resistance highlights the urgent need for equitable supply of vaccine targeting the bacterium's antigenic capsular polysaccharide. This study aimed to optimize fermentation conditions to maximize the polysaccharide production, a crucial step in vaccine development.

Through Design of experiment (DoE) methodologies, we systematically investigated concentration of glucose as energy source, $MgSO_4$ as a key magnesium source in the fermentation media along with pH and need of air supply during fermentation to check its impact on the growth and capsular polysaccharide yield. The Experiments demonstrated that *Streptococcus pneumoniae* thrives under low air supply during fermentation as limited air supply prolonged the bacterial growth, enabling higher yield of antigenic capsule. Additionally, specific glucose and $MgSO_4$ levels were also identified as key contributors to enhance the production. The overall impact is found to increase the capsular polysaccharide yield by 25%.

The outcome can be cost effective and efficient solution to address the growing demand of Pneumococcal vaccines, particularly in the face of increasing infectivity, serotype prevalence and antibiotic resistance. The optimized process contributes to advancing vaccine development efforts and combating global health burden of the *Streptococcus pneumoniae* by improving polysaccharide yield.

Keywords: *Streptococcus pneumoniae, Invasive Pneumococcal Disease (IPD), Pneumococcal capsular polysaccharide Vaccine, Fermentation of Streptococcus pneumoniae, Antigenic capsule.*

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OP-18

The evolution and impact of medical wearables on modern healthcare

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Abstract: Modern medicine relies heavily on wearable devices that monitor and diagnose patients continuously from time to time. Therefore, this paper will summarise the latest landscape around medicinal technologies applied to manage different chronic conditions, cardiovascular health, metabolic monitoring, and general well-being. Different technologies that include biosensors, remote collection of data, and integrating them with telemedicine platforms to discuss their effects on patient outcomes and accessibility.

As well, the review also highlights challenges associated with wearable devices such as accuracy of data, privacy issues, compliance of users, and technological limitations, analyzing the recent advancements and case studies, which helps to identify potential improvements and future directions for research and development in this sector.

With an increase in preventive care and remote healthcare delivery, medical wearables come to be seen as a crucial step toward doing things more efficiently and more patient-centrically. This review will serve as a resource for understanding the current state of wearable technologies and their implications for the future of medical diagnostics.

Keywords*: Wearables, Monitoring, Diagnosis, Chronic, Cardiovascular, Well-being, Biosensors, Telemedicine, Outcomes, Accessibility, Accuracy, Privacy, Compliance, Technology, Advancements, Case studies, Preventive, Remote, Research, Patient-centric.*

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OP-19

Metagenomic data-driven discovery of enzymes for Celiac disease therapy

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Abstract: Celiac disease (CeD) is experiencing a notable surge in incidence across India. While the genetic predisposition—carrying the HLA-DQ2/DQ8 gene—plays a role, not all genetically susceptible individuals develop the disease, pointing to other critical factors in CeD pathogenesis. Emerging research suggests that differences in gut microbiota may be key, with certain microbes in healthy individuals potentially transforming gluten, the primary environmental trigger, into a non-immunogenic form. Our innovative work explores the use of metagenomic data to identify gut microbial enzymes which degrade the harmful components of gluten, paving the way for novel therapeutic strategies to manage CeD.

Using advanced metagenomic analysis approaches combined with in silico filtering, we have identified two promising enzyme candidates with the potential to neutralize the immunogenic properties of gluten. These recombinant enzymes, validated at the molecular level and in CaCo-2 cell line, have demonstrated remarkable efficacy in reducing gliadin immunogenicity. Functional assays—including qPCR analysis of ZO-1 and occludin, confocal microscopy, TEER assay and IL-6 secretion measurement—confirm their ability to restore barrier integrity and reduce inflammatory responses.

Our next phase involves validating these promising findings in a preclinical mouse model, with the ultimate goal of translating this research into a pioneering therapeutic approach for CeD. By targeting the root cause of gluten immunogenicity, this research holds the potential to significantly remodel how CeD is managed and treated.

Keywords: *Metagenomics, Gut microbiome, Celiac disease, Bioinformatics.*

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OP-20

The phytochemicals present in *Vitex negundo* leaf extract transcriptionally regulates colorectal cancer: An *in vitro* study using HCT-116 cells

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Abstract: Colorectal cancer (CRC) ranks as the second most common cause of cancer-related deaths. Currently, there is no targeted medication to improve the treatment of colorectal cancer. In this study, we tried to evaluate anti-cancer properties of *Vitex negundo* (*V. negundo*) using colon cancer cell lines (HCT-116 cells). Flow cytometry and transcriptome analysis were used to determine whether the phytochemicals promote apoptosis in the HCT-116 cells treated with *V. negundo* leaf extract at a concentration of 54 µg/mL. Treatment with *V. negundo* showed 28.6% and 18.5% of cells underwent early and late apoptosis when compared with controls. Further we extended our studies to investigate the genes related to apoptosis and other signaling pathways using transcriptome analysis with and without treatment of *V. negundo* in HCT-116 cells by employing RNA sequencing. Our results revealed that the identification of 195876 transcripts derived from the datasets, with 44682 genes that are predicted to be expressed differently. To forecast the expression characteristics, we utilized functional enrichment analysis using the GO process, GO function, and GO component. Moreover, we used the functional annotation database of David to pinpoint the biological pathways associated with CRC. Pathway study of signaling pathways associated to colorectal cancer revealed that 133 genes are implicated, 23 of which are specifically involved in WNT signaling pathways regulated in CRC, and 6 high rank genes are represented by PPI analysis. In conclusion, our studies revealed that the phytochemicals present in *V. negundo* transcriptionally regulates genes related to apoptosis and cell cycle in HCT116 cells.

Keywords*: Transcriptome, Apoptosis, Colorectal Cancer, Vitex negundo, Gene ontology.*

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OP-21

In vitro antioxidant molecular docking and dynamics to explore the antioxidant and antifungal properties of *Couroupita guianensis Aubl*

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Abstract: *Couroupita guianensis Aubl* (*C. guianensis*) is widely known as "Cannonball tree" and found in different parts of the world. The bioactive compounds isolated from *C. guianensis* fruit extract has different pharmacological activities such as anti-cancerous, anti-microbial, anti-oxidant activities. The current research intends to assess the phytochemicals present in *C. guianensis* fruit extract and their antioxidant activity, as well as their antifungal activity analysis by in silico studies. Phytochemicals are extracted from fruits using various solvents such as ethanol, methanol, ethyl acetate, and water. The GC-MS analysis has done to identify phytochemicals from extract. Further $DPPH^+$ and $ABTS^+$ radical scavenging activity, anti-fungal, molecular docking were performed. Finally, the stability of the most promising ligand in relation to *Aspergillus niger endoglucanase* was evaluated using molecular dynamics (MD) simulations. The purification of solvent extracts aims to identified the most active constituents from the fruit extract through different phytochemical screening tests. The results indicate that in *C. guianensis* showed potent $DPPH^+$ and $ABTS^+$ radical scavenging abilities in a manner that was dependent on the dosage (5-100µg/ml). Anti-fungal activity exhibits capable results against the microorganisms. Molecular docking results showed target proteins *Aspergillus niger endoglucanase* strong binding affinity (-9.7 to -7.5 kcal/mol), CYP51B (-11.8 to -9.4 kcal/mol) in protein-ligand complex. MD simulations further confirmed the stability of the Protein-Oxalic acid bis (6-ethyloct-3-yl) ester complex, emphasizing the formation of a robust interaction between Oxalic acid bis (6-ethyloct-3-yl) ester and the target protein. In conclusion, the GC-MS analysis, anti-fungal and molecular docking demonstrated the phytochemicals from extract exhibits potential efficacy for anti-fungal activity.

Keywords: *Couroupita guianensis Aubl., Extraction, Purification, Active ingredient, Medicinal properties.*

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OP-22

Withania somnifera modulates glucose metabolism in STZ-induced hyperglycemia in rats

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Abstract: Diabetes mellitus is a metabolic disorder characterized by increased oxidative stress, hyperglycemia, and associated implications that require suitable therapy approaches. One of the most effective approaches is to add fortified foods with multi-functional properties. *Withania somnifera* (Ashwagandha) root powder can help diabetics maintain stable blood glucose levels, reduce oxidative stress, and inflammation. This study investigated the effects of fortified meal supplementation on STZ-induced diabetic rats. Two-month-old male albino Wistar rats were divided into four groups as follows; Two-month-old male albino Wistar rats were used as the experiment model, and they were separated into four groups: Group 1 (Controls), Group II (Diabetes), Group III (Fortified Food), and Group 1V (Diabetes + FF). Diabetes was induced by IP injection of Streptozotocin (STZ) at 50mg/kg b.wt. The study found that supplying STZ-induced diabetics with fortified foods significantly improved fasting glucose, body weight, C-peptide levels, HbA1c, and insulin levels, as well as altered lipid profiles. Furthermore, diabetic rats fed a fortified diet exhibited significant improvement in their urea, uric acid, and creatinine levels. In addition, diabetic rats had aberrant plasma sodium, potassium, and calcium levels. Furthermore, liver function tests revealed elevated levels of the AST, ALT, ALP, and LDH enzymes; however, diabetic rats fed a supplemented diet had these enzyme levels reduced to normal. Furthermore, fortified meal supplementation normalized the mRNA expression of PEPCK, G6Pase, IGFBP, GLUT-2, SREBP1c, ABCA1, ABCG1, and fatty acid synthase in diabetic rat liver. Our histopathology examinations confirmed these findings. Finally, supplementation with fortified foods enhanced liver function and lipid profiles while lowering oxidative stress and moderating genetic changes. These data imply that fortified foods can be a beneficial tool in diabetes care, reducing complications and increasing overall health outcomes.

Keywords: *Diabetes mellitus, Withania somnifera**,** Wistar rats**,** Streptozotocin, Fortified Food.*

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OP-23

Green tea (*Camellia sinensis*) consumption offers protection against cigarette smoking-induced biochemical alterations and oxidative stress

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Abstract: Cigarette smoking leads to increased mortality and morbidity all around the world. The current study focuses on the role of green tea (*Camellia sinensis*) consumption in smoking-induced biochemical changes in plasma and erythrocytes. We recruited 120 male participants for this study and divided them into four groups: control group persons (Controls), smokers, healthy control individuals drinking green tea, and smokers drinking green tea. For the past seven years, participants in the smokers group have smoked an average of 16-18 cigarettes per day. The subjects (green tea consumption groups) drank 100 mL of green tea three times a day for a year. In smokers, blood tests demonstrated decreased erythrocyte catalase (CAT), superoxide dismutase (SOD), and glutathione peroxidase (GPx) activity as well as reduced glutathione (GSH) concentration. Furthermore, increased erythrocyte membrane lipid peroxidation, cholesterol phospholipids (C/P) ratio, and decreased protein and Na+/K+-ATPase activity were detected. However, smokers who drank green tea had normal antioxidant status, decreased lipid and protein oxidation, and normal nitrite/nitrate (NOx) levels compared to controls. Increased NOx levels in plasma and red cell lysate were shown to be positively associated with the C/P ratio (r=0.734) and Na+/K+-ATPase (r=0.652) in smokers. To summarize, smoke includes free radicals, and smoking-induced oxidative stress increases free radical formation. Together, they promote oxidative stress and cause metabolic changes in the blood. Green tea, which is rich in polyphenols mainly catechins, offers protection by scavenging free radicals generated from smoking. Also these polyphenols modulate smoking –induced altered antioxidant status, red cell membrane fluidity, and increasing membrane protein and lipid oxidation.

Keywords: *Blood, Camellia sinensis, Cigarette smoking, Human volunteers, Oxidative stress.*

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OP-24

Exploring the clinical variations and their correlation with hypertrophic cardiomyopathy by whole genome sequencing

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Abstract:

Background: Hypertrophic cardiomyopathy (HCM) is a cardiovascular condition with global prevalence, influenced by genetic mutations, geographical factors, lifestyle, and environmental conditions. Extensive genomic data available in public databases provides a valuable resource for identifying genes linked to HCM and predicting functional biomarkers. Prior studies have highlighted the MYBPC3 gene as a key contributor to HCM development.

Methods: Computational approaches were employed to predict gene mutations and identify functional biomarkers using raw data from whole transcriptome and whole exome sequencing. RNA-sequencing analysis was performed on twelve samples, comprising four healthy controls and eight HCM datasets, while twelve samples were used for whole exome sequence analysis.

Results: Datasets were retrieved from the Gene Expression Omnibus (GEO) database. RNA-sequencing analysis identified 20 genes associated with HCM, including MIB2, ZBTB48, MYBPC3, PRPF40B, and MYH7, with MYH7 showing the highest expression and strong similarity to MYBPC3. Exome sequencing further revealed genes such as MYBPC3, MYH6, MYH7, Titin, Desmin, and LaminA/C as significant contributors to HCM. These findings underscore the association of variant genes with the HCM condition.

Conclusion: The study demonstrates the potential of integrating RNA-sequencing and exome sequencing data to uncover critical genes and biomarkers involved in HCM. Key genes, including MYBPC3 and MYH7, are confirmed as pivotal in HCM pathology, paving the way for improved understanding and potential therapeutic interventions.

Keywords: *Hypertrophic Cardiomyopathy, HCM, Biomarker, RNA-Sequencing, Whole Exome Sequencing.*

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OP-25

Pergularia daemia extract offers protection against snake venom by targeting PLA1 and PLA2: An *in vitro* and *in silico* approach

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Abstract:

Background: Snakebite envenomation remains a serious public health concern, particularly in rural areas where healthcare access and efficient antivenom therapies are scarce, sometimes resulting in high mortality rates. Because of a lack of information and cures, residents in these areas regularly use leaf extracts from *Pergularia daemia* (L.) to treat snakebites. However, the molecular mechanisms of antivenom effects of secondary metabolites present *in P. daemia* remains unknown.

Methods: Methanol extract of *P. daemia* for phytochemical screening, *in silico* molecular docking, and antivenom activity assessment using Human Embryonic Kidney (HEK) 293 cell lines. The results of phytochemical screening showed that flavonoids, terpenoids, and alkaloids were abundant.13 secondary metabolites were found *via* LC-MS analysis, and these were then utilized in molecular docking studies against the two main enzymes responsible for venom toxicity, phospholipase A1 (PLA1) and phospholipase A2 (PLA2).

Results: Assays on HEK293 cell lines showed an 89.7% reduction of venom activity at a dose of 0.11 mg/mL. Cephaeline, Uscharidin, Corotoxigenin, and Ankorine established three hydrogen bonds with PLA1 and PLA2, demonstrating binding energies of -6.26, -7.78, -7.28, and -5.68 kcal/mol, respectively, according to the results of silico docking. The findings from molecular docking further confirm *P. daemia* crude extract's potential as an inhibitor for the treatment of envenomation.

Conclusion: Our findings suggested that the phytochemicals present in *P. daemia* inhibit the PLA1 and PLA2 activity and offers protection against snake venom.

Keywords: *Antivenom therapy, In vitro cytotoxicity, Molecular docking, Pergularia daemia, Phospholipases.*

OP-26

Repurposing of potential curcumin derivatives against COX-2 using *in silico* methods and its implication in neurological disorders

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Abstract: Cyclooxygenase-2 (COX-2) plays a crucial role in inflammatory responses and has been implicated in neuroinflammatory processes associated with neurological disorders such as Alzheimer's. While selective COX-2 inhibitors (coxib class of drugs) have been developed, their use is limited by adverse effects, necessitating the exploration of alternative therapeutic approaches. This study investigates the potential of curcumin derivatives as COX-2 inhibitors and their possible therapeutic applications in neurological disorders. We conducted a comprehensive molecular screening of curcumin derivatives against the COX-2 enzyme. Molecular docking simulations using AutoDock Vina were performed for these derivatives against the AB and CD chains of COX-2 separately. The top five compounds identified from the docking studies were subjected to molecular dynamics simulations using Schrodinger Maestro, focusing on their interactions with the AB chain of COX-2. Our results revealed that several curcumin derivatives exhibited strong binding affinities to COX-2, with docking scores comparable to or better than known COX-2 inhibitors. Molecular dynamics simulations demonstrated stable interactions between the top compounds and the COX-2 AB chain, with consistent hydrogen bonding and hydrophobic interactions observed throughout the simulation period. MMPBSA calculations further confirmed the stability of these complexes, with binding free energies indicative of strong and stable interactions. This study provides valuable insights into the potential of curcumin derivatives as COX-2 inhibitors and their possible therapeutic applications in neurological disorders. The identified compounds warrant further investigation through in vitro and in vivo studies to validate their efficacy and safety as potential alternatives to current selective COX-2 inhibitors in the treatment of neuroinflammatory conditions.

Keywords: *COX-2, neurological disorders, inflamation, molecular docking and molecular dynamics.*

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OP-27

Exon mutational analysis in EGFR of Non-Small Cell Lung Cancer (NSCLC) reveals Icotinib, Rociletinib and Olmutinib as potent inhibitors: A computational approach method

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AbstractNon-small-cell lung cancer (NSCLC) is said to account for around 80- 85 % of all Lung Cancer. The most prominent protein responsible for the onset of NSCLC is the epidermal growth factor receptor (EGFR) by activating the epidermal growth factor and other growth factor ligands. It leads to the trigger the EGFR tyrosine kinase triggers downstream pathways further proceeding to cell proliferation and consequently, tumours escaping the immune system.

Potential inhibitors from PubChem and Drug Bank that appeared to be effective against EGFR mutations at exon 18, 21, and 22 in NSCLC were virtually screened. Mutations were inserted in the wild type of EGFR further homology modeling was performed to get 3D structure of the mutations of EGFRs to study the molecular interactions against third-generation drugs. We performed structure-based virtual screening and identified 10 potential drugs and later subjected to ADME to evaluate their pharmacokinetic properties as per standards. Molecular docking studies were performed using AutoDock Vina to examine the interactions between wild-type, mutant EGFRs, and drugs. Molecular Dynamics simulation was carried out through Desmond software till 100ns with docked complexes of wild and mutant EGFR. To understand the stability of drugs in the cavities of receptors, various parameters examined like root mean square deviation (RMSD) and root mean square fluctuation (RMSF).

The results obtained from *in-silico* studies found that Icotinib, Rociletinib and Olmutinib to be effective towards binding with different advanced mutations in EGFR, this analysis can be useful for prescribing drugs rather than based on symptoms but based on exon mutations. Moreover, the studies can further help with computer-aided-drug design and the development of new drugs for NSCLC.

Keywords: *Non-small cell lung cancer, Epidermal growth factor, Molecular Docking Studies, Protein-Drug Complexes, Molecular Dynamics Simulation.*

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OP-28

Sustainable consumption and societal marketing: analysing the impact of climate change on the youth population in India

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Abstract: Businesses and industries have realized to align the goal of the organizations with human welfare, aiming to create value to the customers but also to create long term social value. Climate change sounds an alarm to the global economies for working towards responsible use of the resources and to leave behind a legacy for the future generations. Sustainable production and consumption have become a key issue where the companies advocate to create a balance between the profit, value to the customer and value to the society. Moreover, in this era of digitalization, the attitude and buying behavior of the youth is built through marketing efforts of the companies which are often misleading. India, having the largest youth population in the world grabs a lot of attention for the researchers to scrutinize for consumption patterns. The youth of today is the anchor for future production, consumption, and expenditure. Keeping this in mind the present study examines the impact of consumption intention, societal marketing and sustainable consumption behavior on the reason of buying sustainable products among youth. The study uses Artificial Neural Network to examine the influence of the factors. The study concludes that societal marketing is one factor that leads to sustainable consumption but not the most important factor. Environmental values and attitude are the major reason for making a choice of sustainable product and influence the buying behavior of the consumer.

Keywords: *Sustainable Consumption Behaviour, Socially ethical marketing, Socially responsible marketing, Societal marketing, Sustainable Consumption, Climate Change, Youth.*

OP-29

Attitude and practices of antibiotic use and resistance among parents of under-five children

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Abstract: Antimicrobial resistance (AMR) poses a critical global health challenge, driven largely by the misuse of antibiotics. This study explores the perceptions, attitudes, and practices (PAP) regarding antibiotic use among parents of children under five years of age in Pune, India. A quantitative cross-sectional study was conducted with 400 participants, using a structured questionnaire to assess socio-demographics, attitudes, and practices related to antibiotic use. Results revealed that while 75% of parents preferred consulting a doctor before administering antibiotics, significant misconceptions persisted, including 60% believing antibiotics are the first treatment choice for any illness. Notably, 45% did not complete prescribed antibiotic courses, and 40% reported using leftover antibiotics without consultation. Socio-economic factors played a pivotal role, with average-income parents exhibiting poorer practices (OR=0.496, p=0.013) compared to higher-income groups. Although education levels showed no statistically significant impact, trends suggested a correlation between lower education and inappropriate antibiotic use. The findings underscore the urgent need for targeted interventions addressing socio-economic and educational disparities, promoting awareness of AMR, and encouraging rational antibiotic use. Strategies should include public health campaigns, regulatory reforms, and community-based educational programs to combat AMR and preserve antibiotic efficacy for future generations.

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OP-30

Bridging the gap: A comparative study of diagnostic discrepancies in government and private teaching hospitals

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Abstract:

Accurate diagnosis is the cornerstone of effective patient care, facilitating appropriate treatment and improved health outcomes. Diagnostic discrepancies between provisional and final diagnoses can significantly impact patient management, particularly in resource-constrained settings[2]. Public and private healthcare systems often differ in their operational capacities, influencing diagnostic accuracy and patient outcomes. This study aims to investigate diagnostic discrepancies between provisional and final diagnoses in government and private teaching hospitals, identifying contributing factors and proposing strategies to enhance diagnostic accuracy across both settings.

A record-linked study design was employed to analyse data from 1,000 patients - 500 each from government and private teaching hospitals. Data were meticulously reviewed to examine trends, challenges, and key factors influencing diagnostic accuracy. Variables such as clinician experience, availability of diagnostic tools, systemic inefficiencies, and patient condition severity were evaluated to understand their role in diagnostic discrepancies.

The findings revealed substantial disparities in diagnostic accuracy between the two settings. Government hospitals reported significantly higher rates of misdiagnosis compared to private hospitals. Key contributing factors included: Government Hospitals: Limited clinician experience, resource constraints, delays in obtaining diagnostic tests, and a higher volume of severe and complex cases. Private Hospitals: Fewer diagnostic discrepancies, attributed to superior infrastructure, quicker access to diagnostic tools, and higher clinician-to-patient ratios.Delays in performing critical diagnostic tests were more prevalent in government hospitals due to higher patient volumes and restricted resources. The complexity and severity of cases managed also played a significant role in diagnostic accuracy.

This study highlights critical gaps in diagnostic accuracy between government and private teaching hospitals. Addressing these challenges requires targeted interventions, such as enhanced clinician training programs, investment in diagnostic technologies, streamlined workflows, and multidisciplinary collaboration. Systemic reforms, equitable resource allocation, and policy changes are essential to bridge the diagnostic accuracy gap, ensuring reliable and effective healthcare delivery across public and private systems. By mitigating diagnostic errors, healthcare systems can improve patient outcomes and reduce the burden of misdiagnosis. ***Keywords:*** *Diagnostic accuracy, misdiagnosis, government hospitals, private hospitals, healthcare disparities, clinician training, healthcare infrastructure, diagnostic tools, systemic inefficiencies.*

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OP-31

Impact of climate change on geriatric health and well-being: challenges, vulnerabilities, and adaptive strategies

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Abstract:

Climate change is one of the most pressing global challenges, with severe health implications, particularly for older adults who face heightened vulnerabilities due to physiological changes, preexisting conditions, and socioeconomic constraints. This study explores the impact of climate change on geriatric health and well-being, focusing on challenges, vulnerabilities, and adaptive strategies to mitigate risks.

A cross-sectional survey was conducted with 310 participants aged 65 years and above, recruited using stratified random sampling to ensure representation across urban, suburban, and rural areas. Data were collected through structured surveys and validated rating scales, assessing demographic characteristics, health status, climate preparedness, and quality of life (QoL). Multivariate logistic regression was used to examine associations between climate stressors, socioeconomic factors, and health outcomes.

The findings revealed that 29.68% of participants experienced heat-related illnesses, 39.35% reported respiratory conditions, and 48.71% suffered from psychological stress due to climate-related events. The mean QoL score was 73.87 (on a scale of 50 to 100), with disparities observed based on socioeconomic status and geographic location. Multivariate analysis showed that low-income participants were 2.5 times more likely to experience heat-related illnesses ($p < 0.001$), while rural residents had 1.9 times higher odds of respiratory issues ($p = 0.001$). Participants with preexisting conditions were significantly more vulnerable to climate-induced health risks. This study underscores the urgent need for targeted interventions to enhance resilience and reduce disparities among geriatric populations in the face of climate change. Policymakers and stakeholders must prioritize equitable and inclusive strategies to safeguard the health and well-being of older adults, ensuring they are not left behind in an era of escalating global challenges.

Keywords: *Climate change, geriatric health, Challenges, Vulnerabilities.*

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OP-32

In silico and *in vitro* insights into the synergistic modulation: omega-3 fatty acids amplifying doxorubicin's impact on Topoisomerase II in ovarian cancer

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Abstract: Ovarian cancer is a significant cause of female mortality worldwide and ranks as the third most prevalent gynecological cancer in India. Conventional treatments, including chemotherapy and radiotherapy, often encounter challenges in effectively managing this disease. This study seeks to enhance chemotherapy—specifically using Doxorubicin (DOXO)—in ovarian teratocarcinoma cells (PA-1) by investigating the effects of omega-3 polyunsaturated fatty acids (n-3 PUFAs). Thorough cell viability assays demonstrated that n-3 PUFAs markedly increase the cytotoxic effects of DOXO, resulting in reduced cellular viability and migratory capacity. Clonogenic assays confirmed a reduction in colony formation with the combination treatment, further supported by hanging drop and apoptosis assays. Network pharmacological analyses highlighted the Topoisomerase II A (TOP2A) gene as a pivotal target in this interaction. Molecular docking simulations revealed structural similarities between n-3 PUFAs and DOXO, suggesting potential shared mechanisms, such as DNA intercalation and topoisomerase II inhibition. Molecular dynamics simulations provided insight into the distinct interaction profiles of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) with TOP2A, elucidating their mechanisms. This innovative integration of computational and experimental approaches uncovers the synergistic effects of n-3 PUFAs and DOXO in ovarian cancer treatment, presenting promising prospects for enhanced therapeutic outcomes. These findings bridge the gap between theoretical understanding and practical application, offering a comprehensive perspective on the potential of combining n-3 PUFAs with DOXO for more effective ovarian cancer therapies.

Keywords: *Ovarian cancer, DHA, EPA, Doxorubicin, Cytotoxicity, TOP2A.*

OP-33

The multifaceted benefits of *Murraya koenigii*: phytochemicals in antioxidant and cancer therapy

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Abstract: This investigation delves into the pharmacological potential of *Murraya koenigii* (curry leaf) extracts, emphasizing their phytochemical profiles and associated biological activities. Fresh leaf and stem specimens sourced from Pune, India, were subjected to rigorous analysis, revealing notable disparities in texture, coloration, and concentrations of bioactive compounds. The leaf extract exhibited a markedly higher phenolic content, demonstrating enhanced antioxidant activity and superior radical scavenging capabilities compared to the stem extract. Both extracts displayed antimicrobial properties; however, the leaf extract showed greater efficacy against both bacterial and fungal strains. In anticancer evaluations, the leaf extract illustrated significant cytotoxicity against ovarian teratocarcinoma PA1 cells, inducing apoptosis, as evidenced by Annexin V–PI assays. Furthermore, it demonstrated anti-angiogenic effects by inhibiting vascular endothelial growth factor (VEGF) in chick embryo models without inducing teratogenicity. Liquid chromatography-mass spectrometry (LC-MS) facilitated the identification of key bioactive compounds, while network analysis and ADME profiling underscored potential drug-like candidates. Molecular docking studies revealed robust binding affinities of lead compounds to targets TNFα and PRAP1, which are pivotal in the contexts of inflammation and cancer. These results position Murraya koenigii as a promising natural resource for the development of therapeutic agents, particularly in the realms of oncology and infectious disease management, while also providing novel insights into its mechanisms of action.

Keywords*: Murraya koenigii , Plant Extract, Ovarian Cancer, Antimicrobial, Anticancer.*

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OP-34

Urbanization in India and sustainable development – A study of Mumbai, Maharashtra

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Abstract: Indian cities contribute to about two-thirds of the economic output, host a growing share of the population and are the primary recipients of FDI and the originators of innovation and technology. Nevertheless, accompanying India's rapid economic growth is a massive urban transformation considered the most significant national urban transformation of the 21st century. According to the experts, the transformations would pose unprecedented challenges to India's growing cities and towns in providing housing and infrastructure (water, sewerage, transportation, etc.) and addressing slums. With the rise of urbanisation in India, sustainability issues have become significant in determining the quality of life of urban residents, the economic productivity of its cities and the state of its natural environment. Some of the significant problems of urbanisation faced by India are overcrowding, slums and squatter settlements, housing, unemployment, transport, water, sewerage, garbage disposal and rising urban crimes and pollution. All of them indicate an increasing struggle for sustainability, especially brought to the fore by the unprecedented medical emergency spurred by COVID19, unless the authorities urgently address it by changing their approach to deal with the emerging situation and the impending burst of the bubble. The problem of urban sprawl is significant in tier-one cities like Mumbai, Delhi, Bengaluru, Chennai and Kolkata due to the large-scale migration of people from surrounding areas.

This paper intends to study the rapid and massive urbanisation of Maharashtra in the wake of rising industrialisation and development and the myriad problems related to sustainability and quality of life. The study will be based on a review of literature and secondary data available

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on government websites. It will look at the feasibility of the Gandhian Principle of self-sustained urban cities and Amartya Sen's concept of PURA (Providing urban amenities in rural areas) to contend with the problems related to over-crowding, hygiene and sanitation. This has gained utmost importance of late with the pandemic's unprecedented spread and has brought the adversaries of reckless and unplanned growth and overcrowding of cities like Mumbai to the fore. With increasing focus on the medical well-being of the population, which is also a primary indicator of the Human Development Index, the advocates of PURA have become vocal once again, becoming overtly critical of the growing slums and rising density of population leading to a collapse of infrastructure and paucity of medical and other facilities for the growing population.

Keywords: *Urbanisation, Sustainable development, Human Development Index, Covid 19, rural-urban migration, Sustainable Urbanisation.*

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OP-35

Enhancing cancer treatment with liposomal drug delivery systems: mechanisms, innovations, and clinical impact

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Abstract: Cancer nanotherapeutics development has shown a potential to impact cancer treatment significantly. Nanoparticles, with their optimizable size, shape, and surface characteristics, are designed to deliver anti-cancer drugs passively or actively to tumor sites effectively. Liposomes are spherical vesicles composed of lipid bilayers. They are used in cancer treatment because they can solve many problems that traditional therapies face. They address several limitations of conventional treatments, such as nonspecific biodistribution, poor water solubility, and systemic toxicity. Liposomes take advantage of the enhanced permeability and retention (EPR) effect to naturally build up in tumor tissues. Adding surface modifications and coating like polyethylene glycol (PEG) helps extend their circulation time in the body and allows them to avoid detection by the immune system. Liposomal formulations like Doxil (liposomal doxorubicin) have been approved by the FDA and are widely used in clinical oncology. Liposomes are also used to carry immunotherapy drugs, which help the immune system fight cancer, alongside chemotherapy. Scientists have now made liposomes more significant by attaching special ligands like antibodies or peptides to surfaces. As the research continues, liposomes are proving to be very useful in modern cancer treatments. This review focuses on the latest advancements in liposomal formulations for cancer therapy, exploring their design, clinical applications, targeting strategies, and potential for overcoming challenges like drug resistance and improving targeted drug delivery.

Keywords*: Cancer nanotherapeutics, Nanoparticles, Liposomes, Targeted drug delivery, Drug resistance, Polyethylene glycol (PEG), Chemotherapy, Immunotherapy.*

OP-36

Advancements in human Metapneumovirus research: diagnostic, therapeutic, and preventive strategies

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Abstract: Human metapneumovirus (HMPV) poses a significant health challenge for acute respiratory infections, particularly affecting young children, the elderly, and immunocompromised individuals. Since its discovery in 2001, HMPV has increased as a major cause of acute respiratory infections worldwide, placing its substantial burden on global healthcare systems. The development of advanced diagnostic tools, therapeutic approaches, and preventive strategies have opened new approaches and revolutionized HMPV detection for effectively managing this virus. This review synthesizes the latest research on HMPV, emphasizing innovations in diagnostic techniques such as reverse transcription-polymerase chain reaction (RT-PCR) and next-generation sequencing (NGS) technologies to detect accurately and mitigate the severity of HMPV infections. Promising avenues highlight the progress in antiviral therapies, including monoclonal antibodies and novel small-molecule inhibitors with the potential to block viral replication and reduce disease burden. Despite these advancements, a significant gap remains in developing antiviral treatments or licensed vaccines against HMPV. Hence, to address this critical need, considerable efforts are underway to develop prophylactic vaccines targeting fusion proteins and other structural antigens essential for viral entry into host cells. Furthermore, by effectively integrating epidemiological surveillance and implementing public health measures, we can significantly improve our ability to control HMPV outbreaks. Integrating these strategies can significantly help to overcome challenges in HMPV and respond to future epidemics. HMPV research faces significant challenges in developing effective prevention and treatment strategies. To overcome these obstacles a multidisciplinary approach can be taken into consideration. This points out a deeper understanding of the virus's molecular evolution, its mechanisms for evading the immune system, and its global transmission patterns. By integrating expertise, we can develop innovative solutions to address the gaps in our knowledge and ultimately mitigate the impact of HMPV on vulnerable populations.

Keywords: *Human metapneumovirus (HMPV), acute respiratory infection, molecular diagnostics, antiviral therapies, vaccine development, public health strategies, epidemiological surveillance.*

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OP-37

AI-Powered microbots: advancements, advantages, challenges, and future perspectives in targeted therapy and diagnostics for human health

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Abstract: Microrobots are microscopic robots, developed for use in small and narrow areas. The medical microrobot is an emerging field that aims at painless diagnosis and therapy inside the human body through miniaturized sensors. Microbots integrated with artificial intelligence (AI) is a revolutionizing way in the healthcare landscape, offering transformative solutions for precision medicine. AI-powered microbots are microscopic devices with intelligent systems that enhance their capability to navigate complex biological environments inside the body to deliver targeted therapies and assist in advanced diagnostic procedures. This review provides a comprehensive analysis of the advancements, benefits, challenges, and future perspectives of microbots in human health using AI technology. Recent breakthroughs in AI algorithms have significantly improved the autonomy and accuracy of microbots in performing tasks such as targeted drug delivery for cancer treatment, microsurgery, and tissue-specific diagnostics. The integration of real-time data processing and adaptive decision-making allows these microbots to optimize therapeutic outcomes while minimizing side effects. Key advantages of AI-powered microbots include extraordinary precision in diagnosing, personalized treatment options for patients and minimally invasive procedures, which collectively enhance patient outcomes overally. Additionally, their small size enables them to access hard-to-reach areas within the human body, improving the efficacy of treatments and diagnostics. However, several challenges still persist, such as the acceptance by the body, biocompatibility and biodegradability of materials used in constructing microbots require further research to reduce any risks. Navigational accuracy in dynamic and heterogeneous biological environments, energy to power the bots and other regulatory approval hurdles also present significant barriers to widespread clinical adoption. Looking ahead, ethical considerations, data privacy concerns, and the need for standardized protocols are being explored. The future of AI-powered microbots in healthcare is promising, with potential applications extending to regenerative medicine, smart nanoscale sensors for continuous monitoring, and personalized medicine platforms. This convergence of AI and micro-robotics assures redefining therapeutic patterns and diagnostic methodologies, making healthcare more efficient, precise, painless, and personalized. Continued interdisciplinary collaboration and innovation overcome current limitations and unlock the full potential of this transformative technology for future success.

Keywords: *Microbots, artificial intelligence (AI), targeted therapy, precision medicine, biomedical robotics, autonomous navigation, drug delivery, diagnostics, biocompatibility, biodegradability, future healthcare technologies.*

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OP-38

Unfolded protein response genes: potential biomarkers for ovarian cancer progression and survival

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Abstract: Ovarian cancer ranks as 5th most common gynecological malignancy globally, with a high incidence rate, contributing to poor prognosis and high mortality rate among women. The lack of specific and sensitive biomarkers for early diagnosis delays therapeutic intervention, resulting in a lower 5-year survival rate. The unfolded protein response pathway plays a crucial role in maintaining proteostasis in cancer cells, which are vital for tumour growth, invasion, and resistance to therapy. This study aimed to thoroughly investigate the expression pattern and prognostic relevance of UPR pathway-related genes in OC patients. The RNA-Seq and microarray datasets from TCGA and GEO, respectively, were subjected to computational analysis to uncover differentially expressed genes in ovarian cancer samples. The UPR pathway-associated genes were obtained from the UALCAN database. Gene expression analysis, Functional enrichment analysis and survival analysis identified five UPR-associated hub genes: *HSPA4, ERN1, FN1, PERK, and NPM1*. Among these, *HSPA4*, *NPM1,* and *FN1* were upregulated in advance-stage ovarian tumours, correlating with worse overall survival and poor prognosis for patients in the higher expression group. In contrast, *ERN1* and *PERK* were significantly downregulated in advance-stage ovarian tumours, with their lower expression associated with poor prognosis and reduced survival in the lower expression group. These findings emphasize the potential of these UPR-related genes as prognostic biomarkers. Further validation through in vitro studies may pave the way toward identifying novel biomarkers for ovarian cancer.

***Keywords**: Unfolded Protein Response, Ovarian cancer, Differential Gene Expression, Microarray, RNA Seq, Biomarker, TCGA, UALCAN.*

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OP-39

Integrated bioinformatics analysis of RNA-Seq data reveals prognostic biomarkers for gastric cancer progression

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Abstract: Gastric cancer is one of the leading grounds of cancer-related mortality worldwide, with late-stage diagnosis significantly hindering effective treatment and patient survival. Despite advancements, the lack of reliable biomarkers for early detection and disease monitoring remains a critical challenge. This study aims to identify and validate molecular signatures that drive gastric cancer progression and assess their potential as prognostic biomarkers. Gene expression data from 367 gastric cancer samples across 12 NCBI GEO datasets were systematically analyzed, and stratified by malignancy, tumor stage, and metastasis. Through differential expression analysis, protein-protein interaction networks, and functional enrichment studies, 9,362 differentially expressed genes were identified. These included 8,482 genes linked to malignancy, 568 to advanced-stage tumors, and 312 to metastatic cases. Among the 24 common genes identified across all the tumor categories, FABP1 emerged as a common hub gene, highlighting its central role in gastric cancer biology. Functional enrichment analysis revealed that these hub genes are implicated in tumor-promoting processes, including extracellular matrix remodeling, immune evasion, and signaling receptor activity. FABP1, in particular, demonstrated strong prognostic significance, as validated through UALCAN and Kaplan-Meier plotter databases, where its expression correlated with tumor stage and reduced overall survival. This study provides a novel framework for understanding the molecular landscape of gastric cancer progression, positioning FABP1 as a key prognostic biomarker.

Keywords: *Gastric cancer, prognostic biomarkers, FABP1, molecular pathways, early detection, precision medicine.*

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OP-40

The effect of carbonization temperature on adsorption of methylene blue dye using Banana Peel Char

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Abstract: Aromatic compounds, heavy metals, and dyes are just a few of the organic and inorganic contaminants found in industrial effluents. Due to their toxic nature, many dye molecules are classified as hazardous pollutants. This study aims to explore the usage of banana peel char as an entrapment for removing methylene blue dye from aqueous solutions. Various techniques were used to analyze the physical properties of the banana peel char, which involved elemental analysis, Fourier-transform infrared spectroscopy, scanning electron microscopy, and Brunauer–Emmett–Teller surface area analysis.

The effects of key parameters were evaluated through batch adsorption experiments. The banana peel carbon was prepared at three different temperatures, 500 ^{0}C, 700 ^{0}C and 900 ^{0}C. The initial dye concentration, adsorbent dosage, and contact time during adsorption are all important factors. Methylene blue dye have good co-relation values more than 0.99 for and that are well-matched by the Langmuir Adsorption isotherm. The Temkin isotherm analysis validated that dye has physisorption mechanisms on the char surface. Based on the agreement between predicted and experimental equilibrium capacities, kinetic modeling showed that the pseudo-second-order kinetic model was the most fitting. Additionally, a thermodynamics study of adsorption demonstrated that the adsorption process is favored at higher temperatures.

Keywords: *Banana Peel, methylene blue, adsorption, kinetics.*

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OP-41

Biopolymer-assisted synthesis of copper-doped Zinc Oxide nanoparticles: A sustainable approach for photocatalysis and anticancer applications

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Abstract: Green synthesis methods for nanoparticles and nanocomposites have evolved as a sustainable approach to materials research, reducing the risks associated with traditional chemical processes. The goal of this study is to create copper-doped zinc oxide (Cu doped ZnO) nanoparticles (NPs) using biopolymers. The NPs could be employed as photocatalysts for the breakdown of azo dyes, as well as anticancer medicines for lung and ovarian cancer cells. Galactomannan, a polysaccharide, was used as a bio-template for NPs synthesis via solution combustion. The nanomaterials were characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM) coupled with energy-dispersive X-ray analysis (EDX), and Fourier-transform infrared spectroscopy (FTIR). Cu-doped ZnO NPs displayed outstanding photocatalytic activity, degrading methylene blue, a typical azo dye, by 97.87%. In biological investigations, the NPs produced cytotoxicity and reduced cell migration in lung and ovarian cancer cell lines. Nanoparticles of 31 µg/mL killed lung and ovarian cancer cells by 45% and 42%, respectively, with 4% Cu doping. Additionally, wound healing experiments on lung cancer cell lines showed a substantial reduction in cell migration at dosages as low as 61 µg/ml.

Keywords: *Green approach, Galactomannan, Cu-doped ZnO, Photocatalysis, Anticancer agent, Polysaccharide, Biotemplate*.

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OP-42

Potential of endophytic bacteria isolated from *Azadirachta indica* (Neem) to formulate sustainable nano-biofertilizers

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Abstract: The rapid growth of the global population is significantly intensifying the demand for food, which has led contemporary agriculture to increasingly rely on agrochemicals for enhanced productivity. However, the adverse effects of excessive synthetic chemical application—such as soil degradation and water contamination—have raised considerable concerns. On that account, this study focuses on endophytic bacteria isolated from *Azadirachta indica* (neem), yielding 32 isolates, showing potential growth-promoting attributes. Additionally, 14 isolates displayed notable antagonistic properties against phytopathogens. Molecular identification revealed a diversity of beneficial bacterial species, leading to the selection of potential promising isolates for nanoformulation and subsequent effects on commercially important crop growth and development. These findings shed insight into the potential of endophytic bacteria as sustainable alternatives to conventional fertilizers and pesticides by enhancing plant health and resilience.

Keywords: *Nano-biofertilizers, Plant growth-promoting Promoting Microbiota (PGPM), soil-plant interaction, sustainable agriculture*.

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OP-43

Cytotoxic assessment, molecular docking, and *in silico* ADME studies of 2-(3,4-dihydroxyphenyl-3,5,7-trihydroxy-4h-chromen-4-one) a quercetin (flavonoid) isolated from root of *Rhus mysorensi*

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Abstract: Haemolytic activity assessment is crucial for evaluating drug safety and potential therapeutic applications. This study investigates the haemolytic activity of 2-(3,4-Dihydroxyphenyl)-3,5,7-Trihydroxy-4H-chromen-4-one (quercetin), isolated from Rhus mysorensis root extract, using human red blood cells (RBCs). Quercetin exhibited minimal haemolytic activity across a range of concentrations (0.75 to 100 µg/ml). Additionally, the compound demonstrated concentration-dependent cytotoxic effects against nauplii larvae and breast cancer cell lines (MCF-7 and MAD-MB-231), with the MCF-7 cell line showing greater sensitivity. LD50 values of quercetin against MCF-7 and MAD-MB-231 cell lines were determined, highlighting its cytotoxic potential compared to the standard podophyllotoxin. Moreover, quercetin induced significant activation of caspases 3/7, 8, and 9 in MCF-7 and MAD-MB-231 cell lines at lower concentrations, indicative of its apoptotic mechanism. Molecular docking studies revealed strong binding interactions of quercetin with EGFR, suggesting a potential molecular target for its anticancer activity. ADME predictions underscored favorable pharmacokinetic properties, including high gastrointestinal absorption and compliance with drug-likeness criteria. These findings support quercetin as a promising candidate for further investigation as an anticancer agent.

Keywords: *Haemolytic activity, Rhus mysorensis, anticancer activity.*

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OP-44

Evaluating air pollution tolerance index and carbon sequestration potential of polluted and non-polluted urban terrestrial trees in Pune region

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Abstract: Air pollution significantly impacts urban and peri-urban ecosystems, with pollutants like SO_2, NO_2, and particulate matter disrupting tree physiology, leading to reduced growth, chlorosis, and mortality. Despite their vital role in mitigating climate change through CO_2 sequestration, the capacity of trees as carbon sinks is hampered by pollution, soil degradation, and altered microbial interactions. The present work examines the effects of air pollution on tree health and soil characteristics, with a focus on terrestrial trees such as *Azadirachta indica* and *Ficus religiosa* in polluted and non-polluted regions (from Loni to Hadapsar and the MIT Art, Design and Technology University campus). A thorough analysis was performed to evaluate soil texture, organic matter content, photosynthetic efficiency, CO_2 gas exchange, air pollution index (API), and microbial activity by highlighting the role of carbonic anhydrase enzymes in carbon sequestration.

These findings underscore the adverse impact of air pollution on urban greenery and soil health, emphasizing the urgent need for targeted mitigation strategies to enhance CO_2 capture and storage, fostering sustainable approaches for environmental management.

Keywords: *Air pollution index (API), Carbonic anhydrase, CA enzyme activity, CO_2 sequestration, Soil health.*

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OP-45

Sustainable biocontrol strategies for insect pest management

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Abstract: The upsurge in worldwide population has driven agriculturists towards sustainable agriculture to meet the worldwide food demand. Moreover, economically vital crops are susceptible to various pests/insects that affect yield production. Excessive use of chemical insecticides/pesticides has raised adverse ecological and health issues with the accumulation of toxic residue. Thus, in the current decade, researchers aspire to explore alternative and sustainable approaches to insect pest management and mitigate the detrimental impact of insect pests on crops. Biocontrol agents, predominantly using natural enemies and beneficial organisms, have emerged as a promising strategy. Bio-pesticides like beneficial microbes, like bacteria, fungi, nematodes, plant-derived secondary metabolites, predators, etc., are widely used biological control agents for insect pest management (IPM). These biocontrol agents are less harmful to the environment due to biological origin, are target-specific, and are more effective even at low doses. Consequently, the current review paper delves into various biocontrol approaches, the mechanisms underlying the effectiveness of biocontrol agents, and the integration of modern molecular and genetic for controlling plant pathogens and insect pests under sustainable agriculture.

Keywords*: Biopesticides, Biocontrol Agent, Insect Pest Management, Biotic stress.*

OP-46

Stress analysis of cardiovascular stent using COMSOL multiphysics

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Abstract: Coronary Artery Disease (CAD) is responsible for nearly 9 million deaths every year according to a survey conducted by the World Health Organization (WHO). CAD is the narrowing of the coronary arteries caused by atherosclerosis, which is the accumulation of cholesterol or fatty acids on the inner walls of the arteries leading to physical clogging of blood flow to the heart muscle. The inadequate blood supply can cause chest pain called angina ultimately leading to heart attack. A common medical procedure for artherosclerosis is Precutanous Transluminal Angioplasty (PTA). A small wire mesh tube called a stent is inserted into the obstructed artery by an angioplasty balloon. The expanded stent functions like a scaffold keeping the blood vessel open and enabling blood to flow normally. To avoid various issues like dog boning and foreshortening while positioning the stent within the blocked artery, a deep analysis on the stress deformation experienced by the stent is necessary. Hence, in this work, stress variations experienced by the stent on application of pressure related to the volume of blood flow under non- linear structural mechanics using COMSOL Multiphysics simulation software has been studied. These insights aim to improve stent design for enhanced clinical outcomes and patient safety.

Keywords: *Stent, Coronary Artery, COMSOL, Dog Boning.*

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OP-47

Convolutional neural network-based approach for early detection of breast cancer in mammogram images

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Abstract: Cancer is still one of the largest global health concerns and timely diagnosis is critical to the treatment and prevention of the disease. Breast cancer is still among the major causes of death of women universally, which makes it important to come up with better detection devices. The numerous such effects justify the objective of creating enhanced diagnostic techniques for the disease because of its social and economic implications. Previous breast cancer diagnosis approaches mainly depended on handcrafted feature extraction from medical images, leading to a compromise of precision and reliability. To overcome these limitations, this research introduces an automatic breast cancer classification system using a Five-layer CNN specifically developed for the study. The system supports the characteristic study of Mammogram image using data augmentation strategies to improve the classification outcome. Pre-processing techniques such as image resizing and conversion to grayscale as well as the refined hyperparameters involving adaptive moment estimation were found very useful. The modeled system, tested on a strong database, and reached an accuracy 97% thus proving to be more accurate than the current ResNet-50 architecture in terms of accuracy and time taken for classification. Additionally, the CNN model showed that it requires a shorter time for processing and therefore, the solution could be used for fast diagnosis. Deep learning models enhance breast cancer diagnostics by providing a precise, dependable, and efficient tool for early detection, leading to improved patient outcomes and a decreased disease burden.

***Keywords**: Breast Cancer, Image Preprocessing, CNN, Res Net 50, Medical Image Analysis*

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OP-48

Edge Preserved U-Net For Chromosome Boundary Detection

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Abstract:

The karyotype is an essential tool in genetics and cytogenetics, providing a visual representation of an individual's chromosomes. Boundary identification is important for genetic disease prediction and karyotype generation. This problem is challenging that cannot be handled efficiently without developing new global segmentation algorithms. Precise detection of chromosomal abnormalities and developing high-quality karyotypes are both important for cytogenetics and crucial for advancement in genomic research. We propose an advanced and novel deep learning framework, Edge Preserved U-Net (EPU-Net), composed of a preprocessing block, segmentation-Net starting with a guided filtering integration with Sobel edge detection on the input features. This architecture has a hierarchical layer with convolutional, pooling and upsampling operation linked by skip connections to preserve spatial and contextual information. We introduce a novel Edge Preserving Skip Layer (EPSL) to preserve critical boundary details, and an Edge Preserving Block (EPB) with dilated convolutions for improved feature extraction across multiple scales. The model performance is validated against a custom-built dataset with data augmentation techniques (flipping and rotation) to further improve the generalization capability of model. Experimental results show that EPU-Net delivers better segmentation accuracy as 99.75% and an IoU score of 0.9982. The results show that the approach is robust and significantly outperforms the state-of-the-art segmentation techniques.

Keywords: EPU-Net, Edge Preservation, Genetic Disease Prediction, Karyotype Generation, Deep Learning

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Poster presentations

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PP-01

Molecular dynamics insights into the destabilization of alzheimer's Aβ42 protofibrils by acyclovir, carmustine, curcumin, and tetracycline

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Abstract: Among the various neurodegenerative diseases, Alzheimer's disease (AD) is one of the most prevalent forms of dementia. The hallmark feature of AD is the deposition and aggregation of amyloid-beta (Aβ) peptides within the neural tissue. Several drug molecules have been identified as potential candidates for disrupting and destabilizing the amyloid-beta (Aβ) fibrils. These include the antiviral drug acyclovir, the antineoplastic drug carmustine, the antibacterial agent curcumin, and the antibiotic tetracycline. Although many experimental studies suggest that these drugs can act as effective aggregation inhibitors, the precise mechanisms underlying their ability to inhibit the formation of aggregates remain poorly understood. In this study, a series of molecular dynamics simulations were performed to investigate the molecular mechanisms involved in the destabilization of Aβ protofibrils by acyclovir, carmustine, curcumin, and tetracycline. Our results demonstrate that all four drugs bind to the interior of the hydrophobic grooves of the Aβ protofibrils, leading to destabilization of the β-strand structure within the Aβ protofibrils. These drugs interact with the hydrophobic residues of the Aβ protofibrils, resulting in the disruption of salt bridges between residues D23 and K28, which in turn causes the opening of two β-strands. Our findings suggest that these drugs are effective in reducing Aβ aggregation, with tetracycline emerging as the most effective among them. The underlying molecular interactions of these drugs in inhibiting Aβ aggregation provide important insights that could help guide the design of structure-based drug therapies for AD.

Keywords: *Molecular dynamics simulation, DFT, Molecular docking, MM/PBSA, Amyloid Beta fibrils.*

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PP-02

The national collection of industrial microorganisms (NCIM) at CSIR-NCL, Pune: A Gateway for Bio-based Resource

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Abstract: Microorganisms are the abundant form of life on Earth and can be strategically utilized to achieve sustainable development. Microbes play a major role in detoxification of various toxic compounds, yield useful products for human health, agriculture, environmental, social and economic growth. They also have a potential for developing new antimicrobial agents, bioremediation, probiotics, and increased crop productivity. Microbial Resource Collections (MRCs) are a key component of life science research, biotechnology, and emerging global bio-based economies. *The National Collection of Industrial Microorganism (NCIM), Biochemical Sciences Division at CSIR-NCL, Pune established in 1951 is dedicated to isolation, preservation and distribution of industrially important microbes and has collection of about 5000 microorganisms. NCIM is a member of World Federation for Culture Collections (WFCC/WDCM with Reg.No. 3) and has an online searchable database of strains.* The mission of NCIM is to facilitate safe and responsible utilization of microbial resources for research, industry, medicine, and agriculture for the betterment of human kind. *We provide services for microbial identification based on phenotype (VITEK2 Compact, VITEK-MS) and genotype (Sanger sequencing, Next Generation Sequencing).* Research of NCIM focuses on microbial diversity, ecology and underlying evolutionary mechanisms. *NCIM clients are mainly from Bio-based Industries and start-ups.* NCIM has produced several publications, national and international patents. NCIM catalog is available at www.ncl-india.org/NCIM Overall, NCIM offers interesting avenues for start-ups to tackle challenging problems through simple, innovative solutions using microbial strains available in the repository.

Keywords: *Genotype, Phenotype, Preservation, Antimicrobial, Bioremediation, Probiotic, Agriculture*.

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PP-03

A theranostic approach using magnetic molecular nanoprobes toward the antimicrobial resistance

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Abstract: Antimicrobial resistance, also known as superbugs, are bacterial strains that withstand prolonged exposure to multiple antibiotics, posing a significant threat to global health, as noted by the WHO. Nanoparticles (NPs) are emerging as promising antibacterial agents due to their unique surface area and mechanical, thermal, and optoelectronic properties. Among these, magnetic nanomaterials have garnered attention for their potential in photo remediation, bioimaging, hyperthermia, and drug delivery. However, their applications are limited by toxicity and low bioavailability. To address these challenges, we investigated the synthesis and surface functionalization of magnetic nanoparticles (MNPs) with carboxylic acid at varying pH levels to enhance stability, reduce aggregation, and improve bactericidal activity. Structural and morphological analyses, including XRD, FESEM, DLS, UV-Vis, FTIR, and zeta potential studies, were performed. DLS analysis revealed that functionalized γ-Fe3O4 NPs exhibited reduced aggregation and smaller particle sizes than the Magnetic Molecular probes. The enhanced stability of Magnetic molecular probes was evident from a zeta potential in the range of -25 to -30 mV. compared to unmodified MNPs. FTIR confirmed successful functionalization, while FESEM indicated spherical particles averaging 30 ± 5 nm. The bactericidal activity of these magnetic molecular probes was evaluated against *Acinetobacter baumannii* and *Klebsiella pneumoniae*. Results demonstrated superior antibacterial efficacy of 20 µg/ml and bioavailability of above 50% with a concentration of 250 µM and below compared to conventional MNPs. Additionally, the probes showed the potential to separate bacteria from suspension, offering a dual role in detection and treatment. This approach highlights the promise of functionalized magnetic nanoprobes in combating AMR.

Keywords: *Magnetic Molecular Probes, Stability, Bactericidal, Surface Functionalization, γ-Fe3O4, Acinetobacter baumannii, Klebsiella pneumonia.*

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PP-04

In-silico structure characterization of bifunctional Xylanase and endo-beta-1,3-1,4 glucanase from *Ruminococcus flavefaciens*

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Abstract: Bi-functional xylanase and endo-beta-1,3-1,4-glucanase from *Ruminococcus flavefaciens* plays a vital role in the efficient depolymerization of complex polysaccharides, making it a crucial target for industrial and biotechnological applications. This study emphasizes on the *in-silico* structure characterization of this bifunctional enzyme to explicate its functional domains, catalytic sites, and overall structural stability. Computational techniques, including sequence analysis, comparative modeling, molecular docking, and molecular dynamic simulations, were utilized to examine the enzyme's 3-dimensional conformation and substrate interaction mechanisms. Structural analysis revealed the presence of distinct catalytic domains which are responsible for xylanase and glucanase activities, along with flexible linker regions potentially contributing to their synergistic functionality. Molecular docking studies identified crucial residues involved in substrate binding and catalysis, providing insights into enzyme specificity and efficiency. Additionally, molecular dynamics simulations will be utilized to confirm the structural integrity and adaptability of the enzyme under varying environmental conditions. These findings will offer valuable insights into enzyme's molecular mechanisms, resulting in its optimization for industrial applications such as biofuel production, animal feed improvement, and sustainable agriculture.

Keywords: *Bifunctional enzyme, Ruminococcus flavefaciens, Xylanase, endo-beta-1,3-1,4-glucanase*

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PP-05

Biopolymer-drug nanocomposite as a drug delivery system: An electrochemical approach

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Abstract: The heterogeneity of glioblastoma and presence of brain barriers such as BBB and CSF lead to the failure of current therapeutic regime. The hinderance in drug delivery to the targeted sites becomes the reason for its recurrence, posing a major threat to the life of brain cancer patients. However, the need for optimum sized and effective drug delivery systems (DDS) is still not fulfilled. Various studies have shown the efficacy of Chitosan as nanotherapeutic agents and adjuvant. In this study, Chitosan nanoparticles (CSNPs) and the Temozolomide-loaded CSNPs (TMZ-CSNPs), were synthesized via ionic gelation methods. Chitosan acts as adjuvant decreasing the required drug concentration by effective targeting. In this work, we have amalgamated Cyclic Voltammetry (CV) with Electrochemical Impedance Spectroscopy (EIS) to study time and pH dependent drug release kinetics. The physiochemistry of synthesized TMZ-CSNPs were characterized via UV-*vis* spectrophotometer, DLS, SEM and compared with CV, and EIS. As desired, a significant delay in drug release was observed with TMZ-CSNPs at 10mg/ml concentration at 72 hours, showing better potential as a DDS/ adjuvant for glioblastoma treatment. This study with biopolymer-Drug nanocomposite has thus paved a path for management of brain cancer therapeutics.

Keywords: *Adjuvant, Brain Cancer, Chitosan nanoparticles, Drug Delivery System, Electrochemical Impedance Spectroscopy (EIS), Glioblastoma, Temozolomide*.

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PP-06

Isolation of yeast strains from various biowaste sources and their utilization in bioethanol production.

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Abstract: The present study aimed at isolation, screening and characterization of wild type yeast. Six yeast isolates were isolated from fruit and biorefinery waste on selective yeast glucose chloramphenicol agar medium. These yeast stains were investigated macroscopically and microscopically to identify them for cellular morphology. The glucose tolerance ability of the yeast cells was done to characterize them biochemically. The fermentation ability of screened yeasts was tested to produce bioethanol. Based on a pre-screening experiment, four isolates, namely P1, P2, W1 and B1 showed improved substrate (glucose) consumption efficiency during the fermentation. The selected yeast isolates showed significantly higher bioethanol production for B1 as compared to isolate P2 and W1. There was no significant difference in bioethanol production in the isolated P1, P2 and W1. These findings suggest that isolates B1, P2 and W1 need to be further assessed, refined and required process development for the production and manufacturing of industrial scale bioethanol based on its fermentation potential.

Keywords: *Biowaste, yeast, fermentation, bioethanol, industrial application*

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PP-07

Evaluation of chitosan-gelatin-pectin biopolymer for tissue engineering

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Abstract: In India, the incidences of gastrointestinal diseases like ulcerative colitis, inflammatory bowel disease, Crohn's disease & colon cancer are slowly increasing. At severe level, treatment for these diseases may require intestine transplantation. Chances of organ rejection by patient's immune system is a common limitation of transplantation. Hence, artificial intestine made from biocompatible polymers becomes a better solution than transplantation. Here, we synthesize and characterize different polymer combinations for culturing intestinal tissue. Biopolymers like chitosan, gelatin and pectin were mixed in different ratios and were cross-linked using glutaraldehyde. The resulting mixtures were freeze-thawed repeatedly and dried in a hot air oven. All the mixtures were characterized for their structure using techniques like XRD and FTIR. The absorptive capacities of these biopolymer combinations were studied using a water swelling test. The XRD results of all combinations indicated their amorphous structure. FTIR studies of all combinations showed an imine (-C=N-) peak at 1630 cm-1 and broad -OH peaks at 3295 cm-1 indicating effective crosslinking between different biopolymers. All the biopolymer combinations showed good water absorption and water holding capacity. Of all the combinations, the mixture containing chitosan, gelatin & pectin in the ratio of 1:1:2 showed the highest swelling capacity. Thus overall, we can conclude that combination of chitosan, gelatin and pectin show properties suitable for future steps of artificial intestinal tissue development.

Keywords: *Biopolymer, chitosan, gelatin, pectin, intestine, tissue engineering.*

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PP-08

Development of Bioactive Wound Healing Bandages Using Bromelain

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Abstract: Wound Healing is a complex process that requires efficient biomaterials to promote tissue regeneration and repair. The study explores the development of a composite bandages by using the natural and biocompatible ingredients that includes bromelain, Aloe-vera gel, Chitosan and Gelatin. The primary aim is to design a wound dressing with enhanced wound healing properties. Bromelain, a protease enzyme that is extracted from pineapple, is introduced for its anti-inflammatory and debridement properties, aiding in the complete removal of dead tissue and promotes healing. Aloe-vera gel, that is known for the property of soothing, antimicrobial and moisturized effects is used to promote wound recovery. Chitosan, a natural biodegradable biopolymer has gained significant attention for its application in wound healing, not only for its anti-microbial properties but is also known for its ability to support tissue regeneration and also enhances the mechanical strength of the bandages, while gelatin is known for its biocompatibility and flexibility of material. The bandage is characterized for some properties like anti-microbial, anti-inflammatory and some physical properties like moisture retention, biodegradibility. This composite biomaterial bandage represents a promising alternative to traditional wound dressing, offers healing rates and can reduce infection risks due to its effects from natural materials. ***Keywords:*** *Bromelain, Aloe vera gel, chitosan, gelatin, wound healing, biomaterial, bandage, antimicrobial.*

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PP-09

Microbial valorisation for agrowaste for sustainable development

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Abstract: Agriculture is the primary source of livelihood in India. Every year tones of agricultural waste are generated, a portion of which is used for livestock fodder and energy production. However, farmers frequently burn a significant portion of this waste, especially crop residues, in order to quickly clear fields, which causes serious environmental problems such air pollution and greenhouse gas emissions. This critical problem emphasizes the need for long-term solutions that adhere to the principle of circular economic, like the creating value of agricultural waste. Valorisation promotes both ecological and economic benefits by reducing environmental harm and turning waste into useful products. The present work focused on isolation and identification of microorganisms from diverse agricultural waste such as bacteria, yeast and fungi. The potential of these microorganisms was further evaluated for their biotechnological application such as enzyme production, fuel generation and biopolymer synthesis. This work emphasizes how microbial biotechnology helps to manage waste and promote sustainable development by turning agricultural leftovers into bio-based products. In addition to boosting farm productivity and soil health, the adoption of microbial bioconversion technologies and their field applications may become eco-enterprising for rural farming communities with limited resources. To effectively degrade and transform agricultural residues, additional research is needed to optimise growth conditions of the microorganisms for effective transformation of agrowaste.

Keywords: *Agrowaste, environmental problems, microorganisms, valorisation, biotechnological application*

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PP-10

Assessing the Phytoremediation Potential of Plant *Nephrolepis Cordifolia* towards decolorization of the Industrial Textile Dyes

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Abstract: Textile dyes are well known carcinogenic, mutagenic, cytotoxic and allergic agents posing serious threats to all life forms. Phytoremediation has emerged as a cost-effective, passive, green, and solar dependant approach for environmental cleanup of textile dyes. Plant based treatment of textile dyes is relatively new approach. In this research work, we studied degradation of the different industrial textile dyes (Fast GBC Garnet, Scarlet RC Base, and Red B) by plant *Nephrolepis Cordifolia*. Use of *Nephrolepis Cordifolia* plant has shown significant removal of textile dyes from water. In the initial phase, the degradation rates of three textile dyes—Fast GBC Garnet, Scarlet RC Base, and Red B—were assessed over time, revealing a time-dependent increase in degradation efficiency. After 168 h, *Nephrolepis Cordifolia* showed 85.58, 47.72 and 71.66 % decolorization of Fast GBC Garnet, Scarlet RC Base, and Red B, respectively. Higher plant number correlated with accelerated dye removal, demonstrating the significance of plant density in the phytoremediation process. Further, we isolated the bacteria from rhizosphere of the *Nephrolepis Cordifolia* plant. The addition of this bacterial cultures significantly enhanced dye degradation, with synergistic interactions between plants and bacteria facilitating faster breakdown of contaminants. Furthermore, we analysed degradation of GBC Garnet by FT-IR and GC-MS analysis. Finally, we developed hydroponic phytoreactor system for removal of textile dyes from textile wastewater. Therefore, this study highlights the potential of integrating phytoremediation for sustainable dye wastewater treatment.

Keywords: *Phytoremediation, Textile wastewater, Plant-microbial interactions, Dyes, Ferns*

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PP-11

Isolation, purification and characterization of endophytic bacterial amylase

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Abstract: Production of the amylase enzyme holds significance in various industrial and biological processes. Understanding and optimizing enzymes characters/parameters help to optimize its use for industrial application. Amylase is also known as 'glycosidic hydrolase'. It catalyzes the hydrolysis of starch into sugars such as maltose and dextrin, as well as smaller polymers made up of glucose units. Amylases account for about 30% of the world's enzyme production. Different class of bacteria are known to produce amylases. However, in recent years special attention is given to endophytic amylases due to its unique characters. In this study, we tried to isolate endophytic bacteria from *Catharanthus roseus* and screened for amylase production. Further, for the extraction of the enzyme, the culture was inoculated in starch broth and was centrifuged at 7,000 rpm for 5 mins. The supernatant was collected and for the quantitative analysis of the enzyme, DNSA method was performed. The amylase producing bacterial strain was further evaluated for physiological parameters like NaCl tolerance and pH optimization. The isolated bacteria were also found have high salt tolerance and pH tolerance. The bacterial sample will be outsourced for whole genome sequencing. Further Purification methods and Protein Assays will be performed for the determination and characterization of the enzyme.

Keywords: *Amylase, Enzyme, Production of Enzyme, Qualitative and Quantitative analysis, Endophytic Bacteria, Purification, Characterization*.

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PP-12

Can indomethacin be used against the Mpox virus?

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Abstract: The Mpox virus, previous known as monkeypox virus (MPXV), a member of the family orthopoxviridae, has emerged as a significant zoonotic pathogen due to its rising prevalence, ability to evade the host immune system, and lack of effective antiviral treatments. Since 2022, it has spread over 120 countries affecting more than 100,000 people. This study investigates the potential of indomethacin, a nonsteroidal anti-inflammatory drug (NSAID) with documented antiviral properties, as a therapeutic candidate against Mpox. At first, we screened all the proteins of Mpox and listed all the crucial proteins of Mpox with experimentally determined available structures. For example, the structure of DNA replication machinery of Mpox, which are implicated in viral replication and immune evasion, was recently solved by using cryo-electron microscopy. DNA replication apparatus of Mpox is formed by three crucial proteins F8, A22, and E4. In a preliminary study, molecular docking analyses of indomethacin to two different structures of DNA replication apparatus of Mpox. revealed favourable binding energies of -8.1 kcal/mol and -7.8 kcal/mol. Visualization of the docking poses highlighted multiple stabilizing interactions, including hydrogen bonds and hydrophobic contacts, within the active sites of the target complex. These preliminary findings suggest that further tests are required to test the repurposing potential of indomethacin as an antiviral agent against Mpox. The binding affinities of indomethacin against other crucial proteins/protein complexes of Mpox are being currently screened. The energetically favourable binding poses of indomethacin-docked protein structures will further be analysed by molecular dynamics simulations, which will subsequently be characterized by the estimation of free energies using MM-GBSA/MM-PBSA. The study emphasizes the importance of computational screening of potential drugs in identifying promising therapeutic candidates, paving the way for further experimental validation against emerging infectious diseases.

Keywords: *Mpox virus, Indomethacin, Molecular docking, Antiviral therapeutics, Immune evasion, DNA replication machinery*

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PP-13

Isolation of antibiotic resistant bacteria from Bichitrapur mangrove forest and identification of factors conferring antimicrobial resistance

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Abstract: Bacteria produce bioactive chemicals, which contribute to the discovery of new drugs in medical therapies. The present work encompasses isolation of antibiotic resistant microbes from mangrove forest which has less anthropogenic activity. Culture based method was adapted to isolate strain FMU-55 which was identified to be *Stappia indica* using 16s rRNA sequencing. The isolate was Gram-negative, oxidase- and catalase-positive, rod-shaped, and motile with a single polar flagella. The strain was capable of using both arginine and xylose. The strain was resistant to Tetracycline and Chloramphenicol. *In silico* approach using CARD-RGI led to the identification of *adeF* gene that belongs to the RND (Resistance-nodulation-cell-division) antibiotic efflux pump family and offers resistance to fluoroquinolone and tetracycline classes by effluxing the medicines and antibiotics. Simultaneous metabolomics studies using GCMS led to identification of various antimicrobial metabolites, like N,N-Diethylaniline, Oxime-methoxy-phenyl-, Cycloheptasiloxane, Tetradecamethyl, Phenol, Ethanone, 1,1'-(2,6-dimethyl-3,5-pyridinethiol), and Tert-Butyldimethylsilyl trifluoromethanesulfonate. The current study sought to evaluate the novel strains resistance mechanism towards various antibiotics. The antimicrobial resistant microbes possess resistance genes as well as synthesize various secondary metabolites which protect them from extreme environmental conditions. Isolating microbial strains from extreme environments like mangrove forest increases the possibility of isolating antimicrobial compounds that have not been previously isolated and secondly, because the pathogens are not exposed to these bacterial compounds, it is unlikely that they will develop antibiotic resistance to them.

Keywords: *Mangrove forest, AMR, CARD-RGI, RND, adeF gene.*

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PP-14

Evaluation of transient hypoxia preconditioning on 3D cultures of goat adipose-derived mesenchymal stem cells for enhanced chronic wound healing applications

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Abstract: Adipose-derived mesenchymal stem cells (ADSCs) have emerged as promising candidates in regenerative medicine due to their multipotency, immunomodulatory properties, and minimally invasive harvesting. Transient hypoxia preconditioning (2% oxygen) for 48–72 hours or culturing them into 3D spheroids has enhanced ADSCs' viability and therapeutic efficacy. However, the formation of necrotic cores in larger spheroids necessitates size optimization. To address this, a live/dead cell assay using calcein and ethidium homodimer, combined with high-content screening, was conducted on varying-sized spheroids. The optimal size was determined based on the highest ratio of live cells per cross-sectional area. Gene expression analysis revealed reduced senescence (P21) and apoptosis (P53) in spheroids cultured under transient hypoxia compared to normoxic conditions. Furthermore, transient hypoxia-preconditioned 3D spheroids showed significantly upregulated expression of essential secretory and immunomodulatory genes, including *MMP1*, *CXCR4*, *CCL2*, *VEGFR*, and *TGFB1*, highlighting their enhanced therapeutic potential for wound healing applications. The role of GADD45B is being investigated to improve ADSC efficacy further. This gene, critical for DNA damage repair, cell growth regulation, and apoptosis, exhibits differential expression under varying oxygen conditions and cell-specific patterns. Ongoing studies are evaluating the impact of oxygen conditions and 2D/3D constructs on *GADD45B* expression in ADSCs, aiming to optimize their application in chronic wound healing and tissue regeneration.

Keywords: *Adipose-derived mesenchymal stem cells (ADSCs), transient hypoxia preconditioning, 3D spheroid culture, chronic wound healing, gene expression, GADD45B, immunomodulation, regenerative medicine.*

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PP-15

Biodegradable Nanoparticles-Based Therapeutic Strategy for Targeting Aggregation in Neurodegenerative Diseases.

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Abstract: Neurodegenerative diseases are characterized by the gradual loss of neuron structure and function, often resulting in severe disability and mortality. ALS, the most common motor neuron disease, is marked by progressive muscle weakness and wasting, typically culminating in death within a few years. This project seeks to harness the potential of nanoparticles to develop a targeted, multifaceted therapeutic approach for ALS. Nanoparticles offer a promising platform for delivering treatments across the blood-brain barrier (BBB), which has been a significant obstacle for conventional therapies. By preventing or disrupting TDP-43 aggregation, this project aims to address the root cause of ALS, providing a pathway for novel and effective treatments for neurodegenerative disorders. These surface modifications using cationic phospholipids bind to the amyloid proteins and inhibit the formation of amyloid fibrils. Additionally, different therapeutic agents like beta sheet breaker peptides can be encapsulated to study the inhibition process. By crossing the BBB and delivering encapsulated therapeutic agents directly to affected brain regions, this approach could represent a breakthrough in ALS treatment, moving beyond symptom management to directly address disease mechanisms.

Keywords: *Alzheimer's disease Neurodegeneration, TDP-43 protein, Cationic nanoparticles, Blood brain barrier, cell culture system*

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PP-16

Design and development of a microfluidic reactor for the synthesis of fluorescent nanocrystals and their use in diagnostics

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Abstract: Microfluidics offers a platform for the controlled synthesis of nanomaterials, enabling precise manipulation of reaction conditions at the microscale. Leveraging this property, it can be widely used for the synthesis of carbon dots. They are semiconductor nanoparticles with unique optical and electronic properties, making them highly valuable for diagnostics and biomedical applications. However, their synthesis often suffers from batch-to-batch variability, lack of scalability, and challenges in achieving uniform size and quality. To address these limitations, we designed and developed a microfluidic reactor for the controlled synthesis of quantum dots. A computational flow dynamic software called COMSOL was used to simulate the reaction to optimize the geometric, physical, and chemical parameters. The simulatory microfluidic channel was precisely constructed in 2D using COMSOL and in 3D using Autodesk Fusion 360. The models were then used to simulate the reaction to determine where the mixing is optimum and what parameters provide the required yield with maximum efficiency. Based on the simulation data, a microfluidic chip was fabricated using a polymer by soft lithography technique.

Keywords: *Microfluidics, Fluorescent nanocrystals, COMSOL, Soft Lithography*

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PP-17

An advanced blood-brain barrier-on-chip with trans-endothelial electrical impedance measurement electrodes and dynamic microfluidic system

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Abstract: The blood-brain barrier (BBB) is a selective semipermeable membrane that separates the circulating blood from the interstitial fluid of brain and central nervous system[1]. In vitro models of BBB are studied most in the form of 2D cell culture[2] and 3D transwells[4], but they lack the physiological complexity and the dynamic microenvironment of the in vivo conditions. Microfluidic chips[5] have been employed to bridge this gap by developing BBB on-chip (BBB-OC) platforms that mimic both physiological cues and complexity in a controllable system. Current BBB-OC models include only astrocytic[6], pericytic[7], or their combination with neurons, in co-culture with endothelial cells. However, these BBB-OCs lack the neuronal vasculature unit (NVU) that includes all the above cell types along with microglia. Recent studies[8] highlight that iPSC-derived cell types don't fully recapitulate the mature phenotype of tissue-derived cells. Additionally, existing BBB-OCs employ trans-endothelial electrical resistance measurement which provides quantitative measure of paracellular resistance[9] and correlates only with tightness of cellular junctions. Here, an advanced BBB-OC is reported, developed by co-culturing endothelial cells with the NVU isolated from tissues to achieve more physiological relevance[10]. Furthermore, this model employs trans-endothelial electrical impedance (TEEI) measurement[11] that can detect both paracellular resistance at lower frequencies and transcellular capacitance at higher frequencies. This novel BBB-OC can be employed in investigating and screening drugs for disorders of the NVU.

Keywords: *BBB integrity, Microfluidics, NVU, dynamic, real-time, TEEI*

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PP-18

Enhancing Medical Diagnostics with XAI and Deep Learning for Generalized Disease Classification

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Abstract: A robust and interpretable medical diagnostic imaging technique is essential for detecting and diagnosing a wide range of diseases. Although deep learning approaches, such as CNN architectures, have significantly improved medical diagnostics, understanding how these models arrive at decisions remains challenging. CNNs often function as a 'black box.' To address this limitation and improve interpretability, we propose an innovative diagnostic approach that combines deep learning with explainable AI. This novel technique will use the strengths of Convolutional Neural Networks (CNNs) for classification alongside explainable AI for visual interpretation. The study hypothesizes that integrating two CNNs architectures within a deep learning framework will enhance accuracy and robustness in disease classification. The model will be applied to classify various medical conditions, including pneumonia, tuberculosis, COVID-19, and breast cancer, using available medical image datasets. To evaluate the performance and effectiveness of the proposed work several performance metrics will be employed such as accuracy, F1-Score, Area Under the curve (AUC-ROC). By combining CNN models with explanation AI the proposed approach aims to improve not only the performance of the model but also provide transparency in the disease classification process. This integration makes the model adaptable for a wide array of medical diagnostic applications, fostering both precision and trust in its predictions.

Keywords: *Convolutional Neural Networks (CNNs), explainable AI (XAI), deep learning framework.*

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PP-19

Ontology-Based AI Framework for Designing Cancer Therapeutics by Employing High-Performance Computing and Big Data

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Abstract: Cancer remains one of the most prevalent and deadly afflictions across the globe, often with only a few options for treatment. We propose an artificial intelligence (AI) framework to aid in designing novel therapeutics for treating cancer. We systematically fuse a cancer domain ontology that comprises biological pathways, genetic alterations, and protein-protein interactions with machine learning and high-performance computing to screen for and refine appropriate drugs. The new drug candidate's thermal stability, chain conformations and actual targets were rationally prioritized via AI-based supervised, deep-learning algorithm using large-scale insert genomic, proteomic, transcriptomic, and molecular structural data analysis. The ontology-guided virtual screening, molecular docking, and dynamics simulations revealed the most important interactions between lead compounds and cancer-specific targets. The ontology-based framework provides detailed insights into pharmacokinetic and pharmacodynamic predictions. The framework also enables spatially systematic chemical exploration tailored to the complex structures of cancer molecules, thereby enhancing its effectiveness. This work emphasizes the possibilities of employing AI and ontology approaches to enhance precision oncology targeting cancer.

Keywords: *Cancer, AI, Ontology, Drug Design, HPC, Big Data, Precision Oncology*

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PP-20

Do antibiotic resistant bacteria in wastewater correlate with clinical types? A case study of *Escherichia Coli* in pune, india

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Abstract: Antimicrobial resistance (AMR) is a pressing global health concern, with antibiotic-resistant bacteria (ARB) complicating infection control. *Escherichia coli*, a common uropathogen, is increasingly resistant to carbapenems, posing treatment challenges. Wastewater acts as a reservoir and transmission route for ARB, offering insights into community-level AMR. This study aimed to isolate and characterize antibiotic-resistant E. coli from sewage treatment plants in Pune, India, to evaluate resistance patterns and public health risks. Eighty-eight wastewater samples were collected from 11 treatment plants in Pune between October 2023 and May 2024. Selective media and disc diffusion methods were used to isolate *E. coli*. Identification and antimicrobial susceptibility testing (AST) were performed using the Vitek2Compact system, while whole genome sequencing (WGS) and real-time PCR detected resistance genes, including carbapenemase and extended-spectrum beta-lactamase (ESBL) genes. The study identified a high prevalence of carbapenem-resistant *E. coli* in wastewater which are correlated with previously published clinical isolates. Key resistance genes included blaNDM-5, blaOXA-like, and ESBL genes such as CTX-M and SHV. The most frequent sequence type was ST361, comprising 32.25% of isolates, which exhibited multiple resistance and virulence genes. Genomic analysis strongly aligned with phenotypic AST results, highlighting multidrug-resistant profiles similar to clinical isolates. The findings underscore the role of wastewater as a reservoir for clinically significant AMR bacteria and emphasize the importance of urban wastewater monitoring. Such surveillance bridges environmental and clinical AMR tracking, guiding public health interventions and infection control strategies. Continuous monitoring is essential for understanding resistance trends and developing effective management approaches. ***Keywords:*** *Carbapenem-resistant Escherichia coli, Percentage antibiotic resistance, Multiple antibiotic resistance index, Antibiotic resistance genes, Wastewater, Sequence type, Virulence genes*

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PP-21

Integration of biological networks with machine learning for drug repurposing by targeting DNA damage repair pathways in pan-cancer

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Abstract: Drug repurposing offers a cost-effective and time-efficient strategy for identifying new therapeutic uses for existing drugs, particularly for cancer treatment. DNA damage repair (DDR) defects contribute to genomic instability in pan-cancer, making DDR pathways a key target for therapeutic intervention. This study combines multi-layer network and drug similarity-based approach to identify potential drugs for repurposing in pan-cancer by targeting DDR genes. We screened 192 genes and approved drugs across seven DDR pathways using KEGG and DGI, identifying 81 genes with established gene-disease or drug-disease association. Using the gene-drug network (DGI), we identified the top 30 hub genes using the MCC method from cytoHubba where 12 (40%) were from Fanconi anemia, 10 (33.33%) from Base-excision repair and others across five pathways; nine (30%) genes belonged to multiple pathways. Filtering on ATC anatomical level, molecular weight, and excluding protein-based compounds, we selected a set of 123 drugs linked to these genes. These were screened against a dataset of 3,083 similarly filtered drugs using therapeutic, chemical and ADMET properties and linearly integrated various similarity metrics like Tanimoto coefficient, to identify potential drug candidates. To enhance the prediction accuracy, we integrated the biological layers into a complex network of drug-gene, drug-disease, gene-disease, drug-drug, PPI with gene ontology, genomic features and expression data from TCGA. Finally, machine-learning algorithms were used on the resulting heterogeneous network to predict drug-target associations. This work aims to uncover potential drug candidates for DDR defects and refine a pathway-focused computational approach for drug repurposing in cancer treatment.

Keywords: *Drug repurposing, DNA Damage Repair, Biological network analysis, Drug similarity, Machine Learning, and Pan-cancer.*

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PP-22

Computational Analysis of Bacteriocins against Anti-Microbial Resistance Proteins

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Abstract: MRSA, or Methicillin-Resistant Staphylococcus aureus, is a strain of bacteria that has developed resistance to many antibiotics and is a significant cause of difficult-to-treat infections in humans. The resistance of gram-negative bacteria to antimicrobials stands as a significant global health concern. Consequently, diverse strategies have been recently investigated for their treatment, among which the research on bacteriocins is noteworthy. Bacteriocins, a class of peptides synthesized by bacteria, exhibit efficacy in managing clinically relevant susceptible and drug-resistant bacteria. The present study aims to carry out in-silico analysis between bacteriocins and Anti-Microbial Resistance (AMR) proteins. Molecular docking and molecular dynamics outcomes further revealed a stable interaction between certain bacteriocins with AMR protein. This underscores the promising potential of bacteriocins as an alternative avenue in antimicrobial studies for therapeutic interventions.

Keywords*: Methicillin-Resistant Staphylococcus aureus, Molecular Modeling, AMR protein, Bacteriocin*

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PP-23

Evaluation of therapeutic efficacy of antibacterial enzymatic nanobots embedded in degradable capsule against gastrointestinal infection model in rats

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Abstract: The rising resistance of bacteria to existing antibiotics presents a significant global public health challenge. Many current antibiotic treatments face obstacles due to ineffective delivery to infection sites, which results in unwanted side effects and the development and spread of drug resistance. Over the past twenty years, microscale robots have rapidly advanced, showcasing new capabilities like enhanced power, cargo-towing strength, multifunctionality, easy surface modification, and versatility. These developments hold significant promise for biomedical applications, potentially revolutionizing disease diagnosis, treatment, and prevention. Enzyme-powered nanoparticles, or nanobots, have emerged as a promising method for nanoscale tasks, such as targeted drug delivery and precision medicine. Here, we describe micro- and nanomotors that effectively and autonomously deliver antibiotic payloads to the target area. Specifically, our study explores the use of self-propelling nanobots for targeted delivery in a gastrointestinal infection model, marking one of the first in-vivo applications of enzyme-powered nanobots against an AMR opportunistic enteric pathogen ETEC (*E. coli*) specific to the GI tract. We employed a simple yet effective degradable encapsulated release profile to enhance therapeutic efficacy and minimize offsite localization. Our research focuses on fabricating, characterizing, and evaluating the nanobots' efficacy and toxicity of synthesized nanoparticles in vivo, highlighting the role of the encapsulated release profile as an efficient targeted cargo or payload delivery system.

Keywords: *enzymatic-nanobots, encapsulated release, gastrointestinal infection, in-vitro and in-vivo study.*

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PP-24

Assessment of Metal-Based Nanoparticles for Antiglycation Activity in Type 2 Diabetes Management

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Abstract: Non-enzymatic glycosylation, or glycation, plays a pivotal role in the pathogenesis of various diseases, including diabetes mellitus, cardiovascular disorders, and neurodegenerative conditions. Advanced glycation end products (AGEs) resulting from glycation contribute to tissue damage and organ dysfunction. Nanoparticles possess remarkable properties, including optical, thermal, and electrical conductivity, along with notable biological characteristics, making them highly adaptable for various applications. However, its effect on protein glycation under controlled laboratory conditions remains underexplored. This research paper aims to investigate the influence of metal nanoparticles (NPs) on non-enzymatic glycosylation of proteins in an in-vitro model. Through a combination of biochemical assays and spectroscopic techniques, we will elucidate the mechanisms underlying the inhibitory effects of TiO_2, ZnO, Al_2O_3 metal nanoparticles on protein glycation and propose it as promising therapeutic agents for reducing the adverse effects of glycation.

Keywords: *Metal Nanoparticles, Non-enzymatic glycosylation, Protein glycation, Advanced Glycation End products*

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PP-25

RheuGel: Injectable hydrogel loaded with bioactive nanoparticles for immunomodulation in Rheumatoid Arthritis

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Abstract: Rheumatoid arthritis (RA) is a chronic autoimmune disease caused by inflammation of synovial joints, leading to pain and articular destruction. Conventional treatments for RA often involve immunosuppressive drugs with various side effects. Immunomodulation therapy aims to regulate the immune response without complete suppression, offering a promising alternative for managing RA. A natural polyphenol compound exhibits anti-inflammatory and immunomodulatory properties, making it a potential candidate for RA treatment. However, its limited bioavailability and rapid clearance hinder its therapeutic efficacy. This study proposes a novel approach for RA treatment using bioactive nanoparticles encapsulated within an injectable hydrogel for targeted and sustained delivery to inflamed joints. These nanoparticles enhance the compound's bioavailability and stability, while the hydrogel provides a controlled release system, ensuring prolonged therapeutic effects. These nanoparticles demonstrated a uniform size distribution of approximately 17.94 ± 2.7nm. The in vitro studies investigating their immunomodulatory effects showed a significant reduction in pro-inflammatory cytokines and modulation of dendritic cells towards the tolerogenic phenotype.

Furthermore, the injectable hydrogel showed suitable rheological properties, allowing easy administration into the joint space, and exhibited sustained release of bioactive nanoparticles over an extended period. These hydrogels were cytocompatible as well. Therefore, an injectable delivery system improved efficacy and circumvented repetitive dosing over conventional oral administration. Overall, this innovative approach presents a promising strategy for immunomodulation in RA therapy by localized and sustained delivery of bioactive nanoparticles. Altogether, the injectable hydrogel was thought suitable for development as a therapeutically effective drug carrier for treating RA. ***Keywords:*** *Biomaterial, Injectable Hydrogel, Immunoenginnering, Nanoparticles, Rheumatoid arthritis*

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PP-26

Explainable Deep Learning for Identifying Clinically Relevant Driver Genes from Whole Exome Sequencing Data

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Abstract: Driver genes are critical in cancer development, directly influencing tumor initiation and progression. While Next-Generation Sequencing (NGS) provides comprehensive mutation profiles, identifying key driver genes is essential for targeted therapies. Artificial Neural Networks (ANNs) offer a powerful approach, but their "black-box" nature hinders clinical adoption. This study employed an ANN to classify driver genes based on mutational profiles and genomic attributes from an NGS pipeline. To address interpretability, Explainable Artificial Intelligence (XAI) techniques SHapley Additive exPlanations (SHAP) and Local Interpretable Model-agnostic Explanations (LIME) were integrated to reveal the contribution of individual genomic features to predictions. Visualization methods, including t-distributed Stochastic Neighbor Embedding (t-SNE) and heatmaps, facilitated investigation of relationships between genetic mutations and clinical phenotypes. The model was trained on 1000 mutations (DriverDBv3/IntOGen), tested on 708 mutations (NGS analysis of 47 ovarian cancers), and validated on 50 mutations (Cancer Genome Interpreter). This diverse dataset strengthened model robustness by mitigating overfitting, ensuring unbiased evaluation, and enhancing generalizability. This combined approach enhances driver gene classification and yields practical insights into key predictive features. Our findings underscore the potential of integrating deep learning and XAI with NGS workflows to advance precision oncology and genomic research. ***Keywords:*** *High-grade serous ovarian cancer (HGSC), Explainable Artificial Intelligence (XAI), Whole Exome Sequencing (WES), Genomic data, Mutation ranking, SHAP (SHapley Additive exPlanations), LIME (Local Interpretable Model-agnostic Explanations)*

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PP-27

A subset of HOX genes negatively correlates with HOX/PBX inhibitor target gene expression and is associated with apoptosis, DNA repair and metabolism in prostate cancer

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Abstract: The HOX genes encode a family of homeodomain-containing transcription factors that have important roles in defining cell and tissue identity in embryonic development, but which also show deregulated expression in many cancers and have been shown to have pro-oncogenic roles. Due to their functionally redundant nature, strategies to target HOX protein function in cancer have focused on their interaction with their PBX cofactor using competitive peptides such as HXR9. HOX/PBX inhibition triggers apoptosis through the sudden increase of target genes including Fos, DUSP1, and ATF3, which are otherwise repressed by HOX/PBX binding. Here, we show that a specific subgroup of HOX genes is negatively correlated with Fos, DUSP1 and ATF3 expression in prostate cancer, and that this subgroup also shows a strong positive corelation with pathways that support tumour growth, most notably DNA repair and aminoacyl tRNA biosynthesis, and a negative correlation with genes that promote cell adhesion and prevent motility. In addition, this set of HOX genes strongly correlates with patient age, reflecting a previously identified progressive loss of regulation of HOX expression in normal peripheral blood cells.

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PP-28

Design and Validation of a Primer Panel for Simultaneous Detection of *Babesia and Theileria* Parasites in Dairy Cattle Using PCR assays

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Abstract: *Theileria* and *Babesia* are prevalent parasites in dairy cattle, causing significant economic losses due to reduced milk production, increased mortality. These parasites are transmitted by ticks and are common in tropical and subtropical regions. Pathogen surveillance and genotyping are essential tools for addressing bovine health, enabling early detection of infectious agents. This study focuses on the development of a sensitive and specific primer panel using a comparative genomics approach based on orthologous gene analysis for the simultaneous detection of *Babesia bovis*, *Theileria annulata*, and *Theileria orientalis* by multiplex and simplex PCR assay. The primer panel also includes three 18S rRNA primer sets: one specific for *Babesia* species, one for *Theileria* species, and a universal set for detecting both pathogens. Blood samples were collected from dairy cattle, followed by DNA extraction, quality assessment, and PCR amplification using the targeted primers. Gel electrophoresis was used as the confirmation tool, followed by amplicon sequencing by Oxford Nanopore Technologies (ONT). The sequencing results were analyzed using Minimap2 for alignment, and a consensus sequence was generated to further validate the PCR products. a phylogenetic tree was developed to further support the differentiation and evolutionary relationships among the target species. The sensitivity of the primers was evaluated using serial dilutions of purified PCR products. Our findings reveal mixed infections of *Babesia* and *Theileria* species in some of the blood samples. These results highlight the presence of mixed infections and suggest the reliability of the designed primers in detecting and differentiating these parasitic species. Through this work, we lay the foundation for a diagnostic tool that could be applied in field conditions, providing crucial insights into parasitic infections in livestock.

Keywords: *Livestock, Theileria, Babesia, Diagnosis, ONT.*

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PP-29

Epitope prediction and protein recognition for vaccine design against Mpox Virus

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Abstract: Mpox virus, a re-emerging zoonotic orthopoxvirus, poses a growing threat to global public health. While existing vaccines derived from smallpox immunization offer partial cross-protection, they lack Mpox-specific efficacy, underscoring the need for a tailored vaccine solution. This study proposes an immunoinformatics-driven approach to design and evaluate immunodominant epitopes from the major envelope proteins of Mpox virus. The research focuses on predicting linear B-cell and T-cell epitopes, assessing their antigenicity, allergenicity, and toxicity, and validating their binding interactions with key immune receptors like Toll-like receptor 2 (TLR2). Selected epitopes will be integrated into a multi-epitope vaccine construct using immunostimulatory linkers and adjuvants. A protein engineering scheme will be employed to design multiple constructs of potential vaccines. The structures of these proposed candidate vaccines will be modeled using the AlphaFold and other structure-prediction softwares. Further molecular docking studies will be conducted to perform protein recognition between the candidate vaccines and crucial immunological proteins, such as TLR2. Molecular dynamics (MD) simulations will be performed to the docked structures to assess their structural stability. Further MM-PBSA/MM-GBSA will be conducted to estimate the free energy of binding from the MD trajectories. Immune simulations will be executed to predict the vaccine's efficacy in eliciting robust humoral and cellular immune responses, including antibody production, cytokine release, and memory cell activation. The outcomes of this study could pave the way for further experimental validation and preclinical trials, ultimately contributing to an effective Mpox-specific vaccine. By combining advanced computational techniques with protein recognition and immune simulation, this study offers a comprehensive framework for rational vaccine design against emerging viral threats.

Keywords: *Mpox, Reverse vaccinology, Envelope Proteins, Molecular dynamics simulations, immune simulations.*

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PP-30

Study and significance of mucin degrading bacterial species from human gastrointestinal region

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Abstract: The human gastrointestinal tract comprises a plethora of microbial population and less than 1% of fecal microbiome plays a key role in the degradation of mucous glycoprotein. More than 100 such bacterial species have been identified so far and research in the bacterial species facilitating mucin-degradation is still in its early stages. Therefore, efforts were made to isolate and identify mucin degrading bacterial strains from fecal samples of adult healthy persons, and their enzymatic profile was assessed. Fifteen mucolytic species viz. *Enterococcus* (4), *Priestia* (3), *Shigella* (4), and *Escherichia* (4) were isolated, and their identity was confirmed using metagenomic techniques. The amido black protocol manifested qualitative mucin degradation. The decrease in carbohydrate concentration in the spent medium was in the range of 39-84.7%, protein content ranges between 0-41.7% further validated the ability of strains to breakdown mucin. Moreover, the intracellular and extracellular glycosidase activity e.g. sialidase, α- galactosidase, β-galactosidase, α- glucosidase and β-glucosidase was measured that supported the notion of conversion of mucin oligosaccharide chains into monosaccharides residue. In view of the findings above, it may be concluded that our mucin degrading isolates are fundamental players in mucin breakdown and act collectively to ferment mucin. more detailed investigations are needed to unearth the molecular mechanisms behind the degradation of mucin structure in the gut tract, deepening our insight into health and disease.

Keywords: *Mucin, Mucin degradation, Gastrointestinal region, glycosidase, metagenomic.*

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PP-31

Virtual screening and molecular simulation of FDA-approved drugs targeting the human SLC4A4 protein for colorectal cancer therapy.

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Abstract: The downregulation of SLC4A4 expression in colorectal cancer plays a crucial role in the advancement of tumors and unfavorable prognosis. It impacts multiple cellular processes such as cell growth, programmed cell death, and the spread of cancer cells, mainly by disturbing the balance of pH levels. Considering its association with tumor progression and patient outcomes, the levels of SLC4A4 expression have the potential to be utilized as a prognostic indicator in colorectal cancer.The latest research aimed to investigate the potential repurposing of FDA-approved drugs as inhibitors targeting the SLC4A4 protein for cancer therapy. The CryoEM structure of SLC4A4 was obtained from PDB, remodeled using swiss model, and then subjected to virtual screening through DrugRep web server with an FDA-approved drugs library as the ligands database. Our research findings indicate that Nilotinib has been identified as the most effective inhibitor of SLC4A4, following redocking with CB-DOCK2 among the top 3 molecules from Drugrep result. The docking score for Nilotinib was calculated to be −11.2 kcal/mol. Additionally, a 50 ns MD simulation demonstrated that Nilotinib successfully formed stable complexes with the drug targets of SLC4A4. In summary, Nilotinib shows promise as a potential treatment option for colorectal cancer and warrants further investigation.

Keywords: *Colorectal cancer, docking, molecular modelling, gene expression, nilotinib, SLC4A4*

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PP-32

Structural Analysis For New Drug Targets In Homologous Proteins Of Src Subfamilies For Cancer Treatment

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Abstract: SRC family kinases (SFKs) are a family of non-receptor tyrosine kinases critical to regulating diverse cellular processes, including cell growth, survival, adhesion, migration, and differentiation. Dysregulation of SRC kinases is frequently linked to various diseases, particularly cancers, where mutations such as the Y530F mutation result in constitutive activation, bypassing normal regulatory mechanisms and driving uncontrolled cell proliferation—a hallmark of oncogenesis. This project focuses on the structural analysis of SRC subfamily B proteins to identify potential drug targets for cancer therapy development, emphasizing conserved sites within the SH2, SH3, and kinase domains that may represent novel drug-binding regions. This research provides significant insights into the structural characteristics and functional mechanisms of SRC kinases, identifying druggable regions that could serve as targets to modulate SRC activity. These findings contribute to ongoing cancer drug discovery efforts, laying a foundation for developing targeted therapies aimed at inhibiting SRC kinase activity to control cancer progression. The results may pave the way for new therapeutic strategies to treat cancers driven by SRC kinase dysregulation.

Keywords*: SRC family kinase, Kinase domain, Structural analysis, Protein-Ligand Interaction, Identification of allosteric regions, Cancer, Drug Discovery.*

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PP-33

Computational Analysis of Natural Compounds as Potential Therapeutics for Alzheimer's Disease

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Abstract: Alzheimer's Disease stands as one of the most prevalent neurodegenerative conditions, particularly afflicting the elderly, and exhibits a progressive degenerative course. Its pathogenesis includes Beta-amyloid plaque deposition, Tau protein- related neurofibrillary tangles, neuroinflammation, oxidative stress, and impaired mitochondrial function, culminating in cerebral atrophy. Unfortunately, a definitive cure remains elusive, and conventional pharmaceutical interventions, while mitigating symptoms, often introduce adverse reactions. Our investigation adopted computational methodologies to explore natural compounds sourced from plants as potential alternatives to conventional drugs. The molecular docking, molecular dynamics, network analysis and ADMET studies showed that the top compounds have significant therapeutic potential for AD. Since the selected compounds demonstrated drug-likeness and favourable pharmacokinetic properties, further in vivo and in vitro investigations should be performed to ascertain this potential.

Keywords: *Neurodegenerative diseases, Molecular Docking and Dynamics, Antioxidants, Natural Compounds, Dementia, Network Analysis*

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PP-34

Chemoinformatics Analysis of compounds extracted from *Nyctanthes arbor-tristis* against Dysmenorrhea

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Abstract: Dysmenorrhea, or painful periods, is pain during menstruation that typically lasts less than three days and is felt in the pelvis or lower abdomen. Other symptoms may include back pain, diarrhea, or nausea. Affecting 50% to 95% of female adolescents and women of reproductive age, dysmenorrhea is a leading cause of school absences and productivity loss. It is caused by increased prostaglandin levels that enhance myometrial contractions and constrict endometrial blood vessels, leading to tissue ischemia, bleeding, and pain. Effective treatments include NSAIDs such as mefenamic acid, ibuprofen, etc which have shown to inhibit COX enzymes which help in reduction of inflammation and pain. Methanolic extract of *Nyctanthes arbor-tristis*, a plant native to South Asia and Southeast Asia, has demonstrated effects comparable to diclofenac sodium in a dose-dependent manner. In this study , we look at the analgesic properties of *Nyctanthes Arbor-Tristis* and conduct chemoinformatics analysis on the same.

Keywords*: Dysmenorrhea, Chemoinformatics, Nyctanthes arbor-tristis, COX.*

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PP-35

Microbial Classification Using Convolutional Neural Networks: A Robust and Efficient Approach

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Abstract: Microbial classification is critical across diverse fields such as healthcare, food and pharmaceutical industries, and environmental studies. Accurate identification of microbes is essential for diagnosing diseases, ensuring product quality, and monitoring environmental health. Early detection can prevent disease outbreaks, while in industrial applications, it ensures product safety, prevents spoilage, and extends shelf life. Microbial indicators are also crucial in environmental surveillance for assessing water quality, soil health, and ecological diversity. Traditional microbial classification methods, such as biochemical tests, require extensive culturing and are time-consuming. Molecular techniques like PCR, 16S rRNA sequencing, and ELISA, while accurate, are costly and demand significant expertise. To address these limitations, we propose a Convolutional Neural Network (CNN)-based image classification approach for rapid and accurate microbial identification. CNNs efficiently extract local image features through convolution operations, creating feature maps that enable the network to classify microbial species through supervised learning. This method offers a fast, flexible, and robust solution for microbial classification. A developed and trained a multiclass image classifier for four microbial species Aspergillus niger (fungi), Bacillus subtilis, Escherichia coli, and Staphylococcus aureus using a dataset of 141 images. Out of these, 97 images were used for training and validation (80:20 split). The model achieved a test accuracy of 79.83% and a validation accuracy of 79.17%, demonstrating its potential for reliable and efficient microbial classification.

Keywords: *Microbial classification, Image-based classification, Convolutional Neural Networks (CNN), Rapid identification, Environmental surveillance*

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PP-36

A Potential for Ecological Restoration in Palghar: Soil Parameter Consistency in Degraded and Reference Sites.

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Abstract: The study examines soil chemical parameters of multiple Reference sites (RS)and Degraded sites (DS) critical for ecological restoration in the Govardhan Eco Village (GEV), Galtare, Palghar, Maharashtra of Western Ghats. The attempt to create an assessment for selecting reference sites (RS) and Degraded sites (DS) was made based on satellite imagery, topographical maps and ground truthing. Five soil samples were procured utilizing the 5-point sampling technique. Soil pH, Electric conductivity, Nitrogen, Phosphorus and Potassium were assessed. The results were analyzed using a t-test at a 1% p-value. No significant variations were observed in the selected chemical parameters of the soil, indicating structural soil stability.

The minimal degradation observed may be attributed to sustainable traditional practices of local tribal communities and limited socio-economic activities. These findings suggest that the soil retains its functional capacity, offering significant potential for ecological restoration efforts in the region.

Keywords: *Ecological restoration, Soil sampling, site selection, Northern Western Ghats.*

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PP-37

A comprehensive child development assessment app and board game to aid early detection and diagnosis of ADHD in children

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Abstract: Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent neurobehavioral disorders in children and adolescents, often persisting into adulthood with significant functional impairments and frequently co-occurring with conditions such as mood disorders, anxiety, disruptive behaviors, and substance abuse. Its diagnosis is clinically established through a comprehensive evaluation of symptoms and their impact. This study introduces an integrative solution to assess Emotional Intelligence (EQ) in children aged 6–12 years with ADHD, focusing on attention ability, self-regulation, empathy, social awareness, teamwork, and stress management. The software component features Android-based interactive games, such as puzzles, hidden image challenges, and color-matching tasks, to evaluate emotional responses, cognitive skills, and decision-making. Complementing this, the hardware component is a 3D time-travel-themed board game fostering collaboration, communication, and emotional awareness, where players navigate zones like a Haunted Castle and Amusement Park, engaging with EQ-focused situation cards and teamwork challenges. This dual-format approach offers an innovative, multidimensional tool for evaluating and enhancing EQ in children with ADHD, supporting their cognitive and emotional development and providing insights for therapeutic interventions.

Keywords: *ADHD, Emotional Intelligence, comorbidity, assessment, children, Android games, board game, cognitive skillsBottom of Form*

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PP-38

Study on prevalence and antimicrobial sensitivity of cutaneous fungal infection (dermatophytosis) in dogs in Pune, Maharashtra, India.

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Abstract: This study investigates dermatosis's prevalence and antibiotic susceptibility, a cutaneous fungal infection, in dogs within Pune. Dermatosis, caused by fungal growth, affects humans and animals, with zoonotic implications requiring urgent attention. Key causative organisms include Trichophyton spp., Microsporum spp., Histoplasma spp., and Coccidioidomycosis spp. Preliminary visual observations indicate a rise in cases, emphasizing the need for a deeper understanding of dermatophytosis prevalence and antifungal resistance patterns. Skin scrapings and shavings from 41 canine samples tested positive for fungi using Wood's lamp and UV light techniques. This research aims to bridge critical knowledge gaps regarding dog dermatophytosis, contributing to better veterinary management, reducing zoonotic transmission, and addressing antifungal resistance. The outcomes will inform effective treatment protocols and prevention strategies, enhancing veterinary practice and public health safeguards.

Keywords*: Dermatosis, Dogs, Antibiotic susceptibility*

PP-39

Computational docking investigation of phytochemicals as anticancer agents from *Ficus Racemosa*

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Abstract: *Ficus Racemosa* is a plant with a long history of traditional medicinal use and has been identified to have a rich source of bioactive phytochemicals with anticancer effects. This study employed a computational approach to explore the interaction of modified phytocompounds from *Ficus Racemosa* with cancer-related proteins, focusing on COX-2 inhibition. The two compounds bergenin and leucocyanidin were used as the lead compounds, and structural modifications were made in order to increase their binding affinity and selectivity for COX-2. Molecular docking and dynamics simulations were performed to assess the binding affinity and mode of interaction of these compounds with COX-2. The results showed that the modified structures of bergenin and leucocyanidin exhibited significant interactions with key residues in the COX-2 active site, potentially leading to inhibition of enzymatic function. The binding energies, hydrogen bond distances, and molecular dynamics simulations supported the potential of these compounds as COX-2 inhibitors. This study provides insights into the anticancer potential of *Ficus Racemosa* phytochemicals and highlights the potential of bergenin and leucocyanidin as lead compounds for further experimental validation.

Keywords*: Ficus Racemosa, Cancer, Cyclooxygenase-2, Molecular docking and Dynamics simulations*

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PP-40

Temporal Transcriptomics Uncovers Links Between Diabetic Complications and Alzheimer's in STZ-Treated Microglial Cells

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Abstract: Diabetic complications, including retinopathy, neuropathy, and nephropathy, are driven by complex molecular mechanisms that remain poorly understood. This study aims to elucidate the temporal gene expression changes associated with these complications using RNA-seq analysis of retinal microglia cells from a streptozotocin induced diabetic mouse model. Differential expression analysis revealed significant changes in gene expression at both early (4-week) and late (8-week) stages of diabetes. Gene Ontology enrichment identified key biological processes, such as visual perception, lipid transport regulation, and neuroinflammatory responses, linking metabolic dysregulation with neuronal damage. Notably, the MAPK signaling pathway was consistently associated with inflammatory responses across multiple diabetic complications. In an unexpected finding, our analysis revealed a significant overlap between genes involved in amyloid-beta production and neuroinflammation, suggesting a potential mechanistic link between diabetes and Alzheimer's disease. This discovery highlights shared molecular pathways that may drive both diabetic neuropathy and neurodegenerative processes. This comprehensive understanding of the dynamic molecular changes in diabetes opens new avenues for therapeutic intervention by exploring the overlap between diabetic complications and neurodegenerative diseases. Future research is needed to validate these findings and assess their therapeutic potential in larger cohorts.

Keywords: *RNA-seq, diabetic complications, MAPK signaling, lipid metabolism, neuroinflammation, amyloid-beta, T3DM, network analysis*

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PP-41

Comparative study on Standardization and Evaluation of *In-Vitro* Virucidal Efficacy of Disinfectants Against Influenza Virus Using Traditional Infectivity Assays and Real-Time PCR"

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Abstract: This study aimed to standardize and evaluate the *in-vitro* virucidal efficacy of disinfectants/formulations against Influenza virus using traditional infectivity methods (plaque/quantal tests/haemagglutination assay) and Real-time PCR. The urgency of developing effective virucidal products has been underscored by recent outbreaks of Human metapneumovirus (HMPV), Influenza epidemics, and the COVID-19 pandemic, with limited data on their efficacy against high biosafety level viruses. Traditional infectivity tests, following the European Standard - EN 14476:2013+A2:2019, typically require 72–96 hours for completion, posing challenges in rapid evaluation. In this study, disinfectants/formulations were tested under clean conditions (0.3 g/L BSA) at various time points (0, 6, and 24 hours). The virucidal efficacy was assessed using traditional TCID50 methods and real-time PCR, with the latter targeting the M gene of Influenza virus for precise quantification. RNA extraction and qRT-PCR were performed on samples collected at 0, 6, and 24-hour intervals, and statistical analyses were conducted using Python. By integrating traditional and molecular techniques, this study significantly reduced the time required for testing while improving the accuracy and reliability of virucidal assessments, offering valuable insights for infection prevention and control.

Keywords: *qRT-PCR, Virucidal Assay, Disinfectants, Influenza, European Standard, TCID50*

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PP-42

Design and development of a microfluidic reactor for the synthesis of fluorescent nanocrystals and their use in diagnostics.

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Abstract: Microfluidics offers a platform for the controlled synthesis of nanomaterials, enabling precise manipulation of reaction conditions at the microscale. Leveraging this property, it can be widely used for the synthesis of carbon dots. They are semiconductor nanoparticles with unique optical and electronic properties, making them highly valuable for diagnostics and biomedical applications. However, their synthesis often suffers from batch-to-batch variability, lack of scalability, and challenges in achieving uniform size and quality. To address these limitations, we designed and developed a microfluidic reactor for the controlled synthesis of quantum dots. A computational flow dynamic software called COMSOL was used to simulate the reaction to optimize the geometric, physical, and chemical parameters. The simulatory microfluidic channel was precisely constructed in 2D using COMSOL and in 3D using Autodesk Fusion 360. The models were then used to simulate the reaction to determine where the mixing is optimum and what parameters provide the required yield with maximum efficiency. Based on the simulation data, a microfluidic chip was fabricated using a polymer by soft lithography technique.

Keywords: *Microfluidics, Fluorescent nanocrystals, COMSOL, Soft Lithography*

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PP-43

Exploration of endophytic fungi from various parts of flame lily plant from Western Ghats of Maharashtra, India

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Abstract: The flame lily (*Gloriosa superba* L.), a medicinally significant and critically endangered plant found in the Western Ghats of Maharashtra, harbors a diverse community of endophytic fungi with immense biotechnological potential. To highlight the significance of plant conservation and for exploration of potential medicinal properties, this study sought to extract, identify, and assess the bioactivity of endophytic fungi from a variety of plant tissues, such as roots, stems, leaves, and flowers. A total of fifty fungal isolates were obtained, with molecular and morphological analyses revealing a rich diversity of fungal taxa. Bioactivity assays demonstrated notable antimicrobial, antioxidant, and enzyme-inhibitory properties, supported by secondary metabolite profiling, following identification of alkaloids, phenolics, and other bioactive compounds. These findings highlight the potential of *G. superba*-associated fungal endophytes as a sustainable source of pharmacologically active compounds, reducing the reliance on harvesting the endangered host plant. Conservation strategies, including tissue culture propagation and habitat preservation, are imperative to safeguard *G. superba* while exploring its endophytes for applications in drug discovery and agriculture. This integrated approach supports both biodiversity conservation and sustainable utilization.

Keywords: *Gloriosa superba, Endophytic fungi, Biodiversity conservation, Secondary metabolites, Alkaloids, Enzyme inhibition, Drug discovery, Agricultural applications*

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PP-44

Assessing Phytoremediation Potential of *Nephrolepis Cordifolia* towards Decolorization of Textile Dyes in Sustainable Hydroponic Phytoreactor System

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Abstract: Textile dyes are well known carcinogenic, mutagenic, cytotoxic and allergic agents posing serious threats to all life forms. Phytoremediation has emerged as a cost-effective, passive, green, and solar dependant approach for environmental cleanup of textile dyes. Plant based treatment of textile dyes is relatively new approach. In this research work, we studied degradation of the different industrial textile dyes (Fast GBC Garnet, Scarlet RC Base, and Red B) by plant *Nephrolepis Cordifolia*. Use of *Nephrolepis Cordifolia* plant has shown significant removal of textile dyes from water. In the initial phase, the degradation rates of three textile dyes—Fast GBC Garnet, Scarlet RC Base, and Red B—were assessed over time, revealing a time-dependent increase in degradation efficiency. After 168 h, *Nephrolepis Cordifolia* showed 85.58, 47.72 and 71.66 % decolorization of Fast GBC Garnet, Scarlet RC Base, and Red B, respectively. Higher plant number correlated with accelerated dye removal, demonstrating the significance of plant density in the phytoremediation process. Further, we isolated the bacteria from rhizosphere of the *Nephrolepis Cordifolia* plant. The addition of this bacterial cultures significantly enhanced dye degradation, with synergistic interactions between plants and bacteria facilitating faster breakdown of contaminants. Furthermore, we analysed degradation of GBC Garnet by FT-IR and GC-MS analysis. Finally, we developed hydroponic phytoreactor system for removal of textile dyes from textile wastewater. Therefore, this study highlights the potential of integrating phytoremediation for sustainable dye wastewater treatment.

Keywords: *Phytoremediation, Textile wastewater, Plant-microbial interactions, Dyes, Ferns*

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PP-45

Bioengineering for Precision Cancer Therapy using Chitosan Nanoparticles for Co-Delivery of Anticancer Peptides and siRNA

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Abstract: Antimicrobial peptides (AMPs) with anticancer property (ACP) offer promising cancer treatment through targeted therapy, while nanoparticle delivery systems enhance the stability and controlled release of these therapeutic agents. Similarly, small interfering RNA (siRNA) play a crucial role in cancer therapy through the silencing of genes crucial in oncogenesis pathways but face challenges like instability and poor cellular uptake. To address these, we incorporated ACP and siRNA (*AKT*-1) into chitosan nanoparticles for sustained delivery and stability. Nanoparticle characteristics were confirmed using Direct light scattering (DLS). siRNA and peptide entrapment efficiency were analyzed using UV-spectrophotometry and Bradford assay respectively. Gel retardation assay was performed to check the protection against RNase. MTT assay results showed reduced cell viability in A549 cancer cells treated with different combinations, with maximum cytotoxicity in chitosan-peptide-siRNA nanoparticle (73.51% viability). Gene expression analysis revealed increased expression of pro-apoptotic genes, such as Bax and Caspase3, in treatments with peptide-loaded chitosan nanoparticles and siRNA, indicating potential apoptosis induction. Conversely, the anti-apoptotic gene BCl2 was downregulated, particularly in peptide and siRNA combinations, promoting apoptosis. These results highlight the synergistic potential of combining ACPs and siRNA in nanoparticle delivery systems, offering a novel and effective approach for targeted cancer therapy with enhanced specificity and efficacy. ***Keywords:*** *AMP, ACP, siRNA, chitosan nanoparticles, targeted cancer therapy*

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PP-46

Synthesis, Characterization, and Evaluation of Antioxidant and Antimicrobial Properties of Metal- Organic Frameworks (MOFs)

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Abstract: Metal-Organic Frameworks (MOFs) have gained considerable attention due to their adjustable properties and diverse chemical functionalities. This study focuses on ZnBTC (Zinc Benzene-1,3,5-tricarboxylate) and Cu-Bpy (Copper Bipyridyl) MOFs, synthesized *via* a solvothermal method for precise control over porosity and textural properties. The crystalline structure and phase purity of the samples were analyzed using X-ray Diffraction (XRD). Scanning Electron Microscopy (SEM) combined with Energy Dispersive X-ray Spectroscopy (EDX) was employed to examine the morphology and verify the presence of Zn and Cu elements. Further SEM-EDX data was analysed using origin software and the average crystal size of ZnBTC and Cu-Byp were reported to be 23nm and 11.8nm respectively. The FTIR analysis of ZnBTC MOF reveals C-H stretching vibrations (2800–3000 cm^{-1}) from the benzene ring, O-H stretching (3200–3600 cm^{-1}) due to water or hydrogen bonding, and carboxylate group vibrations (1300–1700 cm^{-1}) confirming coordination with Zn ions. The Cu-Byp spectra show key peaks indicating the presence of fingerprint region bonds such as COO, C=O, C-O, and Cu-O. Notably, dicarboxylic bonds appear at 1386 cm^{-1}, and C-N stretching is observed at 1615 cm^{-1}. Biological activity evaluation demonstrated significant antioxidant potential using the DPPH assay, and exhibiting significant antibacterial activity against both Gram-positive and Gram-negative bacteria. These findings underscore the potential of Zn-BTC and Cu-Bpy in diverse applications, including drug delivery, sensors, cancer therapy, and environmental remediation. The materials' inherent porosity and stability enable multiple adsorption cycles without degradation, making them highly suitable for functionalization, catalysis, and storage applications.

Keywords: *Metal-Organic Frameworks (MOFs), ZnBTC, Antioxidant activity, Antibacterial activity.*

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PP-47

Design and Assessment of Photometric Method for Rapid Evaluation of Microbial Contamination in Milk

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Abstract: Milk contamination poses significant health risks, making rapid and reliable microbial detection critical. Existing methods like the Methylene Blue Reduction Test (MBRT) are effective but time-intensive, requiring 4–6 hours, sterile conditions, and skilled personnel. A rapid, cost-effective, and user-friendly device capable of detecting microbial load in milk within 30 minutes using colorimetric principles was developed to overcome these limitations. The system employs a Metabolic dye-based assay, where microbial enzymatic activity induces a colour change. Milk samples were placed in test and control chambers and optical density (OD) changes were detected using a Light Dependent Resistor (LDR). Temperature control is incorporated for improved accuracy. A microprocessor processed the signals, using change in OD (Optical Density) between the test and control chambers at the 1st and 30th minutes to calculate the outcome. Preliminary testing confirmed the reliability of change in OD for measuring contamination, providing accurate results that correlate well with microbial concentration. Future enhancements include developing a database for standardised absorbance-concentration curves, and integrating AI for predictive analysis. The device is designed to be versatile, applicable to various products, and accessible for use in diverse settings. This innovative solution addresses the need for rapid, accurate, and affordable milk quality assessment especially at the farm level and resource-limited settings, offering significant benefits for ensuring public health and food safety.

Keywords*: Contamination, Diary Microbiology, Food Safety, Detection.*

PP-48

Exploiting Endophytic Microbiota for Biocontrol Potential against *Xanthomonas campestris* in Tomato

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Abstract: Biocontrol plays a pivotal role in mitigating biotic stress and promoting plant growth by utilizing beneficial microorganisms that depict antagonistic activity against phytopathogens. Xanthomonas campestris, a bacterial pathogen known to cause diseases such as bacterial blight, canker, and leaf spot in various economically important crops. Therefore, to identify effective biocontrol agents, endophytic microbiota was explored for their antagonistic activity against Xanthomonas campestris. Among these, two potential isolates named LE8 and LE11, based on their inhibitory effects, were subsequently selected for further analysis to contribute to sustainable agriculture practice. The treatment of tomato leaves with these potential isolates showed both preventive as well as curative effects. The current investigation resulted in a significant reduction in disease symptoms, demonstrating their effectiveness as a biocontrol agent. These findings highlight the beneficial impact of endophytic bacteria as a biocontrol, providing a sustainable alternative to pesticides. Further studies will evaluate their antagonistic activity in the field on tomato plants.

Keywords: *Biocontrol, Antagonistic Activity, Sustainable, Xanthomonas, Endophytic microbes.*

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PP-49

Design and development of a portable Electrospinning model for Nanofiber fabrication and its use in biomedical applications.

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Abstract: Electrospun nanofibers have emerged as versatile platforms for cancer therapy due to their high surface area, tunable porosity, and ability to incorporate therapeutic agents for localized and controlled drug delivery. This study presents the design and development of a portable, multi-syringe electrospinning device capable of producing tailored nanofibers at the point of care, addressing limitations in conventional systems. The device integrates a multi-syringe dynamic mechanism, allowing the simultaneous or sequential processing of multiple polymers, enabling the fabrication of composite nanofibers with gradients in composition, drug release profiles, and mechanical properties. Compared to conventional electrospinning systems, the multi-syringe design enhances versatility by enabling the co-fabrication of functionalized nanofibers with different therapeutic payloads, tailored to various stages of cancer progression or combined therapies such as photothermal and immunotherapy. The device's cost-effective and compact design ensures accessibility, especially in resource-constrained settings, bridging the gap between advanced laboratory-scale research and practical clinical applications. By combining portability, adaptability, and multi-material functionality, this electrospinning system redefines the potential of nanofibers in cancer therapy and personalized medicine.

Keywords*: Portable electrospinning; multi-syringe system; cancer therapy; point-of-care nanofiber fabrication; localized drug delivery.*

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PP-50

Non-Invasive Detection of Vascular Abnormalities Using Doppler Ultrasound and AI Model

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Abstract: Stenosis and thrombosis can lead to complications like stroke if not detected early. The early detection of vascular abnormalities, such as blood clots and stenosis, is important for preventing severe vascular complications. Therefore, continuous monitoring of blood vessels is essential to identify potential issues at an early stage. Traditional diagnostic methods, such as angiography, are invasive, expensive, and expose patients to radiation restricting the widespread use of these techniques. Integrating AI with Doppler ultrasound will enhance diagnostic accuracy and automate analysis, enabling real-time monitoring for improved patient outcomes. This work proposes a novel approach combining Doppler ultrasound with artificial intelligence (AI) for the non-invasive detection of vascular abnormalities. Doppler ultrasound provides real-time data on blood flow dynamics, which is analysed by an AI-driven technique based on a Long Short Term Memory (LSTM)--based deep neural network model. The proposed model will incorporate a baseline frequency customised for each individual, ensuring high accuracy and adaptability. The proposed AI system will periodically monitor patient progress for reliable diagnosis which can help early detection of vascular abnormalities. This combined approach offers a non-invasive, safer, cost-effective, and radiation-free alternative to conventional techniques, paving the way for its application in routine medical diagnostics, personalised healthcare and supporting long-term patient care.

Keywords: *Doppler ultrasound, vascular abnormalities, baseline frequency shift analysis, Artificial Intelligence(AI)*

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PP-51

Deep Convolutional Neural Networks for Ovarian Cancer Prediction and Subtype Identification

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Abstract: Ovarian cancer is a type of cancer, that arises from the uncontrolled growth of cells in ovaries and can spread to nearby tissues and other parts of the body. Early detection is challenging as symptoms often go unnoticed until the disease has progressed to advanced stages. Ovarian cancer can be classified into different subtypes such as benign cysts, borderline tumors, malignant cysts, and metastatic growths. Precise classification and early detection can significantly improve patient prognosis, tailor treatments, and reduce the burden on healthcare systems. Our approach utilizes Convolutional Neural Networks (CNN) alongside a Saliency map trained on a robust dataset. Our dataset includes Multi-Modality Ovarian Tumor Ultrasound (MMOTU) images comprising 2D and 3D Ultrasound images, where subsets are annotated with pixel-wise semantic images and global category classifications. The deep learning model possesses the potential to assist clinicians and radiologists by offering a second opinion, expediting early detection, and enabling personalized treatment pathways. Further enhancements include integrating multimodal data (eg: CT/MRI scans and clinical parameters) to improve accuracy and generalizability across diverse patient populations. We also envision deploying this model as a cloud-based platform for seamless integration into clinical workflows. Our current work represents a significant step forward in the evolving field of integrating AI with healthcare, to improve patient outcomes and advance diagnostic accuracy.

Keywords: *Ovarian Cancer , Deep Learning , Saliency Map , Ultrasound Scans*

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PP-52

Development and Characterization of a Collagen-Based Nanocoated Wound Healing Patch Derived from Fish Skin for Biomedical Applications

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Wound healing is a complex biological process that can be significantly improved by advanced biomaterials with antimicrobial and regenerative properties. This study focuses on the development of a collagen-infused wound healing patch derived from fish skin, a natural and sustainable source. The patch is further enhanced with silver nanoparticles for their potent antimicrobial activity, aimed at preventing wound infections. Silver nanoparticles were synthesized and characterized through spectrophotometry, with optical density measurements confirming successful synthesis. Collagen was extracted from fish skin using the acid-soluble collagen extraction method, yielding a biomaterial suitable for medical applications. To further enhance the stability and shelf-life of the wound healing patch, lyophilisation (freeze-drying) was applied, preserving the integrity of both the collagen and nanoparticles. Antimicrobial assays demonstrated the effectiveness of the silver nanoparticle-enhanced patch in inhibiting bacterial growth. Current progress includes successful nanoparticle synthesis, collagen extraction, lyophilisation, and antimicrobial testing, with future work focusing on integrating these components into a functional wound healing patch and assessing its efficacy. This research highlights the potential of fish skin as an eco-friendly source for collagen and its application in innovative biomedical solutions.

Keywords: *Wound healing, collagen extraction, nanoparticles, fish skin, patch*

PP-53

Green Synthesis and Characterization of Algae-Derived Cerium Oxide Nanoparticles for Biomaterial Applications

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Abstract: The emerging field of nanotechnology has witnessed significant advancement in eco-friendly synthesis methods, particularly in developing metal oxide nanoparticles. This research presents an innovative green synthesis of nanoceria using aqueous extracts from distinct algal species (*Spirulina* sp., *Caulerpa* sp., and *Sargassum* sp.) using cerium nitrate hexahydrate as a precursor salt. The successful formation of nanoparticles is evidenced by visible precipitation and distinct color changes in the reaction medium. The synthesized nanoparticles are extensively characterized using various analytical techniques, including Field Emission Scanning Electron Microscopy coupled with Energy Dispersive Spectroscopy (SEM-EDS), X ray Diffraction (XRD), and UV-visible spectroscopy. Various synthesis parameters were systematically optimized to enhance nanoparticle yield. The research explores waste water treatment for removing heavy metals and organic pollutants and its applications in dental implant coatings for enhanced osseointegration and antibacterial properties. This green synthesis approach presents a sustainable solution for producing multifunctional cerium oxide nanoparticles with diverse industrial and biomedical applications.

Keywords*: Green synthesis, Cerium oxide nanoparticles, Marine algae, Metal oxide nanoparticles, Biosynthesis.*

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PP-54

Comparative Phytochemical Evaluation of different plant species known as Gojihva

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Abstract: The long-standing chronological gap in the documentation of Ayurvedic herbs has resulted in various plants being identified by the same name, leading to confusion regarding their medicinal applications. This study aims to compare different plant species known as Gojihva, deduce their phytochemical profiles, and identify potential bioactive compounds present in them. *Onosma bracteatum* Wall. is recognized by the Ayurvedic Pharmacopeia of India as the official source of Gojihva, while other species such as *Elephantopus scaber* Linn. and *Launaea sarmentosa* (Willd.) Schultz have also been associated with this name. Additionally, *Launaea procumbens* (Roxb.) Ramayya & Rajagopal, known as Pathri or Creeping L*aunaea*, is evaluated for its medicinal properties in comparison to Gojihva species. The physicochemical parameters of these plant pecies were compared to aid in their standardization. Preliminary qualitative studies revealed the presence of several compounds, including alkaloids, reducing sugars, flavonoids, glycosides, and saponins, which were common across all Gojihva species, including *Launaea procumbens*. It was found that phytosterols are specific to *Onosma bracteatum* Wall., while *Launaea sarmentosa* and *Launaea procumbens* contain proteins and amino acids. This highlights the distinct phytochemical profiles of these Gojihva species. Further studies, such as LC-MS analysis, are recommended to elucidate the specific bioactive compounds present in these plants, paving the way for future research, including clinical trials and pharmacological studies.

Keywords*: Gojihva, bioactive compounds, medicinal plants, Ayurvedic herbs, phytochemical profile.*

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PP-55

Harnessing *Deinococcus radiodurans* for Green Synthesis of Silver Nanoparticles: A Step Towards Eco-Conscious Photocatalysis

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In this study, we report biogenic synthesis of silver nanoparticles (AgNPs) using polyextremophilic bacteria *Deinococcus radiodurans*. Optical and structural properties of the green synthesized silver nanoparticles was investigated in addition the AgNPs entrapped in calcium alginate beads were used for photodecolorization of cationic and anionic dyes. AgNPs in the suspension as well as entrapped in beads could degrade methylene blue, methyl orange and methyl green dyes. The photocatalytic activity of immobilized AgNP in fabricated column model shows potential application for removal of dyes from effluents contributing ultimately to ecological clear out process and facilitated in recovery and reprocess. The efficiency of beads entrapped silver nanoparticles as a promising candidate for the catalysis of organic dyes is established in the present study. Additionally, phytotoxicity and cytotoxicity assay was performed to show significant reduction in toxicity of nanoparticle assisted degraded cationic and anionic dyes.

Keywords-
Deinococcus radiodurans, Methylene blue, Methyl orange, Methyl green, Photocatalytic degradation, Silver nanoparticles.

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