7th International Conference
on
Recent Trends in Bioengineering (ICRTB-2024)

Editors
Prof. Vinayak Ghaisas
Dr. Renu Vyas

Organized by

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In loving memory of

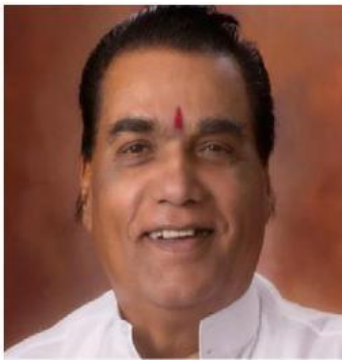
Late Hon'ble Dr Suresh Ghaisas

Ex-President & Founder Trustee

MIT MAEER, Pune

A great doctor and a great human being!!
Your life was a blessing. Your memory is a treasure.
You shall always stay with us.

Messages



Hon. Prof. Dr. Vishwanath Karad

It gladdens my heart to note that MIT School of Bioengineering Sciences & Research, a constituent unit of MIT Art, Design and Technology University Pune is organizing its annual flagship event- the 7th International Conference on Recent Trends in Bioengineering (ICRTB 2024). Conducting such scientifically intense conferences consistently for the past seven years reflects the deep commitment of the organization towards research – an important pillar of a University system.
I welcome the eminent speakers, and delegates and congratulate the organizers for conceptualizing and consistently raising the standard of such events.

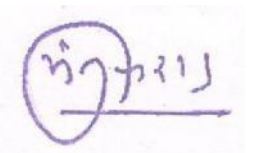
Prof. (Dr.) Vishwanath D. Karad
Founder MIT Group of Institutions
President, MIT Arts, Design & Technology University, Pune

Dr. Mangesh Karad

Dear Delegates

Very proud to note that MIT School of Bioengineering Sciences & Research is organizing the 7th International Conference on Recent Trends in Bioengineering (ICRTB 2024). It has become a unique event that brings together professionals from diverse fields on a single platform at our campus and sets the stage for the promotion of innovation and research at the institute, ADT University and society at large. I personally look forward to the deliberations on the cutting edge of science and technology. It has been our constant endeavour to serve as a new-age University that promotes interdisciplinary fields such as Bioengineering.

I congratulate the convenors, faculty and students of the institute and wish them tremendous success for the event. A warm welcome to all guests and delegates!!

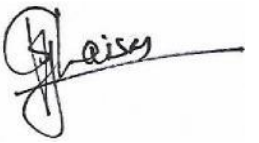


Hon. Dr. Mangesh Karad
Executive President, Vice Chancellor, MIT-ADT University
Trustee, MAEER, Pune

Prof. Vinayak Ghaisas

I am very happy & excited to host our annual "International Conference on Recent Trends in Bioengineering(ICRTB)". Various speakers and participants from India & abroad will be discussing various interesting topics and advancements in the field of Bioengineering during this conference. Bioengineering holds such great promise for the coming decades to solve some of the complex problems we have been facing. Every year we have seen a rise in the participants and speakers from multiple nations which is a great sign of increasing interest in this field. Such conferences play a vital role in advancing the knowledge in this multi-disciplinary field of Bioengineering. I am sure everyone at the conference will make the best use of this great opportunity to network and broaden their horizons.

Warm welcome to all delegates, speakers and hope you enjoy our hospitality.



Prof Vinayak Ghaisas
Founder & Executive Director
MIT School of Bioengineering Sciences & Research
Trustee, MAEER, Pune
Convenor, ICRTB 2024

Dr. Renu Vyas

A warm welcome to all the delegates, guests and speakers from research, academia and industry to the 7th International Conference on Recent Trends in Bioengineering (ICRTB 2024). Let us all meet again on the unique ICRTB platform to savour the latest happenings in the multidisciplinary field of Bioengineering and deep delve into the solutions that can be provided for healthcare and the environment. Bioengineering is poised to be a larger game changer than computer engineering as the impacts are manifold and the possibilities for finding sustainable solutions are immense. It can help us find better drugs, vaccines, cancer biomarkers, smart prostheses, water purification systems, alternative green fuels, and even batteries.

We hope you will appreciate the amazing profiles of keynote/ plenary speakers and vibrantly participate in all the sessions of the conference. This endeavour will also build good network and inter-institutional collaborations that amplify your career goals ahead.

Thanks for being part of the ICRTB phenomenon!!

Dr. Renu Vyas
Head of the School MIT School of Bioengineering Sciences & Research
Dean, Faculty of Technology, MIT ADT University, Pune
Convener, ICRTB 2024

Eminent Speakers

Prof. Sunil Bhagwat
Director, IISER Pune, India

Profile

A chemical engineer by training, Prof. Sunil Bhagwat was a faculty member at ICT Mumbai for about 35 years. Prof. Bhagwat's research is in the areas of interfacial science and engineering, energy and exergy engineering, computer process simulation, and artificial neural networks. He is passionate about teaching and was elected as the best teacher by students over ten times so far. In 2013, his research group won the first prize in the Bry-Air Asia awards for the HVAC for his work in the area of heat-based refrigeration. He was awarded NOCIL Award of the Indian Institute of Chemical Engineers for Excellence in Design or Development of Process Plant or Equipment in 2012 and the CSMCRI-Chemcon Distinguished Speaker Award at Chemcon Dec 2014. In 2016, the Indian National Science Academy (INSA) bestowed upon him the Best Teacher Award for the year 2016. In 2019, he was selected for the UDCT Alumni Association's Distinguished Alumnus Award-Academic category. Prof. Bhagwat is an active consultant to a wide range of companies in the chemical industry. He has guided over seventy masters theses, over forty doctoral theses, has more than 100 international publications and over eighty national/ international conference presentations and ten national and international patents to his credit.

Dr Anil Prasad Dash
Scientist 'G' & Director, HEMRL, DRDO, India

Profile

Dr. Anil Prasad Dash assumed the charge as Director of High Energy Materials Research Laboratory (HEMRL), Pune on 01 Sep 2022. Prior to his appointment as Director, HEMRL, he has served as Project Director for 2nd and 3rd generation SLBM. He completed his B.Tech (Civil) from College of Engineering and Technology, Bhubaneswar, Odisha followed by M.Tech (Ocean Engineering) from IIT Madras where he was awarded with the ABS gold medal. After brief stint of research at IITM, he joined DRDL as a Scientist 'B'.While in service at DRDL, he completed Ph.D in Aerospace Engineering with specialization in Composite Structure. He had a magnificent career at DRDL where he was given the responsibility to design the 1st generation SLBM of India as a member of the core design team. SLBM has successfully gone through development trials and now is in service of Indian Navy. Subsequently he was given the responsibility of Deputy Project Director for the 2nd generation SLBM where he successfully steered the development activities and led to its successful completion and presently, it is under productionisation. Based on the successful completion of these projects, he was chosen as the Project Director for the 3rd generation SLBM and currently,these missiles are under design and development for Indian Navy.His areas of expertise include solid propulsion, composite structure and missile system engineering. While working in confidential project, where open publications are restricted. He has published seven technical papers in reputed national and international journals, seminars and symposiums. There are two patents to his credit. He is the recipient of many prestigious awards including DRDO Scientist of the year (2018), DRDO Award for Performance Excellence (2007 & 2016), Innovation Idea Contest (2015), Special Award for Strategic Contribution (2014) and Technology Group Award (2005). He is President of High Energy Material Society of India (HEMSI) at the National Level. He is the Chairman, Pune Chapter of Aeronautical Society of India (AeSI) and a Life Member of ISAMPE.

Talk synopsis

Biodegradation of high-energy materials

High Energy Materials Research Laboratory (HEMRL) is one involved in basic and applied research in the area of high energy materials. HEMRL conducts R&D in formulation, design and development of propellants, high explosives, pyrotechnics, polymeric materials, liners/insulators, and other materials. These include studies on the physiochemical and combustion characteristics of materials, study of detonation phenomena and development of new systems.

Biodegradation of high-energy materials involves the use of natural processes, such as microbial action or enzymatic reactions, to break down explosive compounds into environmentally benign byproducts. This area of research is essential for addressing the environmental impact of explosive residues in various contexts, including military activities and industrial applications. By harnessing the capabilities of microorganisms or specific enzymes, scientists aim to develop sustainable and eco-friendly methods for the disposal and remediation of high-energy materials. Understanding and optimizing biodegradation pathways not only contribute to reducing environmental contamination but also align with broader efforts to develop green technologies and practices in fields where energetic materials are utilized. Ongoing research in this domain seeks to strike a balance between effective disposal methods and minimizing ecological consequences.

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

Profile

Kirsten Rosselot is a chemical engineer who specializes in understanding and improving environmental performance. She has owned her own consulting firm since 1995 and has done projects for non-profits, academia, governmental agencies, and industry. She taught an upper division/graduate student elective on pollution prevention in the chemical engineering department at California State University, Long Beach for two years and has co-authored many handbooks, textbooks, peer-reviewed journal articles, and other materials.

Talk synopsis

Possible unconventional barriers to adoption of beneficial bioengineered materials

Innovative bioengineered materials face many types of hurdles on their route to adoption, even when they have significant health and/or environmental advantages. Some of these barriers tend to be overlooked when assessing a material's potential for commercialization and determining its commercialization plan. In this talk, we'll discuss some of the potential barriers that a new material might face as it makes its way to market, such as the level of investment in the existing infrastructure, the intertwined nature of the chemical manufacturing industry, and prevailing institutional practices.

Prof Jeremy Simpson
School of Biology & Environmental Science
University College Dublin, Ireland

Profile

Jeremy Simpson obtained his PhD from the University of Warwick (UK). After post-doctoral work at the Scripps Research Institute (San Diego, USA) and the ICRF (London, UK), a long term EMBO fellowship took him to the EMBL (Heidelberg, Germany), where he developed and applied novel high-throughput imaging approaches to study protein localisation and membrane traffic in mammalian cells. In 2008 he was appointed as Full Professor of Cell Biology at University College Dublin (Dublin, Ireland). His lab applies high-throughput imaging technologies to study intracellular trafficking pathways, diseases associated with the endomembrane system of cells, and the internalisation routes taken by synthetic nanoparticles as drug delivery vehicles. His lab also develops novel 3D cell models allowing the quantitative study of cell behaviour at multiple scales. He has authored 125 peer-reviewed articles, including articles in Nature Cell Biology, Nature Communications, Nature Methods and Scientific Reports and runs the UCD Cell Screening Laboratory (www.ucd.ie/hcs). He is currently also serving as the College Principal and Dean of Science in the UCD College of Science.

Talk synopsis

Advanced Biological Imaging Applications for Cell Biology & Biotechnology
Advanced biological imaging approaches can be used to study a wide range of phenomena in basic cell biology as well as having applications in biotechnology and bioengineering. In this seminar I will present a range of data produced by my laboratory over almost two decades that give insight into the power of quantitative fluorescence imaging. I will describe how we use imaging approaches to study

trafficking pathways in cells, several specific human diseases, as well as how nanoparticles, as therapeutic carriers, deliver their cargo into cells. Our work combines fluorescence imaging with other methods, including RNA interference and complex 3D cell models, which together provide us with the opportunity to interrogate cell function at the molecular level, in turn making valuable contributions to our wider understanding of human disease and treatment options.

Mandar Bodas

Solution Consultant, Elsevier, India

Profile:

Dr. Mandar Bodas' passion for life sciences spans the lab bench to the marketplace. With a doctorate in Organic Chemistry from the National Chemical Laboratory, Pune, his early research delved into cutting-edge techniques like Sharpless Asymmetric Dihydroxylation and Asymmetric Synthesis. His postdoctoral explorations at the University of Montreal honed his expertise in solid-phase peptide synthesis, laying the foundation for a career devoted to translating scientific prowess into tangible healthcare solutions. From 2006 to 2008, Dr. Bodas' talent blossomed at Ranbaxy Laboratories, where he tackled challenges in oncology through combinatorial library synthesis, the engine driving new drug discovery. This experience ignited his drive to bridge the gap between fundamental research and real-world patient needs. He transitioned seamlessly to Biocon Bristol Myers Squibb Research Centre (BBRC) in 2008, taking on the mantle of Senior Principal Investigator. For a decade, his leadership steered research efforts in diverse therapeutic areas, from unravelling the mysteries of the brain in neuroscience to conquering cardiovascular foes like atherosclerosis, heart failure, and fibrosis. In 2018, Dr. Bodas embarked on a new chapter at Elsevier, leveraging his vast scientific knowledge and industry acumen as a Solutions Consultant. He now applies his expertise to the domain of life sciences data analytics, empowering academic institutions with cutting-edge tools that accelerate research, ultimately paving the path for faster scientific breakthroughs and improving human health. Dr. Bodas' journey exemplifies the transformative power of scientific curiosity and a keen business sense. His unwavering dedication to bridging the gap between the lab and the market promises to translate the language of molecules into a healthier tomorrow for all.

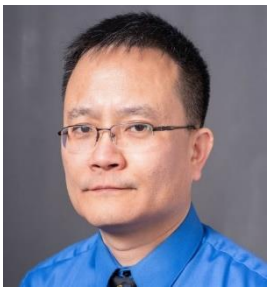
Talk Synopsis

Driving Chemistry for Sustainable Change

Mandar Bodas[1]*, Ravindra Gupta, and Adeline Teoh[3]

[1] Elsevier India; [2] Elsevier Singapore

Modern chemistry is the backbone of our society and has a profound impact on our lives. The chemical sector consumes 10% of the world's total energy and contributes to 8% of greenhouse gas emissions. 90% of global production depends on chemical products. Chemistry also is a major contributor to global environmental pollution, plastic waste and the ongoing climate crisis based on the products we use such as detergents, toothpaste, plastic, paints, drugs and beyond. The transition toward a sustainable future is the key to radical transformation towards sustainability to meet these global challenges on how chemistry is designed, developed, and executed. Sustainability-focused chemistry research is key to realizing lower pollution levels, less waste, safer chemicals, and greater energy efficiency. To adapt to a changing world, chemical syntheses and processes need to be adapted too. Sustainable Chemistry makes a critical contribution to achieving the aims of all SDGs. Reaxys database along with the interoperability experience from Science Direct and Scopus database helps researchers in providing the right solutions which saves time and cost by improving efficiency and productivity. Reaxys retrieves literature, compound properties and chemical reaction data faster than any other solution Reaxys offers a highly intuitive interface and robust database to help leading chemists retrieve relevant chemical literature, patent information, valid compound properties and experimental procedures in half the time. Designed to support the full range of chemistry research, including pharmaceutical development, environmental health & safety work and material science, Reaxys puts every scientist, from novice to expert, on the shortest path to answers.



Xiang Simon Wang, Ph.D.
Professor, Howard University, Washington DC, USA

Profile

Dr. Simon Wang is currently a tenured professor at the Department of Pharmaceutical Sciences, Howard University College of Pharmacy (HU COP). He also directs the Artificial Intelligence and Drug Discovery Core Laboratory for the District of Columbia Center for AIDS Research. His expertise includes computer-aided drug design (CADD), artificial intelligence (AI)/machine learning (ML), high-throughput screening (HTS), computational chemistry, and biomolecular simulation. Dr. Wang has published about 90 peer-reviewed research articles, reviews, book chapters, patents and datasets as well as more than 220 invited lectures and conference presentations, also been awarded numerous university-, state-, federal-, industry- and internationally-funded grants. He has been a long-time reviewer for over 50 major research journals including the *Journal of Medicinal Chemistry* and the *Journal of Chemical Information and Modeling*, also served on review panels for domestic and international funding agencies such as the National Institute of Health (NIH), National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), Alzheimer's Drug Discovery Foundation (ADDF), and Swiss National Science Foundation (SNSF) etc. In recent years, Dr. Wang has pioneered the application of AI/ML methodologies to expedite early drug development, boasting successes with multiple targets. He has also championed the use of AI/ML to fine-tune reaction conditions for visible-light photo catalysis in heterocycle synthesis; enhancing packaging capacity and refining tissue tropism in therapeutic gene delivery.

Talk Synopsis

AIDD – How AI Reshaping Pharma

Dr. Wang will highlight how AI is transforming drug discovery. Artificial Intelligence for Drug Discovery (AIDD), the evolution of computer-aided drug design, is now involved in all stages of the development pipeline from target identification to market, slashing timelines and costs. Preclinical phases can be halved, phase I accelerated. Pharma giants are partnering with AI companies, applying it in all key therapeutic areas. AI shines in small-molecule drugs, but its reach is expanding to large-molecule drugs like antibodies and ADC. In recent years, Dr. Wang's lab has pioneered the application of AI/ML methodologies to expedite early drug development, achieving success with multiple targets. He has also championed the use of AI/ML to fine-tune reaction conditions for visible-light photocatalysis in heterocycle synthesis; to enhance packaging capacity in therapeutic gene delivery.

Dr. Justin Dauwels

Associate Professor, TU Delft
Signals and Systems, Department of Microelectronics

Profile

Dr. Justin Dauwels, an Associate Professor in Signals and Systems at TU Delft's Department of Microelectronics, previously held the same position at Nanyang Technological University (NTU), Singapore, until 2020. During his tenure at NTU, he played a pivotal role as the Deputy Director of the ST Engineering – NTU corporate lab, overseeing a cohort of 100+ PhD students, research personnel, and engineers dedicated to pioneering autonomous systems tailored for airport operations and transportation. At TU Delft, Dr. Dauwels leads the Model-Driven Decisions Lab (MoDDL), a groundbreaking initiative fostering collaboration between the police force and the university's Knowledge Building program. Additionally, he holds the esteemed positions of Chairperson of the EE Board of Studies and serves on the board of the Netherlands Institute for Research on ICT. His research focal points revolve around data analytics, specifically applied to intelligent transportation systems, autonomous technologies, and the analysis of human behavior and physiology. Graduating with a PhD in electrical engineering from the Swiss Polytechnical Institute of Technology (ETH) in Zurich in 2005, he further honed his expertise through pivotal roles, including postdoctoral fellowships at the RIKEN Brain Science Institute and a research scientist stint at the Massachusetts Institute of Technology. Acknowledged for his academic prowess, Dr. Dauwels was elected as the IEEE SPS 2024 Distinguished Lecturer and has received esteemed fellowships like the JSPS, BAEF, and Henri-Benedictus Fellowships. He has actively contributed to numerous editorial roles, chaired IEEE chapters, served on committees, and organized conferences, contributing significantly to the field. Dr. Dauwels' research team has been honored with several best paper awards and their work on intelligent transportation systems has gained significant

media attention from BBC, Straits Times, Lianhe Zaobao, Channel 5, and various tech platforms. Beyond academia, Dr. Dauwels collaborates extensively with local startups, SMEs, agencies, and multinational corporations, fostering advancements in data-driven transportation, logistics, and medical analytics. Notably, his academic lab has catalyzed the inception of four startups, spanning AI applications in healthcare to the development of autonomous vehicles.

Talk synopsis

AI for Applications in Psychiatry

Dr. Justin Dauwels

Many tasks in medicine still involve substantial manual work. In many cases, there is strong potential for intelligent automation by A.I., leading possibly to a reduction in costs and man-hours while increasing the quality of clinical service. In this talk, we will consider applications of AI in the domain of psychiatry. Specifically, we will give an overview of our research towards automated behavioural analysis for assessing the negative symptoms of mentally ill patients. Specifically, we will give an overview of our research towards automated behavioral analysis for assessing the negative symptoms of mentally ill patients.

Dr. Simon Haydar
Senior Vice President & Head, Integrated Drug Discovery Solutions (IDD),
Aragen.Life Sciences, Indianapolis, Indiana, United States

Profile

Dr. Simon Haydar is currently Senior Vice President & Head, of Integrated Drug Discovery Solutions (IDD) at Aragen. Dr. Haydar has over two decades of rich experience in building IDD capabilities and has spearheaded integrated projects to develop novel oral therapies for Neuroscience, Oncology and infectious diseases. Dr. Haydar has deep experience across discovery R&D leadership, licensing, due diligence, biotech alliances & partnerships, external R&D activities, mergers and acquisitions. In his current role, Dr. Haydar is responsible for designing and implementing Aragen's overall IDD scientific strategy, overseeing the end-to-end execution of partner programs and ensuring the delivery of high-quality candidates for clinical development. Before joining Aragen he was Executive Director, Integrated Capabilities and Drug Discovery at Syngene International Limited. He has assumed senior leadership roles in Organizations like Assembly Biosciences, Eli Lily, GSK and Pfizer.

Talk Synopsis

"Digital Disruptors and Emergence of AI in Drug Discovery"
Artificial intelligence (AI) offers the potential to transform drug discovery. Over the last few years, AI-enabled drug discovery has grown substantially. This presentation will provide a brief review of recent trends in Automation and AI/ML tools in the discovery of novel therapeutics.

Dr. Natalie Artzi

Principal Research Scientist, MIT Institute of Medical Engineering & Science, Cambridge, Massachusetts, USA

Profile:

Dr. Artzi is an Assistant Professor at the Department of Medicine, Division of Engineering in Medicine, Brigham and Women's Hospital, Harvard Medical School. She is a Principal Research Scientist at MIT and an Associate Member of the Broad Institute of Harvard and MIT. She completed her postdoctoral studies at the laboratory of Prof. Elazer Edelman at MIT focusing on studying tissue: biomaterial interactions and designing smart biomaterials for therapy and diagnosis applications. Dr Artzi is the recipient of multiple grants and awards, including the One Brave Idea award, Stepping Strong Innovator Award, Controlled Release Society Young Investigator Award, Mid-Career Award from the Society for Biomaterials, Bright Futures Prize, and the Massachusetts Life Science Center for women entrepreneurs. Currently, Dr Artzi directs multiple research venues aiming to integrate science, engineering and medicine to rationally design personalized materials to improve human health and has co-founded a startup company, BioDevek, which develops next-generation biomaterials to improve outcomes following internal surgeries.

Talk synopsis

Engineering therapeutic immunity to glioblastoma through the intracranial delivery of chemoimmunotherapy using adhesive hydrogels

Immunotherapy is a promising modality for the treatment of glioblastoma (GBM) due to its ability to stimulate specific, potent anti-tumour immune responses; however, like in many other solid tumours, only a subset of patients has derived clinical benefit. This lack of efficacy can be partially attributed to the inability of immunomodulatory agents

to achieve the appropriate spatiotemporal kinetics to elicit therapeutic responses when administered systemically, and due to the inability of monotherapy to overcome the numerous immunosuppressive mechanisms and rapid growth rate of GBM. In this study, we investigated the efficacy and immunomodulatory mechanisms of local hydrogel-mediated delivery of chemo immunotherapy—a cyclic dinucleotide (CDN) stimulator of interferon gene (STING)-agonist and doxorubicin—in combination with checkpoint blockade antibodies. STING agonists are powerful immunomodulatory therapeutics as they induce the production of Type I interferons and other proinflammatory cytokines, which enhance the recruitment and activation of dendritic cells that can license both T-cell dependent and independent (natural killer cell, macrophage) anti-tumour immunity. We hypothesized that the local delivery of combination CDN and doxorubicin chemoimmunotherapy using an injectable adhesive hydrogel would improve therapeutic outcomes by enabling efficient penetration and retention of chemo immunotherapy in the tumor. This therapy will drive immunogenic cancer-cell death and the release of tumor antigens while potently activating immune cells in the tumor microenvironment and draining lymph nodes to propagate multi-axis tumor-specific immune responses and establish immune memory. In mice bearing orthotopic, syngeneic GL261 tumors, treatment with a single injection of chemoimmunotherapy hydrogel combined with systemic anti-PD-1 resulted in curative survival and potent immune memory protection from contralateral hemisphere rechallenge in all treated mice, whereas intratumoral injection of free therapies did not extend mouse survival. Pharmacokinetic and immunophenotyping studies demonstrated that local hydrogel therapy persisted for up to three weeks in vivo and induced significant alterations in multiple immune compartments of the tumor microenvironment and draining lymph nodes. Our results demonstrate that sustained local delivery of immunogenic therapies using our adhesive hydrogel platform can induce and maintain effective, durable immune responses that potently eliminate intracranial tumors and prevent their recurrence, establishing an effective platform for GBM immunotherapy.

Dr. Hemanta Baruah
Founder & CEO, Aakha Biologics, Dallas-Fort Worth Metroplex, USA

Profile

Dr. Hemanta Baruah founded Aakha Biologics in 2021 and is currently the president and CEO of the company. Aakha Biologics is an immuno-oncology company that is engaged in developing novel bispecific antibody assets for potential treatment of multiple solid tumor indications. Prior to founding Aakha, he was an Entrepreneur in Residence (EIR) at Alloy Therapeutics from 2020 to 2021. Dr. Baruah has more than 20 years of research experience. His PhD research was dedicated to understanding the interaction of platinum-based drugs with DNA using multi-dimensional NMR experiments. He joined Massachusetts Institute of Technology (MIT) in 2005 as a postdoctoral fellow in a chemical biology group where his focus was protein engineering. Dr. Baruah Joined Adimab in 2009 as a scientist and led several very successful antibody discovery campaigns including the discovery and development of Sintilimab (an approved anti PD-1 mAb). From 2018 to 2020 Dr. Baruah was leading the antibody discovery and development team at Dragonfly Therapeutics. Under his leadership a number of successful programs were licensed by major pharmaceutical companies. In summary, Dr Baruah is an experienced drug developer with an approved checkpoint inhibitor and several additional candidates in advanced clinical trials.

Talk synopsis

Aakha Biologics is utilizing a novel bispecific antibody platform that harnesses the full potential of NK cell cytotoxicity. One of the immune escape mechanisms of advanced metastasis tumours is through the shedding of ligands that are otherwise recognized as “kill signal” by activating receptors expressed on the surface of NK cells. Our

bispecific assets generate a strong net activation signal by blocking the shedding of those ligands and by allowing the efficient engagement of other activating receptors.

Dr Pawan K. Dhar
Professor, Biotech Scientist
Jawaharlal Nehru University, India

Profile

Prof. Pawan K. Dhar is currently Head, Synthetic Biology group at the School of Biotechnology, Jawaharlal Nehru University, New Delhi. Prof. Dhar received his Ph.D. degree in 1993 from BHU (Varanasi) in Human Genetics. One of his significant contributions has been to develop a novel drug discovery platform from DNA sequences historically considered junk. In the past, Prof. Dhar has headed RIKEN (Japan) and TCS (Hyderabad) program on metagenomics, established research labs in India, Singapore, and Japan. In addition to publishing in the areas of human genetics, systems biology, and synthetic biology, he has co-founded India's first lab grown meat company.

Talk synopsis

Entrepreneurship in biotechnology - a personal experience

Abstract: Biotechnology entrepreneurship has been an incredible journey filled with challenges, failures and triumphs. My foray into this field began with a deep fascination for synthetic biology and its potential to revolutionize healthcare. With my Post Doc, we started Foresight Biotech Pvt. Ltd., a drug discovery company based on our 15 years of work in Dark Genome. Nearly four years back, we cofounded another company, Clear Meat Pvt Ltd - the first lab grown meat company in India. Convincing investors of the potential of our biotech innovation was an arduous process, but it taught me the importance of persistence and refining the pitch and delivering a story. Once the initial financial hurdle was overcome, the real work began. After a series of failures and long hours on the bench, we developed ClearX9, a serum free complete animal cell culture medium. Next in the line was edible scaffold and cultured meat. The scientific innovation was exhilarating, but it came with its own challenges, from navigating complex regulatory pathways to securing funding. Amidst these challenges, the satisfaction of seeing our product in the hands of scientists was immeasurable. Witnessing its impact on the emerging food industry reinforced my belief in the

transformative power of biotechnology. In my talk, I would describe our journey in both the companies, lessons learnt and key message for the budding entrepreneurs.

Santosh Kumar Balivada
CEO - Centre for Additive Manufacturing, AMTZ
Andhra Pradesh, India

Profile

He heads the Center of Excellence at AMTZ which is established under the National Strategy for Additive Manufacturing by the Government of India. He manages national and global partnerships techno-commercially and leads different manufacturing technology verticals like Medical Materials, Ultrafast Lasers, Optoelectronics, Medical Imaging & Radiation Physics at AMTZ. Earlier in his career before Med Tech, he has worked with Astrophysics and Design of Telecommunication Networks. His expertise includes R&D, business development, operations management, design thinking and product development in Medical Devices converging various advanced manufacturing segments. His projects in last three years span from Setting-up Automated Molecular Diagnostics device production to managing EMI-EMC testing for Medical Devices. He has been part of the core team driving establishment of India's indigenous capacity in radiology space for MRI, X-Ray Detectors, Tubes, LINAC and Cyclotron projects. Currently, he and his team are working bring out impactful innovations in Medical Materials. His current research areas are Surface Enhanced Raman Spectroscopy, Ultrafast Lasers and Implant materials, Pacemakers. He has many publications to his name in Photonics and Optics. He is also ISO 13485: Certified Lead Auditor for Medical Device QMS and a member of Bureau of Indian Standards Sectional Committees for Cardiovascular Instruments, Neurosurgery Implants, Eletromedical Diagnostic Imaging, Radiotherapy equipment. Mr. Santosh is also leader in Entrepreneurship continuously interacting and networked with more than 70 start-ups and several national incubators in various capacities mentoring and evaluating for capital funding. He possesses vast exposure and proven track record of successfully collaborating with national organizations such as the Ministry of Commerce, Ministry of Science & Technology, and Ministry of Electronics in executing large-scale projects for the country.

Dr Kavita Reginald

Associate Professor
Head, Department of Biological Sciences, School of Medical and Life Sciences
Sunway University, Malaysia

Profile

Dr. Kavita is currently an Associate Professor and head of the Department of Biological Sciences at the School of Medical and Life Sciences at Sunway University, Malaysia. In her capacity, she oversees three undergraduate and two post-graduate degree programmes at the department. Dr. Kavita's primary research focus is within the field of immunology and allergy. Having earned her PhD in allergy from the National University of Singapore, she furthered her expertise through two post-doctoral fellowships at renowned institutions in Austria and France. Upon returning to Malaysia, she set up the Allergy Research Laboratory at Sunway University, where she currently conducts her research and trains post-graduate students. Her research interests revolve around better understanding why allergic diseases occur and identifying innovative solutions to diagnose and treat these diseases. In addition to her research endeavours, Dr. Kavita is the Assistant Secretary of the Malaysian Society of Allergy and Immunology. This non-governmental organization is committed to advancing patient care and enhancing the quality of life for individuals affected by allergies. Dr. Kavita's involvement underscores her commitment to the broader goals of society, aligning with its mission to promote improvements in patient care and overall well-being for those grappling with allergies.

Talk Synopsis

Advances in molecular allergology research

Precision medicine stands as a cornerstone in the realm of bioengineering applications. The exploration and application of precision medicine, encompassing both diagnostic and therapeutic aspects, are currently subjects of intensive research within the field of allergies. Allergies, characterized by Immunoglobulin-E-mediated reactions to ostensibly harmless agents, have the potential to elicit inflammatory responses in approximately 25% of the world's population. These reactions can manifest in various forms, including allergic rhinitis, asthma, food allergies, and eczema. Despite affecting a significant segment of the population and leading to a diminished quality of life, with potentially life-threatening consequences, current diagnostic and therapeutic methods fall short in precisely identifying the cause of allergy triggers and efficiently treating them. The integration of precision medicine, coupled with the use of purified, recombinant allergens, emerges as a strategy to enhance the accuracy of allergy diagnosis. Additionally, innovative designs for allergy vaccines aimed at allergen immunotherapy hold promise for improving the standard of care in managing allergic conditions. A multidisciplinary approach that integrates precision medicine with point-of-care tools would make precision diagnostics of allergies accessible to allergic individuals, ultimately guiding the correct therapeutic approach. This integration would result in better treatment outcomes and an enhanced quality of life among allergic patients.

Dr Shailaja Saxena
Business Head - Diagnostics and Regenerative Medicine
Reliance Life Sciences, India

Profile

Dr. Shailaja Saxena, a distinguished figure in the field of healthcare and life sciences, currently serves as the Business Head for Diagnostics and Regenerative Medicine at Reliance Life Sciences in India. Her illustrious career has been marked by a deep commitment to advancing medical technologies and a relentless pursuit of excellence in the healthcare industry. With a robust educational background, Dr. Saxena earned her advanced degrees in the medical sciences, establishing a strong foundation for her subsequent contributions to the field. She possesses a keen understanding of the intricacies of healthcare, diagnostic methodologies, and regenerative medicine, making her a prominent thought leader in her domain. Dr. Saxena's journey at Reliance Life Sciences has been nothing short of transformative. As the Business Head for Diagnostics and Regenerative Medicine, she plays a pivotal role in steering the company's strategic initiatives in these critical areas. Her visionary leadership has not only led to the expansion of the company's portfolio but has also positioned Reliance Life Sciences as a key player in the rapidly evolving landscape of healthcare solutions. Regenerative medicine, another frontier that Dr. Saxena has ardently explored, holds immense promise for the future of healthcare. She has been instrumental in driving research and development initiatives that harness the potential of regenerative therapies to address various medical conditions. Dr. Saxena's forward-thinking approach has positioned Reliance Life Sciences at the forefront of regenerative medicine advancements, paving the way for groundbreaking treatments and solutions. In summary, Dr. Shailaja Saxena stands as a trailblazer in the realms of diagnostics and

regenerative medicine. Her leadership at Reliance Life Sciences has not only elevated the company's standing in the industry but has also played a crucial role in shaping the future of healthcare in India and beyond. Dr. Saxena's unwavering commitment to innovation, coupled with her passion for improving patient outcomes, establishes her as a dynamic and influential figure in the field of healthcare and life sciences.

Dr. Mahesh J Kulkarni
Senior Principal Scientist, AcSIR Professor and Associate Dean (BS)
Biochemical Sciences Division, CSIR-National Chemical Laboratory
Pune, India

Profile:

Dr. Mahesh J Kulkarni is a Senior Principal Scientist in the Biochemical Sciences Division of CSIR National Chemical Laboratory Pune. He is instrumental in setting up a mass spectrometry and proteomics facility at NCL. He has guided 15 PhD students hitherto and has published more than 90 articles in reputed journals like Molecular Cellular Proteomics, Journal of Proteome Research, Proteomics, RSC Advances, Molecular Biosystems, Journal of Proteomics, Scientific Reports, Aging Cell, Elife, BBA Molecular Basis of diseases etc. He has led several important projects as a Principal Investigators. Dr. Kulkarni has contributed significantly to understanding protein glycation in diabetes by using mass spectrometric and proteomics approaches. Recently, he has started working on developing and characterization of bio therapeutics. He is an editorial member of reputed journals such as Scientific Reports, Clinical Proteomics Journal, Journal of Proteins and Proteomics, and Chronicle of Diabetes Research and Practice. He was elected a Fellow of the Maharashtra Academy of Sciences in 2016. He was Raman Research Fellowship, to visit the University of Turku, Finland, in 2016.

Talk Synopsis

Towards the development of glycated peptides of albumin as alternative diagnostic markers for diabetes and its complications

Diabetes treatment and management heavily rely on glycated haemoglobin HbA1c levels. However, it is influenced by RBC lifespan, anaemia, albumin levels, ethnicity,

etc. Also, it is not efficient in predicting prediabetes and diabetic complications. On the other hand, glycated albumin (GA) is emerging as a potential marker since it is readily accessible for glycation in plasma since it is the most abundant plasma protein and has 85 glycation sites, 59 lysine, and 26 arginine residues. GA, a predominant advanced glycation end product AGE in the plasma, binds to the receptor for AGE RAGE, causing oxidative stress and inflammation and contributing to the pathogenesis of diabetic complications. To this end, we have synthesized glycated albumin by modifying it with either glucose, glyoxylic acid, or methylglyoxal. The glycated albumin was digested and analyzed by the high-resolution accurate mass spectrometer. The glycated peptides identified were manually annotated, and a comprehensive mass spectral library was developed for targeted quantification (Mol Cell Proteomics. 2015). Amongst these 59 lysine residues, we have found K36, K438 and K549 to be glucose-sensitive lysine residues, and the glycated peptides involving these lysine residues were found to be significantly abundant in prediabetes (J Proteom, 2019) and diabetic nephropathy (ACS Omega 2023). These peptides also showed a good correlation with the various clinical parameters such as blood glucose, HbA1c, and lipid profile. Further, based on the literature survey, one of these peptides, namely KQTALVELVK involving lysine K549, was selected for developing an immunoassay for diagnosing diabetes and its complications.

Dr. Andreas Bender
Director, Digital Life Sciences at Innovation Campus Berlin (ICB)/Nuvisan Berlin.

Profile

Dr Andreas Bender is a Professor for Molecular Informatics at Cambridge University, working on data analysis methods related to compound safety and efficacy. Previously he was a Director for Digitial Life Sciences at Nuvisan in Berlin, as well as as an Associate Director for Data Science and AI in the Clinical Pharmacology & Safety Sciences group at AstraZeneca. On the entrepreneurial side, Andreas was involved in setting up Healx Ltd. (for data-driven drug repurposing) and PharmEnable Ltd. (for designing novel chemistry for targets that are difficult to drug conventially), both based in Cambridge/UK. He received his PhD from the University of Cambridge and worked in the Lead Discovery Informatics group at Novartis in Cambridge/MA as well as at Leiden University in the Netherlands as well as AstraZeneca before his current post.

Talk synopsis

Artificial Intelligence in Drug Discovery: We Need to Appreciate the Characteristics of Chemical and Biological Data to Really Make Progress

Andreas Bender, University of Cambridge and Pangea Botanica

The amount of chemical and biological data available has increased in the public as well as the private domain, and both on the algorithmic and hardware side progress has been tremendous in machine learning. Press releases describe the design of functional proteins and antibodies from scratch, and several ‘first AI-designed drugs’ have

already entered clinical phases. However, all is not well when it comes to the marriage of algorithms with drug discovery, in particular when it comes to the *in vivo* relevance of what we are able to do with chemical and biological data at this point in time. Reasons for this are that the field is still stuck in reductionist thinking, in combination with a lack of relevant data (and our ability to handle it computationally) and the formation of too many, too narrow specialist domains (among other reasons). This contribution will point out several areas, from data to algorithms to human mindset, that need changing to benefit fully from available compute power when it comes to *in vivo* relevant decision making in drug discovery in the future.

Dr Hemant Gautam
Chief Scientist, IGIB, Delhi

Profile

Dr. Hemant Gautam: A Leading Scientist at the Forefront of Genomic Research Dr. Hemant Gautam, currently serving as the Chief Scientist at the Institute of Genomics and Integrative Biology (IGIB) in Delhi, is a distinguished figure in the field of genomics. With an extensive background in life sciences, Dr. Gautam has emerged as a leading authority in genomic research, contributing significantly to advancements in the understanding of the human genome. Dr. Gautam's academic journey is marked by notable achievements and a profound commitment to scientific inquiry. His expertise spans various facets of genomics, and he has been actively involved in groundbreaking research projects aimed at unraveling the complexities of genetic information. As the Chief Scientist at IGIB, Dr. Gautam leads the institution's research endeavors, overseeing innovative projects and initiatives that contribute to the broader scientific community. His leadership has played a crucial role in positioning IGIB as a hub for cutting-edge genomic research in India. Beyond his institutional role, Dr. Hemant Gautam is actively engaged in collaborative efforts, both nationally and internationally. His contributions to scientific literature, participation in conferences, and mentorship of emerging researchers highlight his dedication to advancing the field of genomics. In summary, Dr. Hemant Gautam stands as a key figure in genomic research, leading the way in unraveling the mysteries of the human genome. His role as the Chief Scientist at IGIB underscores his commitment to pushing the boundaries of scientific knowledge and fostering advancements in genomics for the benefit of society.

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7th INTERNATIONAL CONFERENCE ON RECENT TRENDS IN BIOENGINEERING (ICRTB-2024)

(January 19 – January 20, 2024)

Detailed Schedule

Day 01: January 19, 2024, Friday(Timings are in IST)

Inauguration (Venue: R. K. Auditorium, MIT- ADT University)	
8.30 am to 9.30 am	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-ADT University
9.30 am to 9.35 am	Welcome of audience by the anchors, World Peace prayer and lamp lighting
9.35 am to 9.45 am	Introduction of guests and conference theme by Convenor Dr. Renu Vyas
9.45 am to 9.50 am	Welcome speech by Prof Vinayak Ghaisas Founder Director, MIT Bioengineering and Trustee MAEER Pune
9.50 am to 9.55 am	Felicitation of guests by dignitaries
9.55 am to 10.00 am	Release of abstract book by dignitaries on the dais
9.50 am to 10.00 am	Brief remarks by the Chief Guest Dr Sunil Bhagwat and guests of honour
10.00 am to 10.15 am	Speech by Prof Mangesh Karad, Executive President and vice chancellor, MIT Art, Design and Technology University
10.15 am to 10.30 am	Motivational Talk by Hon. Dr. Vishwanath Karad sir, Founder MIT group of institutes Pune and President MIT ADT University
10.30 am to 10.35	Vote of Thanks
10.35 am to 10.45	Tea break and group photo
11.15 am to 1 pm	Key Note Addresses session I , Session Chair : Dr Vyas
11.15 am to 11.45 am	**Prof. Sunil Bhagwat** Director, IISER Pune, India
11.45 am to 12.15 pm	**Dr. Anil Prasad Dash** Director, HEMRL, DRDO, India
12.15 pm to 12.45 pm	**Dr. Kirsten Rosselot** Director, Process Profiles, California, USA

1.00 pm to 2.30 pm	Lab Inauguration by dignitaries, Lunch Break, poster session,
2.30 pm to 5.00 pm	Plenary Session I Session Chair : Dr Kirsten
2.30 pm to 3.00 pm	**Prof Jeremy Simpson** College Principal & Dean of Science, UCD College, Dublin, Ireland
3.00 pm to 3.30 pm	**Dr. Mandar Bodas** Solution Consultant, Elsevier India
3.30 pm to 4.00 pm	**Prof. Simon Wang** Professor, Howard University, Washington DC, USA
4.00 pm to 4.30 pm	**Dr. Justin Dauwels** Professor at Technische Universiteit Delft, Netherlands
4.30 pm to 5 pm	**Dr Simon Hayder** Senior Vice President, Aragen Life Sciences, Indiana, USA
5.00 pm to 6.30 pm	Poster Evaluations
6.30 pm	Tea and snacks

Day 02: January 20, 2024, Saturday

8.30 am to 9.00 am	Tea and Breakfast
9 am to 11am	Keynote addresses Session II Session Chair Dr Mandar Bodas
9.00 am to 9.30 am	**Dr. Natalie Artzi** Associate Professor of Medicine, Harvard Medical School Associate Faculty Member, Wyss Institute for Biologically-Inspired Engineering, Harvard University Principal Research Scientist, IMES, MIT, USA
9.30 am to 10 am	**Dr. Hemanta Baruah** Founder & CEO, Aakha Biologics, Dallas-Fort Worth Metroplex,
10 am to 10.30 am	**Dr. Pawan K. Dhar** Professor, Biotech Scientist, Jawaharlal Nehru University, India
10.30 am to 10.45 am	Tea Break, Poster session and Visit to Industry Stalls
10.45 am to 1.00 pm	Plenary Session II Session Chair Dr. Neeraj
10.45 am to 11.15 am	**Mr. Santosh Kumar Balivada** CEO - Centre for Additive Manufacturing, AMTZ, Andhra Pradesh,
11.15 am to 11.45 am	**Dr. Kavita Reginald** Head, Dept. of Biological Sciences Sunway University, Malaysia

11.45 am to 12.15 pm	**Dr. Shailaja Saxena** Business Head - Diagnostics and Regenerative Medicine, Reliance Life Sciences, Mumbai India
12.15 pm to 1.30 pm	Lunch break
1.30 pm to 4.00 pm	Plenary Session III Session Chair Dr Pawan Dhar
1.30 pm to 2.00 pm	**Dr. Mahesh Kulkarni** Chair, Biochemical Division, Senior Principal Scientist, CSIR NCL,
2.00 pm to 2.30 pm	**Dr. Andreas Bender** Chief Informatics and Technology Officer (CITO) Pangea Bio, Berlin, Germany
2.30 pm to 3.00 pm	**Dr. Hemant Gautam** Chief Scientist, IGIB, Delhi, India
3:00 pm to 3.15 pm	Tea break
3.15 pm to 5.00 pm	Oral presentations by delegates (parallel sessions)
5.00 pm to 5.45 pm	Valedictory function, announcement of Prizes, feedback from delegates, concluding remarks by Director, National Anthem
5.45 pm to 6.30 pm	Conclusion

INDEX

Sr. no	ID	Abstract	Page no.
		Oral Presentations	
1		**Eco-friendly LDPE degradation by Microbes (Bacteria, Fungi) from garbage soil**	2

Oral Presentation

OP-002

Green synthesis of magnesium oxide nanoparticles and its biological applications

Parashuram Shivappa[1] and Chandrappa Mukappa Kamanavalli[1*]

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Abstract: Nanoparticles (NPs) have proven applications in scientific domains. NPs have a greater impact on in vitro and in vivo models due to their exceptional diagnostic and therapeutic applications. In this study, we utilised plant phytochemicals in combination with metal oxide NPs as a viable option. The MgO NPs were characterised using SEM and TEM studies. The NPs show an unevenly distributed polygonal shape, with sizes ranging from 30 to 60 nm. The EDX spectrum validated the elemental composition of MgO NPs. The results of the antioxidant activity of the samples (plant extract, NPs, and AA) showed good antioxidant properties. MgO NPs display a notable antiangiogenic effect on the chick embryo in the chorioallantoic membrane (CAM) experiment. MgO NPs toxicity was evaluated in KYSE-30 and PANC2 human cancer cell lines. The MTT assay revealed the cytotoxic effect, with IC_{50} values found to be 54.41 and 34.56 µg/mL, respectively, after 48 h of treatment. The results showed that MgO NPs have the potential to be used in biological, pharmacological, and other applications.

Keywords: Green synthesis, magnesium oxide nanoparticles, antioxidant, antiangiogenic, anticancer activity.

ISBN: 978-93-6039-051-8

OP-004

Antibacterial and antibiofilm activities of bacteriocin produced by a new strain of *Enterococcus faecalis* BDR22

Bandita Dutta[1], Debarati Basu[1], Dibyajit Lahiri[2], Moupriya Nag[2], Rina Rani Ray[1]*

[1]Department of Biotechnology, Maulana Abul Kalam Azad University of Technology, West Bengal
[2]Department of Biotechnology, University of Engineering and Management, Kolkata

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Abstract: Antibiotic resistance generated due to rampant misuse of antibiotics and almost 80% recalcitrant bacterial pathogens are not easily treated by antibiotics due to existence of biofilm. Hence, an alternative strategy needs to be adopted so that this biofilm forming recalcitrant infectious agents can be treated without the development of antibiotic resistance. Bacteriocins, being considered as one of such therapeutic option, are the ribosome mediated proteinaceous toxins having the potential to inhibit the growth of small range of bacteria. In the present study, after screening number of sources, a bacteriocin producing strain *Enterococcus faecalis* BDR22 was isolated and identified from one dairy product that showed marked reduction (around 80%) in the growth of planktonic cells of Gram-positive *Staphylococcus aureus* (ATCC 23235) and Gram-negative *Pseudomonas aeruginosa* (ATCC 10145) compared to the conventional antibiotic tetracycline in minimum concentration of 7.477µg/mL (w/v). The considerable reduction of the biofilm forming sessile cells with no significant cell revival even after removal of the treatment was also perceived with 87.12±0.02% and 86.37±0.015% reduction of *S. aureus* and *P. aeruginosa* respectively. The Extracellular Polymeric Substance content of the biofilm was also reduced with a total carbohydrate reduction of 84.78±0.01% in *S. aureus* and 84.11±0.007% in *P. aeruginosa.* The molecular docking interactions with docking energy ΔG of -54.40 kcal/mol and -66.2373 kcal/mol validate the affinity of the bacteriocin towards the biofilm forming protein confirming the competence of bacteriocin produced by the working strain to act as antimicrobial and antibiofilm agent against several common pathogenic bacteria replacing antibiotics.

Keywords: Bacteriocin, *Enterococcus faecalis*, antibacterial, antibiofilm, molecular docking.

OP-005

ISBN: 978-93-6039-051-8

Comprehensive Machine Learning Framework for Neurological Stress Detection from Physiological Signals

Akshita Singh*[1], Aiswarya S[1], Sneha M L[1], Ashishkrishnan V S[1], Gowtham G. Iyer[2], Manhazy Rashmi[1], Shiva Pratap Gopakumar[3], Radhagayathri Udhayakumar[2]

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**Corresponding author:*

Abstract: This research paper presents an extension of prior investigations focused on stress detection through non-EEG physiological signals. Leveraging the success of nonlinear feature extraction methods paired with popularly used models in previous studies, our current research explores a more comprehensive extraction of nonlinear features from non-EEG physiological data obtained from 20 subjects experiencing distinct neurological states: relaxation, physical stress, cognitive stress, and emotional stress. In phase 1 of our study the effectiveness of basic linear machine learning models like logistic regression in classifying various neurological states is assessed. Binary and multi-class classification approaches are explored. Under binary classification, we assessed relaxation versus stress. Furthermore, we investigated how these models perform in distinguishing a relaxed state from each specific stress condition, resulting in a four-class classification problem. Building upon this foundation, the next phase of our research expands the binary classification to encompass (a) relaxation versus stress, (b) relaxation versus physical stress, (c) relaxation versus cognitive stress, and (d) relaxation versus emotional stress. We examine the impact of feature reduction techniques including PCA and t-SNE on model performance. Additionally, the study explores the influence of cross-validation methods, such as K-fold and leave-one-out, on refining the model's accuracy and effectiveness in this specific context. The aim of this research is to provide valuable insights into the nuanced interplay of physiological signals and stress states, contributing to the broader understanding of stress detection methodologies.

Keywords: Stress detection, non-EEG physiological signals, nonlinear feature extraction, neurological states, machine learning, dimensionality reduction.

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OP-006

Effect of Fly ash & Microbes on Strength properties of Subgrade soil for Pavements

Thokalapudi suresh

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Abstract: This work investigates the utilization of microbial-induced calcite precipitation (MICP) treatment to improve the stability of soil by introducing Class F fly ash and Bacillus subtilis microbes. Various experiments were carried out using soil that was readily available in the vicinity area. The primary tasks consisted of mixing fly ash and subsequently utilizing varying quantities of fly-ash. The experiment involved the incorporation of fly ash at varying ratios, specifically 5%, 10%, 15%, 20%, 25%, and 30%.The soil's characteristics are influenced by the presence of fly ash, as evidenced by the following tests: reduction in liquid limit, increase in UCC and CBR values, analysis of soil compaction under high pressure, measurement of unconfined compressive strength (UCC) at various time intervals (0, 3, 7, 14, and 21 days), and assessment of California bearing ratio (CBR) for soil samples with varying amounts of fly ash. The most favorable results are obtained by integrating 25% fly ash into the soil, surpassing all other quantities. Following the introduction of Bacillus subtilis C4nc8 bacteria, the OMC is blended with a mixture consisting of 25% fly ash and soil. In addition, it is shown that the optimal values for CBR (2.2 times higher than that of soil) and UCC (6.5 times higher than that of pure soil) are attained by blending soil with 25% fly ash and microorganisms. Ultimately, the addition of soil, 25% fly ash, and microorganisms has been discovered to significantly improve the CBR strength of the subgrade.

Keywords: Fly ash, clayey sand, microbes, ucc, cbr.

ISBN: 978-93-6039-051-8

OP-008

Secondary Metabolites for New Age Potent Bio-Pesticides Formulations

Bhagyashree Popat Mane, H.V. Thulasiram

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Abstract: There are many obstacles in the way of extracting terpenoids from neem, such as problems with yield and purity and the high cost of doing so on a wide scale. In addition to complicating matters, batch-to-batch variability makes it challenging to establish repeatable and consistent bioactivity. In addition, addressing market demand for biomasses with a low carbon impact presents scalability challenges. An alternate strategy to overcome these obstacles is to produce high-value neem compounds by using heterologous hosts like Saccharomyces cerevisiae or Escherichia coli. known to be usually safe, these hosts have the potential to be more functional and high-quality than those that use more conventional extraction techniques. The functional characterization of terpene genes involved in isoprenoid biosynthesis is the main goal of the proposed study. Using concepts from synthetic biology, the goal is to maximize production in metabolically tractable heterologous systems, including bacteria and in vitro and in vivo plant systems. This approach holds promise for overcoming the limitations of large-scale extraction and providing a more controlled and scalable method for meeting the market demand for neem chemicals.

Keywords: Neem, terpenoids, secondary metabolite, functional characterization.

ISBN: 978-93-6039-051-8

OP-009

Biosynthesis of copper oxide nanoparticles using *Simarouba glauca* leaf extract and screening for their antibacterial, antioxidant and anti-cancerous applications

Anjana Thatesh Gaddigal[1] and Chandrappa Mukappa Kamanavalli[1*]

[1,*] *P. G Department of Studies in Biochemistry, Karnatak University, Dharwad-580 003 India*

**Corresponding author: cmkamanavalli@gmail.com*

Abstract: The green synthesis of copper oxide nanoparticles and their applications in biomedical field have gained huge attention in recent years due to their various physico-chemical properties. The present study 0.1mM of copper sulphate solutions is used as precursor to synthesis CuO NPs form *S. glauca* leaf extract, which was visually indicated by the color change from brown to green color and further calcinated at 200 °C for 2 h. The synthesized CuO NPs were characterized using X-ray crystallography (XRD) to detect the crystallinity of the particle and Transmission electron microscopy (TEM) indicated the rod-shaped structure of the CuO NPs. These were further screened for their biological properties like antibacterial, anti-angiogenic, antioxidant and anti-cancerous properties. CuO NPs showed great antibacterial activity for Gram-positive bacteria compared to Gram negative. The CuO NPs possessed antioxidant and angiogenic activity in dose dependent manner. The cytotoxicity effect of NPs was assed against HCT-116 and HeLa cell line, the IC_{50} value was found to be 17.89±0.60 µg/ml and 20.21±0.33 µg/ml at 72 h. The anti-ROS property was assessed for both cell lines and the results were plotted using histogram.

Keywords: Copper oxide nanoparticles, *Simarouba glauca*, antioxidant, anti-angiogenic, anti-cancerous, anti-ROS.

ISBN: 978-93-6039-051-8

OP-010

Harnessing the role of Phosphate Solubilizing Bacteria (PSB) from the microbiota of *Azadirachta indica* in formulation of Nanotechnology based Bio-fertilizer

Sunita Fernandes[1] and Priyanka Sharma*[1]

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Abstract: As the global population expands, the demand for the food also surges. So, modern agriculture is escalating more in the use of agrochemicals to boost crop productivity with global higher food demand. The studies conducted by agriculturists highlighting the negative impacts on indiscriminate use of synthetic agrochemicals viz. nutrient depletion on account of soil degradation, water contamination and imbalance in the ecosystem. Hence, on considering the properties of nanomaterials and biofertilizers (PGPR), researchers are diving towards the development of sustainable and cost-effective nano-biofertilizer to enhance plant traits by minimizing climatic calamities. Nano-fertilizers provide increased nutrient availability, microbial revitalization, resistance to various diseases and reduced nutrient losses that can lead to improved crop health and yield. Since phosphorus is a necessary macronutrient for plant growth and development, PSB are able to convert insoluble forms of phosphate into soluble ones. These bacteria can be Nano-formulated to improve nutrient bioavailability and yield as well. *Azadirachta indica*, often known as Indian Lilac or Neem, has been recognized for its ethanopharmacological properties. This plant system interacts with several microorganisms that have been shown to be advantageous in the fields of bioenergy, medicine, and agrochemicals. Therefore, the present study emphasizes on the encapsulation of PSB by using biopolymers. These nano-polymer enabled bio-fertilizers significantly improve organic nutrient absorption while also retaining shelf life of bacteria to enhance the dynamics of soil-plant interaction as promising for sustainable agriculture.

Keywords: Nanotechnology, bio-fertilizers, phosphate-solubilizing bacteria(PSB), soil plant interaction, sustainable agriculture.

ISBN: 978-93-6039-051-8

OP-011

Modelling and analysis of multi-analyte based microfluidics system

Janani G K[1], Priyanshu Mondal[1], Sai Sirandana R[1], B R Subrahmanyam[1], R Parameshwari[*]

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**Corresponding author:*

Abstract: The modern healthcare sector has been revolutionized by the advent of point-of-care (POC) devices which enable rapid, accurate, and non-invasive diagnosis of patients around the world through their integration into wearable devices. The presence of microlevel POCs in wearable systems can enable continuous and precise monitoring of various diseases which leave behind distinct, detectable biomarkers in the form of biofluids. Microfluidics allow for the sensing of changes in the properties of fluids, and offer feasible methods for their control. In this research project, we aim to design a multi-layered microfluidic system that analyzes multiple clinical markers including, but not limited to, glucose, lactate, urea, and pH in order to facilitate the early diagnosis of hyperosmolar hyperglycemic state (HHS), a complex condition of diabetes. This design will be implemented on the user-friendly platform, COMSOL Multiphysics, utilizing its features to explore different microchannel geometries, optimize fluid flow rates, and predict the behavior of different analytes.

Keywords: Point of care devices, wearable devices, microfluidics, hyperosmolar hyperglycemic state, sweat, clinical markers, glucose, lactate, urea, pH, COMSOL Multiphysics.

ISBN: 978-93-6039-051-8

OP-013

Insights into *trichogramma chilonis* olfactory signalling: molecular cloning and expression profiling of pheromone binding proteins.

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Abstract: Chemical pesticides risk environmental pollution, harm to non-target species, and development of resistance in pests. In contrast, biological pesticides, like *Trichogramma*, offer targeted, sustainable solutions with minimal ecological impact and reduced potential for resistance. *Trichogramma chilonis*, a widely utilized biocontrol agent in India, was the focus of our study. Using the Illumina pair-ended sequencing platform, we conducted the first RNA-Sequence analysis of adult *T. chilonis*. The sequencing generated 18,372,639 high-quality reads, which were de novo assembled into 24,488 transcripts. *T. chilonis* specimens were mass reared on *Corcyra cephalonica* eggs, and total RNA isolation and mRNA purification were carried out. A specific gene, the Pheromone Binding Protein gene, was amplified using gene-specific primers, cloned into a TA vector, and transformed into DH5α cells. Positive clones were identified through colony PCR, and the inserted gene was confirmed by sequencing after restriction release. The obtained sequence underwent bioinformatic characterization, and the full-length gene was codon-optimized. The synthetic, codon-optimized gene was then cloned into a pET28a sumo vector and transformed into BL21 *E. coli* cells. Positive clones were confirmed by colony PCR. The expressed recombinant protein was purified and subjected to analysis using SDS PAGE. Confirmation of protein expression was further validated through western blotting. This comprehensive study provides valuable insights into the molecular aspects of *Trichogramma chilonis* and lays the groundwork for potential applications in pest management and crop protection.

Keywords: *Trichogramma*, cloning, biocontrol, pheromone binding protein.

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OP-014

Bioinspired Solutions: *Trichogramma chilonis* as a Dual weapon against Agricultural pests and antimicrobial resistance

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Abstract: India, the world's second-largest farming nation and a leading producer of fruits and vegetables, faces significant challenges in agriculture productivity due to pest infestations. Lepidopteran insects, a major pest group, impact crops such as cereals, pulses, vegetables, fruits, cotton, sugarcane, rice, and maize. Excessive pesticide use has led to resistance in pests, prompting a shift toward biocontrol agents for sustainable pest management. *Trichogramma chilonis*, an egg endoparasitoid, stands out as a commonly employed biocontrol agent against Lepidopteran pests. Its effectiveness in fields with diverse insecticide applications, including organo-chlorine, organophosphate, and pyrethroids pesticides, is notable. *T. chilonis* exhibits tolerance to organophosphate pesticides through mechanisms involving acetylcholine esterase insensitivity and altered esterase forms. In the pursuit of safer pesticide poisoning diagnostics, *T. chilonis* serves as a rich source of organophosphate-sensitive esterase. A project is underway to develop an affordable, rapid, and user-friendly dipstick assay for detecting organophosphorus and carbamate pesticides in biomedical samples. This tool aims to identify pesticide presence in saliva/serum, aiding in the timely administration of life-saving interventions for poison victims. Beyond pest control, *T. chilonis* reveals potential in combating infectious diseases and antimicrobial resistance. *T. chilonis* defensin from *T. chilonis* exhibit promise as alternatives to traditional antibiotics hindering the growth of opportunistic microbes introduced during the egg-laying process. Our Research involves cloning, domain synthesis, antimicrobial assays, and bioinformatics analyses. In summary, the versatile role of *Trichogramma chilonis* as biocontrol in agriculture, pesticide detection in biomedical samples, and the development of antimicrobial agents, showcasing its significance in addressing critical challenges in India's farming landscape and public health.

Key words: *Trichogramma chilonis*, Biocontrol, antimicrobial- peptides.

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OP-015

Cross-Cancer Drug Repurposing of Ten Digestive Tract-Related Cancer Drugs against Gastric Cancer Protein Targets

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Abstract: Gastric cancer is the fifth most common cancer overall and the fourth most common cause of cancer-related deaths, worldwide. At the time of diagnosis, most patients are already in advanced stages due to the high challenges of early diagnosis. It takes a long time, is expensive, and is unsuccessful in developing a new cancer treatment medicine promptly. Drug repurposing, a technique for identifying novel therapeutic agents from currently used medications and medicinal substances, has the potential to produce clinical benefits more quickly and at a cheaper cost than de novo drug development. Drug repurposing is a growing area of research that gives an existing medicine a new purpose. This study investigates ten digestive tract-related (oral, esophageal, pancreatic, liver, small intestine, gall bladder, colon, rectum, kidney, bladder) anti-cancer drugs selected from standard drug databases. The potential drugs are identified by profiling the results of molecular docking and dynamics simulations of known drugs against validated gastric cancer targets. A virtual compound library is also constructed from known gastric cancer drugs and prioritized for these known gastric cancer targets. This study makes use of a variety of techniques to enable drug repurposing and lead identification of already existing non-gastric cancer drugs as well as novel compounds for gastric cancer.

Keywords: Gastric cancer, drug repurposing, molecular docking, molecular dynamics, virtual screening, lead identification

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OP-016

Constructing comprehensive Omic database for Parkinson's disease in Indian subpopulation

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Abstract: Parkinson's disease represents a chronic and progressive neurological ailment that predominantly has an impact on the central nervous system. In industrialized nations, its prevalence is approximated at 0.3% across the general population and notably escalates to 3% among individuals aged 65 and above. A comprehensive analysis of the literature suggests that the epidemiological profile of Parkinson's disease in India may differ. Notably, many of the genetic mutations implicated in PD among other populations do not appear to be prevalent in the Indian context. So we are constructing appropriate database classifying the genetic data, SNPs, and drug interactions. It would greatly aid in understanding on PD which in turn can provide new insights in the control and treatment of PD. We have collected genetic data from different biological databases available (GenBank, PubMed). This data includes gene name, gene ID, FASTA sequence, also identifying mutations that result in Parkinson's disease phenotypes. The PD database catered to Indian population will help in scientific consensus among researchers and will foster research in the field. This work presents the development of a comprehensive genetic database for Parkinson's disease specific to the Indian sub-population.

Keywords: Parkinson's disease, genetic database, Indian sub-population, comprehensive

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OP-017

AI tools for prediction of Biomass energy: A Path to Circular Economy Sustainability

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Abstract: The energy business is undergoing a huge upheaval, fueled by cutting-edge technologies and increasing energy demands, which are encouraging the investigation of novel routes. Because of the production of greenhouse gases and their contribution to global climate change, fossil fuels continue to be the primary source of energy generation worldwide, and their use poses significant problems. For the use of fossil fuels, the agro-industrial biomass energy is one of the alternatives. The diverse varieties of agro-industrial biomass materials such as agriculture residues, energy grasses, bagasse, wood, straw and forest wastes are available widely and used abundantly all over the world as alternatives to produce energy. For efficient conversion of biomass into heat and power a detailed information of their diverse physical, chemical and thermal properties is essentially required. The heating value determines the energy content available with biomass thus determining the quality of biomass. The calorific value is one of the measure for heating value which is determined experimentally using Bomb calorimeter traditionally. But this method is costly, time consuming, strenuous and requires well define skillset and conditions for sample perpetration for more accurate result. For getting results more accurately and in less time a better and predictive method of biomass heating value is required. Artificial intelligence (AI) is evolving tool which offers new predictive models for better results and optimize energy systems operations. This approach helps in fighting with climate challenge and environmental challenges by reducing the required resources and increasing the result efficiency and accuracy. Various experimental advantages can be extracted for prediction of biomass heating value using various AI based models. Artificial Neural Network, Gaussian process regression, support vector regression is few of the AI tools have been used for determination of biomass heating value previously. The use of AI models in predicting the biomass heating value is time saving, reliable than predictions by empirical models and can be determined in real time

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compared to the laboratory methods. However, despite of handling huge data efficiently, the accuracy of the AI based model is always challenging.

Keywords: Biomass, Biomass heating value, energy, Artificial Intelligence, Artificial Neural network

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OP-018

Catabolism of monolignols by pseudomonads

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Abstract: Agriculture worldwide generates significant quantities of lignocellulosic biomass (LBM) that can become source of energy and materials. LBM comprises of cellulose, hemicellulose and lignin. While cellulose and hemicellulose, have been maximally exploited to produce fuels and chemicals, lignin is relegated to meet the power demands. Depolymerization of lignin by chemical catalysis yields a heterogenous stream of aromatic molecules, however separation to obtain a single molecule is laborious. Opting for biological route to valorize such streams is environmentally benign. While fungi have been maximally studied for degradation of lignin, they exhibit multiple bottlenecks which may become an impediment during commercialization. Bacteria are noteworthy for their catabolic potential of monolignols. In the current study, two well-known strains of Pseudomonas namely *Pseudomonas putida* KT440 and *Pseudomonas putida* S12 along with a Pseudomonad isolated from a soil were studied for growth and metabolic profile on monolignols as sole carbon source. All three strains exhibited different behaviour when grown on aromatic monomers derived from lignin singly or in concoctions. The findings of this work have paved a way for valorization of lignin to products of commercial importance.

Keywords: Lignocellulosic biomass, lignin, Pseudomonads, valorization.

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OP-19

Utilizing structural biology tools by neurosnap for affinity maturation of single domain antibodies (VHH) targeting immune checkpoints

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Abstract. The field of antibody-based therapeutics has consistently sought advancements in methodologies for candidate discovery and engineering. Historically, the discovery and development of biologics heavily relied on laboratory-based approaches; however, computational informatics methods have recently started exerting a notable influence. Specifically, deep learning, a subset of machine learning, has gained significant traction in biomedical research. Recent strides in big data mining through next-generation sequencing have not only revolutionized the landscape of therapeutic antibody discovery but have also yielded copious antibody repertoire sequencing data, thereby offering novel avenues for employing deep learning methodologies. This study introduces a novel model designed to simulate the binding process between multi-specific ligands and membrane receptors on cell surfaces. The investigation involved the generation of complementarity-determining region 3 (CDR3) mutated libraries comprising 32 sequences of FDA-approved anti-PD1 antibodies sourced from the TABS database. Leveraging artificial intelligence-based software tools such as Protein MPNN, ESM-1F1, and MIF-ST developed by Neurosnap.ai, we employed variant generation and conducted modeling in conjunction with molecular docking and molecular dynamics (MD) simulations to discover and redesign single-domain antibodies (VHH) against the same target with enhanced affinity and specificity. Strategically, CDRs targeting PD1 were integrated into structurally compatible antibody scaffolds. Subsequently, three single-domain antibodies (VHHs) targeting Programmed Death 1 (PD1/PDL1) antigens were designed and subjected to in silico testing. Computational characterization revealed the high stability of all designs, showcasing sub-nanomolar binding affinities (KDs) with PD1/PDL1. This methodology holds promise in facilitating the discovery of stable VHHs exhibiting sub-nanomolar KDs without the need for in vitro affinity maturation.

Keywords: Immune Checkpoint Inhibitor, single domain antibodies (VHH), homology modeling, molecular docking, MD simulation

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OP-020

Plasmid and its application in evolution of phytopathogenic bacteria *Xanthomonas citri* pv.*viticola*

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Abstract: Globally grape production is severely threatened by bacterial leaf spot which is caused by *Xanthomonas citri* pv. *viticola* (*Xcv*). The disease has gained considerable importance due to climate change. Genome diversity and distribution of genes responsible for various factors in the pathogen are not well understood. Plasmids are likely to play an important role in maintaining pathogenicity and developing bacterial fitness in the field. The evolution of pathogenicity factors and horizontal gene transfer events mostly occur due to plasmid. Present study was conducted at ICAR-NRCG, Pune to study several plasmid-borne traits in *Xcv* collected from twenty-three different locations. Four different curing agents viz. ethidium bromide (EtBr), acridine orange (AO), sodium dodecyl sulphate (SDS) and elevated temperature were used to cure the plasmid. The results demonstrated no diversity amongst plasmid size (23kb) of isolates. Wide range of variation was observed in the efficacy of curing agent and was observed that plasmid curing had a major impact on characteristics like shape, pathogenicity, exopolysaccharide synthesis, and antibiotic sensitivity. Cured *Xcv* had shown variation with respect to the traits tested. Phenotypic characters like colour, size, shape, elevation, appearance and margin were affected by the curing of plasmid indicating that these traits are plasmid-borne. Moreover, exopolysaccharide production and pathogenicity were significantly reduced in the cured isolates. Antibiotic sensitivity was the crucial part of the study which suggested that most of the isolates had resistance trait on the plasmid. This study highlighted the importance of plasmids as vehicles for exchanging genetic elements between plant pathogenic bacteria and contributing to bacterial adaptation to the environment.

Keywords: Plasmid, curing, antibiotics, pathogenicity, exopolysaccharide production *Xanthomonas citri* pv. *viticola*.

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OP-021

VGEF Protein docking and modeling studies to target the angiogenesis pathway in cancer with flavanone derivatives

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Abstract:
Plants and citrus fruits, such as oranges and lemons, naturally contain a molecule called flavanone, which has been shown to have anticancer properties. It primarily inhibits the apoptosis, cell cycle and angiogenesis. Since the bioavailability of flavanone is poor till today they are not considered as a prime therapeutic targets.it has been observed that modification of flavanone derivatives at its B- ring position may improves the bioavailability we used compound libraries like Drugbank, PubChem, and Sellkchem Database for this modification. VGEF having a molecular weight of 45 kilo Dalton which is homodimeric glycoprotein .it is a signaling protein and having a key role in embryogenesis and Angiogenesis .in cancer oncogene expression VGEF is the prime mediator of angiogenesis, in which it is up regulated by. For development and growth of tumer cell, it requires blood vessels for nutrients and oxygen. And angiogenesis process is essential for that. All of these factors will indicates that VEGF are the prime targets in cancer chemotherapy. The protein known as VGEF Receptor was obtained from the Protein Data Bank (PDBID: 4AG8). Using FlexX docking, the binding site was identified. FlexX docking software was used to dock flavanone and its congeners against the 4AG8 receptor protein. The Desmond Package was used to perform Molecular Dynamics simulations of the best-fitting molecule in order to validate the docking results. The potentials for stable conformations of non-covalent interactions such as electrostatic interaction, hydrogen bonding, and Vander Walls were computed. Therefore, using docking and molecular dynamics investigations, we were able to identify several flavanone derivatives that may be used as pharmacological targets to modulate VGEF

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arrest, including flavanone 39, flavanone 38, and flavanone 23. These compounds may also prove to be promising candidates for future cancer treatments.

Keywords: cancer, VGEF, flavanones, Molecular Docking, molecular Dynamics

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OP-022
Study of Insecticidal activity of nanoparticles

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Abstract: Insects are one of the major causes of infectious diseases. The major insect vectors fall under the category of Dipterans, and act as agents for emergence and re-emergence of viral diseases, globally. The purpose of the current study was to ascertain whether nanoparticles can be used as potential insecticidal agents, especially to control the Dipterans. *Drosophila melanogaster* was chosen as the model organism for this study. The larvae were fed with sub-lethal concentrations of Zinc oxide (ZnO) NPs and Copper oxide (CuO) NPs orally and were allowed to develope to the adult stage. The effect of these NPs on the development and reproductory functions of the organisms were evaluated. The NPs exhibited a negative impact on the development or reproductory functions of the organism. The NPs were ingested by *D. melanogaster* which resulted in significant morphological changes in the organism and in its subsequent generation. The lifecycle and the survivability of *D. melanogaster* was also significantly reduced. Further molecular characterization of the effect of NP and its evaluation on other members of the Dipteran family will be relevant to develop these as potential agents for vector control.

Keywords: Nanoparticles, Potential insecticidal, ZnO, CuO, Morphological changes

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OP-023

Identification of candidate biomarkers for recurrent ovarian cancer prognosis by integrated analysis of RNA-Seq and microarray data

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Abstract: According to American cancer society, the year 2022 has seen 19,880 patients being diagnosed with ovarian cancer (OC) and 12,810 deaths due to this disease. Over 75% of these cases were detected at advanced stages, requiring urgent surgical intervention and platinum-based chemotherapy. Most of death is due to delay in diagnosis and higher recurrence rate of the disease. In this study we identified recurrence-related differentially expressed genes (DEGs) for OC by integrating RNA Seq dataset and microarray dataset, obtained from TCGA-GDC portal and NCBI-GEO database, respectively. DEG analysis of datasets was performed using Bioconductor R packages DESeq2 and Limma. DEGs observed commonly between the microarray and the RNA seq datasets were selected for further analysis to identify hub genes, their functional analysis and for identifying the protein-protein interaction. Six recurrence related hub genes viz. CXCL1, CCL20, MMP1, IHH, S100A7 and FGF20 were identified and validated by survival analysis. Identified hub genes may have a strong influence on the prognosis of ovarian cancer recurrence and progression. Further, in vitro analysis of these hub genes can help in the identification potential biomarkers and drug targets.

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OP-024

AI-Based System for Real-Time Monitoring of Water Quality in context of the Indian Urban Water Landscape

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Abstract: Water quality monitoring is a crucial requirement for both environment and healthcare management. The growing challenges faced by India's diverse water bodies, demand more efficient real time monitoring systems that enable proactive interventions and actionable insights. To address these need, the present work introduces an AI-driven system aimed towards significant improvement in water quality monitoring, offering real-time insights, adaptive learning and predictive capabilities. The proposed system comprises of a network of sensors to be strategically placed across different water sources and collect real time data on key indicators such as pH, dissolved oxygen, contaminants, turbidity, nutrient levels etc. These data points are transmitted to an in-house central AI-powered platform enabled with sophisticated machine learning models to identify anomalies. The derived insights will be disseminated to facilitating decision-making with actionable recommendations for water management and benefiting stakeholders. The system also aligns with the government's initiatives for a "Digital India" by leveraging technology to enhance environmental monitoring and safeguard water resources. Thus by harnessing the power of artificial intelligence, remote sensing technologies and IoT devices the proposed integrated system has the potential to enhance water quality management, ensuring the availability of clean and safe urban water. As a case study, a GP model utilizing a dataset of 3276 values for critical water quality parameters has been built and the preliminary results will be presented during the conference.

Keywords: AI, adaptive learning, environment monitoring, IoT, remote sensing, real-time, machine learning water quality monitoring, sensor.

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OP-025

Effect of Chemical and Bio fertilizers on the Yield of Soybean production

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Abstract: The utilization of biofertilizers is a key point for sustainable agriculture farming and its use is an eye-catching research area to enhance plant growth and yield. The current study delves into the intricate dynamics of soybean cultivation by examining the combined application of chemical and biofertilizers. Emphasizing the pivotal role of soil testing and the meticulous screening of biofertilizers. The research aims to elucidate the interactions that shape their efficacy in soybean production. A focal point of the investigation involves a comparative analysis between the conventional use of chemical fertilizers and the targeted application of carefully screened biofertilizers. The study goes beyond mere yield assessments delving into the intricate details of nutrient value variations resulting from these distinct fertilization approaches. The overarching goal is to offer insights that can inform sustainable agricultural practices, providing a bridge between traditional fertilization methods and innovative environmentally friendly approaches. The anticipated findings hold promise not only for optimizing soybean yields but also for contributing valuable knowledge to the broader discourse on precision agriculture and the quest for resilient and sustainable food production systems.
Keywords: Bio-fertilizers, Bioengineering, Chemical fertilizers, Soya bean, Agricultural farming

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OP-027

Engineering the Tumor Microenvironment: A novel strategy in Breast Cancer therapeutics

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Abstract: Breast cancer is the most prevalent cancer and is leading cause of cancer related deaths among women worldwide. Increasing incidence and mortality for breast cancer, in spite of availability of various therapies, is a matter of deep concern. In the last few years, sufficient data has emerged to advocate role of various non-cancerous cells (stromal cells), present in the vicinity of cancer cells, in modulating proliferating/invasive properties of cancer cells. Proliferating tumor cells along with these non-cancerous cells comprises Tumor microenvironment (TME). Besides stromal cells, major immune cells infiltrate into TME and are linked to poor prognosis of breast cancer. Various molecules are secreted in the TME that impact proliferation, apoptotic behaviour, angiogenenic ability of cancer cell, along with extra-cellular matrix remodeling. A significant cell population in breast TME is known to be tumor-associated macrophages (TAM), which is characterised by M2 phenotype, associated with pro-tumorogenic properties. TAMs are known to express various pro-angiogenic growth factors, cytokines, and chemokines and macrophage colony stimulating factor. Annexins, another class of molecules, have significant role in modulating TME and thus the disease state. Secretome studies have reported the presence of annexins A1-A6 in the secretome of the breast TME and their critical importance In light of the above studies, it is plausible that the components of TME can be crucial targets in defining invasive, anti-apoptotic and migratory behaviour of cancer cells. Targeting these molecules will be of great benefit for effective management of the disease.

Key words: Annexins, cancer, macrophage polarization, tumor-associated macrophages, tumor microenvironment.

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OP-028

In Silico Study of Clinically Available Antivirals

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Abstract: Everyone is nowadays aware about the dangerous and tricky nature of viral infections owing to the pandemic. Time and again viral diseases causes endemics or pandemics. In this study we focus on using the FDA approved antiviral drugs to repurpose them for other viral targets and also to find out molecular fragments that may be key to binding to either the structural or enzymatic proteins of the virus, thereby causing an inhibition in its activity. Some key proteins were identified from the literatures. PCA analysis was performed to study the distribution of various compounds in chemical space. We then used the selected FDA approved antiviral molecules, which is a subset of the data available in ViMAL database and preformed molecular docking studies. The top molecules were selected for further screening and scaffolds were generated and then a new virtual library was generated. These virtual molecules were docked against the same protein targets as earlier and the results were compared. MD simulation was also performed to calculate the ligand RMSD, Radius of Gyration (rGyr) and other related parameters to support our findings. The study showed that the newly generated virtual molecules showed good binding affinity towards the same pockets.

Keywords: ViMAL, virus, antiviral, molecular docking, molecular dynamics, drug repurposing

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OP-029

Advancing Infectious Disease Classification through Optimized Deep Learning Models: Towards SaMD Integration for Tuberculosis, Pneumonia, COVID, and Healthy State Detection

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Abstract: In the era of SaMD, this research explores the pivotal role of Software as a Medical Device (SaMD) in optimizing deep learning models for the accurate classification of infectious diseases. With a specific emphasis on medical imaging, this study addresses the urgent need for efficient disease prediction methods in the context of general infectious diseases. Medical imaging, particularly through X-ray analysis, has emerged as a vital tool in the early prediction and control of infectious diseases, underscoring the importance of integrating SaMD solutions in infectious disease management. Although different prediction designs have been developed in the past, they face challenges in image segmentation and classification. Thus, a novel hybrid Spider Monkey-based Radial Basis Neural (SMbRBN) framework was designed in this article. This developed model was validated with the X-ray images dataset. The input dataset contains four classes namely Tuberculosis, Pneumonia (Viral), COVID-19 and healthy. Here, the pre-processing mechanism in the designed model filters the unwanted noise features. Moreover, the feature extraction module extracts the features useful for disease prediction and classification. The disease severity probability was analysed for the detected infectious diseases. Furthermore, the effectiveness of the presented work is checked by comparing the estimated outcomes with the existing disease prediction models. The accuracy rate, precision, recall, and f-measure obtained by the proposed method are about 98.78%, 98.33%, 98.33% and 98.22%, respectively. The prediction results and comparative assessment show that the developed model accurately predicts infectious diseases.

Keywords: COVID-19 prediction, Spider Monkey Optimization, Radial Basis Neural System, X-ray Images

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OP-030

Construction and analysis of Co-Expression Network associated with Abiotic stress responses in *Sorghum bicolor*

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Abstract: Abiotic stress has a major impact on the development and yield of *Sorghum bicolor*. Investigating the gene expression profiles under abiotic stress may help us understand molecular mechanisms of plants to cope with unfavourable conditions. In the current study, system-level analysis was performed by establishing a gene co-expression network on the basis of several RNA-seq datasets which are easily accessible in public domain. The aim of our research is to find key players involved in stress responsive pathways. This study is the first of its kind, based on abiotic stress related condition dependent co-expression network in *Sorghum bicolor*. 6593 DEGs were identified in three different abiotic stress conditions. Co-expression network was constructed using Weighted Gene Co-Expression Network Analysis (WGCNA) with 21 high throughput samples from 3 dissimilar experimental conditions. 12 co-expressed modules were identified out of which 4 showed specific functional enrichments in abiotic stress responsive pathways. 9 hub genes were identified in the 4 modules and GO analysis revealed their response to temperature stimulus, cold, sulphur starvation, heat, lithium ion, alcohol, lipids, chemical, oxygen-containing compound. Altogether the study provided better insights of key regulators corresponding with abiotic stress reciprocation in *Sorghum bicolor*. Furthermore, metabolic pathways and genes identified here can act as esteemed genetic resources for more distant functional validation experiments.

Keywords: *Sorghum bicolor,* abiotic stress, RNA-seq, DEG, co-expression networks, hub genes.

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OP-031

Fermentation process development using a statistical method called Design of experiment (DoE) in Biopharmaceutical research

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Abstract:
The quality of the product in bioprocesses is depend on many direct or indirect variables, therefore, when Design of Experiment (DoE), a statistical method is applied at the designing stage, it enables the researchers to analyses outcome with very strong rational for selection of parameters which in turn provides the consistent quality and reproducibility of the product. Although Pharmaceutical industry is little late to utilize these DoE techniques for research, in recent times, DoE has become the most reliable tool to design or optimize the process. The major benefit of these methods are: a) It provides more detailed information as per Law of vital few, b) Collecting information that is only impactful towards the goal of the research. The current research uses DoE method for fermentation yield improvement in vaccine manufacturing process by screening the Media component using Plackett Burman Design (PBD), followed by optimization of factors and study interaction between factors by Response Surface methodology (RSM) using ANNOVA, surface plot, Pareto chart, Central Composite Design (CCD) etc. Similar to media composition, the physical parameters can be optimized using same tool to design a effective fermentation strategy. DoE based research provides a impactful insights for designing feed composition and feeding strategy. This research is an attempt to explore the DoE methods to improve the intrinsic antigenic yield during fermentation process of pathogen and thus, design a platform technology suitable for multiple antigen fermentation process by using PBD, ANNOVA and RSM tools of DoE.

Keywords: DoE, Factor Screening, Fermentation, Yield Improvement, Fermentation yield improvement, Vaccine research, Vaccine Manufacturing, RSM, CCD, ANNOVA, Fermentation strategy, Media optimization, Feed batch fermentation, Vaccine manufacturing Process development, Antigenic yield, Surface plot, Pareto chart, Biopharmaceutical research

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OP-033

Homology modeling and docking studies of Mycobacterium tuberculosis UDP-NAG enol pyruvyl transferase (Mtb-MurA) against drugs and derivatives of 5-sulfonoxyanthranilic acid derivatives

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The peptidoglycan synthesis in *Mycobacterium tuberculosis* is very essential for the survival of bacterium. Many antibiotics used in therapeutic settings, primarily glycopeptides and β-lactams, work by blocking the latter stages of peptidoglycan production. The cytoplasmic peptidoglycan precursor's early biosynthesis steps, however, are not well-utilized as antibacterial targets because, with the exception of MurA, which is inhibited by fosfomycin, none of the enzymes involved in these steps are inhibited by synthetic chemicals or known antibiotics. In bacteria, every gene from murA to murF is necessary. Even though crystal structure of Mtb-MurA is available at the Protein Data bank, few amino acid co-ordinates are missining . To understand the structure of Mtb- MurA protein, homology modeling was carried out with Modeller software. All the models were validated with PROCHECK and based on the quality of packing to 3D structure, one model selected for further docking process with inhibitors.

The inhibitor site was chosen based on the binding mode of Fosfomycin in the cavity of Mtb-MurA. The docking studies were carried out against various drugs and as well as derivatives of 5-sulfonoxyanthranilic acid derivatives. Based on docking energy and binding mode of derivatives, few compounds are predicted as potent inhibitors of Mur A enzyme of peptidoglycan sysnthesis pathway. Based on our observations, we concluded that screened compounds may act as new leads for the design of Mtb MurA inhibitors.

Keywords: *Mycobacterium tuberculosis*, Mur A, Peptidoglycan synthesis, Homology modeling, docking

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OP035

Integrated approach for simulating, optimizing, and fabricating low-cost passive micromixers for enhanced biochemical reactions

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Abstract: This study presents a comprehensive approach to passive micromixer fabrication by leveraging acrylonitrile butadiene styrene (ABS) scaffolding to realize diverse geometric configurations. As passive micromixers are crucial in microscale applications, various geometries, such as serpentine, zigzag, square-shaped structures were explored. The study focused on the interplay between geometric structure and mixing efficiency across varying concentrations of reagents. The mixing index was systematically calculated for diverse channel geometries, providing insights into their performance. The research included a detailed analysis using COMSOL Multiphysics to optimize micromixer designs for enhanced mixing efficiency. Notably, the study introduced a curved serpentine pattern as the selected micromixer geometry within a microfluidic chip. The effectiveness of this design was demonstrated through a graphical representation illustrating the mixing efficiency of fluids after every 2 turns of the micromixer. Furthermore, the investigation addresses the cost-effectiveness of the fabrication process, emphasizing a low-cost approach using ABS scaffolding and soft lithographic techniques in limited laboratory setups. Experimental results showcase the successful fabrication of passive micromixers with diverse geometries, highlighting the versatility of the ABS scaffolding approach. This study underscores the significance of ABS scaffolding as a robust substrate for passive micromixer fabrication and emphasizes the importance of computational simulations in guiding design choices for enhanced mixing performance. The findings contribute to the development of customizable and efficient micromixers for applications in chemical synthesis, biotechnology, and diagnostics.

Keywords: ABS scaffolding, COMSOL Multiphysics, microfluidics, passive micromixers, soft lithography.

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OP-36

Emerging Trends in the Development of Microthermofluidic Systems for Diagnostic Applications

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Abstract

In recent times, the miniaturization of microthermofluidic systems has gained fabulous attention in science and technology because of their versatile capability to be compact, automated, integrated, and affordable miniaturized devices that are acquiescent to be incorporated into numerous microfluidic-driven biochemical and healthcare diagnostic applications. The development of a microthermofluidic system entails the amalgamation of several components and peripherals including a microprocessor/microcontroller, microheater, microsensor, recording and display unit within a compact minuscule platform that finds application predominantly in the healthcare sector essentially as a point-of-care-testing (POCT) device. Further, an accurate, steady, and consistent temperature-controlling module is fundamental and significant to transfer brisk output for continuous supervising and screening of numerous biomarkers. Prominent applications of microdevices requiring specific and susceptible temperature control include nucleic acid amplification, drug delivery, drug formulation, protein denaturation, cell/tissue culture, nanoparticle synthesis, rheology, and digital microfluidics. However, it has been noted that the laboratory-oriented typical thermal devices that are currently in use lack cutting-edge technologies, are bulky, more costly, consume more power, and dissipate more heat leading to the drawback of being used for POCT. Thus, the development of an integrated, automated, miniaturized, low-cost, rapid ramping response and IoT-enabled microthermofluidic system is the need of the hour in most clinical and diagnostic applications. Usually, these microthermofluidic systems should have a temperature sensitivity of ±0.1-0.5°C for effective and efficient bioclinical outcomes. Further, the proposed microthermofluidic system bids prospects for differentiated novel ideas to be implemented in a microfluidic temperature-based environment for diagnostic applications including screening for several virulence such as

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COVID-19, Rhinovirus, and SARS-COV 2.

Keywords: Microthermofluidic (MTF), biosensor, biomarker, miniaturization, internet-of-things (IoT), thermal management system, point-of-care (POC).

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OP-037

Microbial peroxide-producing cell coupled in-situ enzymatic depolymerization for lignin bio-refinery

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Abstract: Lignin is one of the most versatile and complex macromolecules and can give value-added products like p-coumaric acid and vanillin upon its depolymerization. The current work explored oxidative lignin depolymerization in a microbial peroxide-producing cell containing manganese peroxidase enzymes. A double-chambered microbial peroxide-producing cell was constructed containing the immobilized manganese peroxidase on alginate beads in the cathode chamber, while the anodic chamber contained wastewater. This setup is run for 5-7 days after the addition of lignin in the catholyte. The voltage measured in the circuit was 0.491 V and the current and power densities were 223 µA cm-2 and 110 µW cm-2, respectively. The maximum H2O2 concentration observed was 1.5 mM. Depolymerization of lignin was confirmed by the change in the significant peaks at 280 and 314 nm of the UV-Visible spectrum and change in the signature regions of β-β linkages and β-O-4 linkages observed in the FTIR spectrum. LC-QTOF-MS analysis revealed the presence of some compounds primarily including isoeugenol, acetovanillone, methacrylic acid, phenamacril, diofenolan and jasmolin identified as the product of lignin depolymerization.

Keywords: Microbial Peroxide Producing Cell, Manganese Peroxidase, Lignin Biorefinery, Fuel Cell, Advanced Oxidation Process.

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OP-038

In-silico molecular docking, ADMET analysis, and toxicity prediction for investigating insecticidal activity of *Curcuma angustifolia* essential oil against *Lasioderma serricorne*: a severe insect pest in stored coriander seeds

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Abstract: Coriander seeds, derived from the *Coriandrum sativum* plant, are used as a culinary spice and offer several health benefits. These are rich in nutrients and a good source of vitamins and antioxidants. *Lasioderma serricorne* is the major insect pest species that infest and damage the stored coriander seeds. Their larvae feed on the inner contents of the seeds, leaving behind frass and silk webbing. Synthetic insecticides like DEET, chlorpyrifos, and trichlorfon damage the ecological balance. Essential oil-based insecticides getting more popular nowadays. These green insecticides are safer to use and easily decompose in the environment. The present research work focused on the computation docking and the prediction of natural insecticidal agents from CAEO against the targeted AChE (Acetylcholinesterase) of *L. serricorne.* Major bioactive compounds of CAEO were achieved by Gas chromatography–mass spectrometry. Out of 72 compounds, only 7 bioactive compounds were present in major amounts. Eucalyptol (14.35%), Vulgarone (11.67%) followed by Germacrone (7.93%), Linalool (5.06%), Camphor (3.82%) and A-pinene (3.58%). Homology modeling of the targeted protein was done via Phyre2 and validation was done by Ramachandran plot. DogSiteScorer was used to predict the active site. Ligands were downloaded from PubChem. Molecular docking was performed by AutoDockVina and protein ligand interaction was seen in Discovery Studio. The binding affinity and docking score of vulgarone was more excellent than the standard compound (DEET). ADMET analysis and toxicity prediction of the best-docked ligand were checked by Swiss ADME and ProToII to understand the pharmacophore kinetics and the acute toxicity.

Keywords: Essential oil, Molecular docking, AChE, ADMET, ProToxII.

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OP-39

A wearable microfluidics sensing system for non-invasive monitoring of multi-analytes

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Abstract: The introduction of point-of-care (POC) monitoring devices nowadays have greater influence in biomedical diagnosis and monitoring of disease progression and treatment. Microfluidics plays a critical role in biosensing by enabling precise manipulation and analysis of tiny amounts of fluids. This technology revolutionizes how we detect and analyse biomolecules, offering higher sensitivity, reduced reagent consumption, faster reactions, and the integration of multiple assays on compact platforms. Here, we try to provide a paradigm of on-demand, entirely non-invasive diagnostics that may replace routine blood-based laboratory testing for identification of diseases. The integration of microfluidics into wearable POC device allows for continuous monitoring of biomarkers present in biofluids, at the periphery of the human body. Creating effective microfluidic devices necessitates dealing with intricate design details that can be provided using COMSOL Multiphysics, a comprehensive and user-friendly simulation platform, to design and optimize microfluidic structures. This involves exploring diverse microchannel geometries and fluid flow rates, as well as predicting the behaviour of analytes within biofluids. The simulation-based approach streamlines the development process, ensuring efficiency and accuracy in system design. The study aims to contribute to the creation of compact fluid-based systems for precise analysis of biofluids, ultimately aiding in the prognosis of chronic diseases. The outcomes of this research could significantly advance the capabilities of POC devices, offering improved patient care and diagnostic accuracy.

Keywords: Sweat, wearable device, microfluidics, osteoporosis, COMSOL Multiphysics.

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Poster Presentations

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PP-001

Simple & Innovative Approaches for Point-of-Care Pancreatic Enzymes Detection in Paper Devices

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Abstract: Acute pancreatitis (AP) is a common serious abdominal illness of the digestive system. Several biomarkers have been identified to be known for the diagnosis of AP secreted from pancreatic acinar cells like amylase, proenzyme trypsinogen, and lipase. A higher level of α-amylase, lipase enzyme in human serum is a suggestive indication of the onset of pancreatitis. In this, we aim to investigate simple & innovative approaches for pancreatic lipase and α-amylase detection conjoined with different bio-functionalization techniques on a paper-based microfluidic platform. Surface functionalization is carried out in paper devices to improve the sensitivity of detection assay as the surface treatments bring certain changes/modifications in the physicochemical properties, thus surging their performances. Lipase was detected using (a) 4-nitrophenyl butyrate (PNPB), and (b) Indoxyl acetate, as a substrate. For α-amylase detection approaches are as follows, (i) Starch-povidone conjugate, and (ii) Starch-stabilized silver-copper nanoparticles (Ag-Cu NP). In all the above reactions, a swift change in color was observed immediately after the addition of enzymes. A good color gradient was observed in coated device compared to non-coated. All the above approaches showed good colorimetric demarcation from control when used with sera samples. The new sensing methods for pancreatic enzymes detection can be a potential point of care device for early screening for acute pancreatitis in low-resource settings or home users with abdominal pain.

Keywords: Paper-based devices, acute pancreatitis, lipase, α-amylase, colorimetric detection.

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PP-002

Unlocking the Potential of *Clostridium butyricum* ARI-I: Genomic Insights and Safety Assessment for Probiotic Applications

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Abstract: Antibiotic resistance is a serious global health problem, spurring the quest for new infection-combating techniques. Probiotics, known for their potential to improve gut health and boost the immune system, have garnered significant attention. The limited gastroenteric survival of conventional probiotics such as *Lactobacillus* and *Bifidobacterium*, on the other hand, underscores the need to investigate alternative probiotic bacterial species. Hence, the present study was undertaken to explore the probiotic propensity of spore-forming *Clostridium butyricum* through genome analysis. The genome sequence of *C. butyricum* ARI-I was examined and annotated for molecular mechanisms related to probiosis. Comparative genomics of ARI-I using Eztaxon-ANI, GGDC-DDH, and BRIG analysis with seven publicly available reference genomes of *C. butyricum* indicated a resemblance between them. Functional annotation using the RAST platform predicted the excellent gut adaptive features of ARI-I, like multisubunit F0-F1 ATPases, Na+-H+ antiporters, and the fibronectin-binding protein-encoding gene for adhesion. Genome mapping also displayed the ability of ARI-I to produce compounds advantageous for the host (folate, bacteriocins), to release antioxidative enzymes against free radicals, and to metabolize lactose potentially harmful to lactose intolerants. The strain also demonstrated a positive effect on reducing cholesterol levels, proving to be a potential candidate for food and pharmaceutical applications. Furthermore, the *in silico* analysis predicted ARI-I as a non-human pathogen devoid of transferable antibiotic resistance or virulent genes, proving its safety as a probiotic. This study provides insight into the application of

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probiogenomics to identify marker genes as pre-selection criteria for the identification of potential probiotic strains.

Keywords: *Clostridium butyricum*, probiotic, genome, comparative analysis, functional annotation, health-promoting attribute.

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PP-003

Investigating Simple & Innovative Approaches for Point-of-Care Pancreatic α-Amylase Colorimetric Detection in Paper Devices

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Abstract: Acute pancreatitis (AP) is a common serious abdominal illness of the digestive system. Several biomarkers have been identified to be known for the diagnosis of AP secreted from pancreatic acinar cells like amylase, proenzyme trypsinogen, and lipase. A higher level of α-amylase enzyme in human serum is a suggestive indication of the onset of pancreatitis. In this, we aim to investigate simple & innovative approaches for pancreatic α-amylase detection conjoined with different bio-functionalization techniques on a paper-based microfluidic platform. Surface functionalization is carried out in paper devices to improve the sensitivity of detection assay as the surface treatments bring certain changes/modifications in the physicochemical properties, thus surging their performances. Paper coatings included: Chitosan, polyethylene glycol, PEG - Chitosan, AuNP-APTES, and Chitosan Nano powder, CNP. Three different detection approaches on functionalized paper devices are studied, (i) Starch-povidone conjugate, (ii) Starch-stabilized silver-copper nanoparticles (SI-Ag-CuNP), and, (iii) Starch- Iodine conjugated with pH indicator. In all the above reactions, a swift change in color was observed immediately after the addition of amylase. A good color gradient was observed in all four coatings whereas PEG-Chitosan, chitosan, and CNP showed better color gradients as compared to others. Non coated device failed to show any gradient. All the above approaches showed good colorimetric demarcation from control when used with acute pancreatitis sera samples. The new sensing methods for pancreatic α-amylase detection can be a potential point of care device for early screening for acute pancreatitis in low-resource settings or home users with abdominal pain.

Keywords: Paper-based devices, acute pancreatitis, α-amylase, surface bio functionalization, colorimetric detection.

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PP-005

Single Cell Analysis to understand Cellular Heterogeneity and Transcriptome profile of Primary and Metastatic Tumors

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Abstract: Single-cell transcriptomic analysis is an effective way to study diseases like cancer which show multifaceted heterogeneity and constant evolution. Within this heterogeneous group, a certain genotype may be better adapted to spread and invade other body tissues. One of the hallmarks of cancer metastasis is the Epithelial-Mesenchymal (EMT) and Mesenchymal-Epithelial transition (MET). Between the two states (E and M) a third intermediate state is said to exist where cells express hybrid epithelial/mesenchymal markers (E/M) and show properties of drug resistance and tumor-initiating potential. Hence, timely identification and treatments that target these cells are important to terminate cancer progression to more advanced stages. In this study, the single cell transcriptomics profile of primary breast cancer and paired metastatic lymph node tumors in 8 breast cancer patients were analyzed using R packages like Seurat, SingleR for annotation, and Monocle3 for trajectory analysis. After pre-processing, the cells were clustered and annotated to distinguish the cancer cells from the other immune cells. The cancer cells were divided into three subgroups depending on the level of expression of Epithelial and Mesenchymal markers to identify those that are at the intermediate state (E/M hybrid). Furthermore, the differential expression analysis was done to compare the primary and secondary tumor site, in terms of cell-cell interaction and expression patterns. The trajectory analysis was performed to understand the evolution on the temporal scale in pseudo time that will explain the dynamic progression of cells to a metastatic state. Thus, it was found that the immune cells in the metastatic site are less active compared to the primary tumour and down regulate their antigen presentation pathway in primary breast cancer

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Keywords: Single-cell transcriptomic analysis, heterogeneity, metastasis, hybrid epithelial/mesenchymal, primary breast cancer and paired metastatic lymph node, Seurat, trajectory analysis, cell-cell interaction.

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PP-006

Plant mediated synthesis of CuO-ZnO bimetallic nanocomposite using *Theobroma cacao* plant leaves

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Abstract: Nanoparticles have unique chemical and physical properties. The green synthesis of nanoparticles provides several potential uses in the environmental and biomedical domains because it generates fewer toxic substances. This work describes the biosynthesis of CuO-ZnO (copper oxide-zinc oxide) bimetallic nanocomposite utilising leaf extract from *Theobroma cacao*, along with its characterization and potential application screening. Phytochemicals play reducing and capping roles in the CuO-ZnO bimetallic nanocomposite synthesis. The highest absorbance at 365 nm suggested the production of a bimetallic nanocomposite. The green synthesis of the bimetallic nanocomposite has been confirmed through initial analysis using a UV-visible spectrophotometer. FTIR was used to identify functional groups that were involved in the creation of bimetallic nanocomposite. The largest peak on the XRD graph, located at 36.21°, revealed the bimetallic nanocomposite crystalline structure. The mean dimension of the nanocomposite was found to be 14.82 nm. The Zn, Cu, and O peaks in the elemental composition seen in the SEM with EDS provide proof that the CuO-ZnO bimetallic nanocomposite was synthesized. DLS research revealed that the CuO-ZnO bimetallic nanocomposite had a hydrodynamic diameter of 94.7 nm. The surface charge of the particle was measured using the zeta potential, and the result was -46.9 mV, suggesting that bimetallic nanocomposite is more stable. The antibacterial capabilities of CuO-ZnO bimetallic nanocomposite are demonstrated.

Keywords: Green synthesis, capping agent, CuO-ZnO bimetallic nanocomposites, antibacterial activity.

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PP-009
Repurposing the Dark Genome – I: Reverse Proteins

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Abstract: In the genome's blueprint, three distinct sequence categories emerge: sequences accountable for protein encoding, RNA encoding, and sequences that play no role in expression. We asked: If evolution favoured sequences for metabolic functions, to what extent is untapped (non-expressing) and underutilized (solely RNA encoding) information accessible for continued innovation? These questions drive us to experimentally create functional proteins through the utilization of intergenic sequences from E. coli, as published by Dhar et al. in 2009. This ongoing study extends the scope of the original report and explores the potential of reading naturally evolved genes in reverse order to unlock novel proteins or peptides. Using the full length reverse gene data in *C.elegans,* we computationally translated 20,000 *C. elegans* protein-coding genes in reverse direction to construct a virtual library of 188 'full-length and first-in-the-class' proteins. Here, we present a brief account of these reverse proteins in terms of their sequence similarities, structural details, stability, function and cellular address. This approach opens up new opportunities of designing novel proteins and peptides towards functional outcomes. Currently the experimental studies are going on. In future, we plan to expand the search space to other model organisms and provide a public access of this new data for further experimental validation.

Keywords: Reverse coding, synthetic proteins, synthetic biology, genomics.

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PP-010
Repurposing the Dark Genome – I: Antisense Proteins

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Abstract: Based on the expression patterns, genomes are divided into three categories: sequences that encode proteins, sequences that encode RNA, and sequences that don't participate in expression processes. Recent sequencing and annotation have confirmed that a minor portion of the genome is tasked with protein encoding, while a significant section encodes RNA, and the remaining portion of DNA sequences does not actively contribute to the expression of genes. This allocation ratio varies among different organisms. Is it feasible to create proteins and peptides synthetically using non-expressive sequences? This study extends the prior research conducted by Dhar et al. in 2009, which involved creating intergenic proteins in E. coli. It explores the possibilities of making functional genes and proteins from antisense DNA sequences. We computationally translated antisense strands of 4315 protein-coding genes in *E. coli* and 6317 genes in *S. cerevisiae*, producing 32 and 10 full-length proteins, respectively. Among these, 9 in *E. coli* and 7 in *S. cerevisiae* were found to be unique. Furthermore, antisense proteins exhibited isoelectric points, instability indexes, and hydropathy values in the promising range, suggesting potential structural stability if these proteins were expressed within cells. Many of the antisense proteins indicated strong possibilities of transporter and enzyme functions. Currently the experimental validation studies are going on. Designing novel antisense genes, RNA, and proteins/peptides from the dark genome points to a huge untapped space that may yield a wealth of information from cell physiology, evolutionary, and application perspectives.

Key Words: Antisense protein, non-expressing, protein-coding.

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PP-012

Formulation and Evaluation of Mosapride Citrate Dihydrate Nanoemulsion

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Abstract: Formulating and Evaluating a Nanoemulsion with Mosapride Citrate Dihydrate for Effective Treatment of Dyspepsia and GERD. Treating digestive issues such as dyspepsia and GERD often involves the use of gastroprokinetic agents like Mosapride Citrate. However, the limited aqueous solubility of this drug can hinder its bioavailability. In response, this study focuses on creating nanoemulsions loaded with Mosapride to boost its solubility and increase its dissolution rate. Innovative nanoemulsion formulations were successfully prepared through the high-energy emulsification method, utilizing top-quality ingredients such as linseed oil, Tween 80, and Polyoxyamer 127. Comprehensive characterization of the formulations included measurements of globule size, zeta potential, polydispersity index, drug content, in vitro drug release, stability under different conditions, as well as imaging techniques such as transmission electron microscopy (TEM) and Fourier-transform infrared spectroscopy (FTIR). The results of solubility studies proved the superior solubility of mosapride when incorporated in the nanoemulsions, surpassing that of the pure drug. The optimized nanoemulsion exhibited a remarkable globule size of 13.5nm, impressive 92.33% drug release within 60 minutes and remained stable for a period of 3 months. The confirmation of nano-range globule size was obtained through TEM images, solidifying the efficacy of the developed nanoemulsion.In summary, the newly created nanoemulsion containing mosapride has great potential as a delivery method for enhancing the solubility and dissolution rate of the drug, which is known to have poor water-solubility. Such improvements could result in increased bioavailability and effectiveness in treating patients.

Keywords: Mosapride citrate, nanoemulsion, solubility enhancement, dyspepsia.

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PP-013

N-acetyl glucosamine modified Boltorn H40 nanoconstructs for pH-sensitive delivery of anti-cancer drugs to cancer tissues

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Abstract

Breast cancer is the most common cancer in the world, accounting for more than 10% of all new cancer cases each year. Breast cancer treatment options currently available are scarce and ineffective. Targeted delivery of anti-cancer drugs specifically to cancer cells can be more effective than conventional chemotherapy. Dendrimers have played a crucial role in targeted delivery of chemotherapeutic agents. Dendritic structures can be easily functionalized for specific tasks like targeting and cargo delivery. Boltorn H40 is a polyester-structured dendritic polymer which is biodegradable in the tumor microenvironment causing rapid drug release. In this study, we developed a bis-MPA-based dendrimer H40-Boltorn-NAG (N-acetyl glucosamine) conjugate for increased drug loading and increased cellular uptake through GLUT transporters. The nanocarriers were characterized by ^{1}H NMR, dynamic light scattering, and FTIR. Confocal microscopy of DOX-loaded H40-NAG and H40 showed increased DOX accumulation in case of H40-NAG compared to the H40 only. Drug-loaded H40-NAG and H40 were evaluated on MDA-MB-231 and 4T1 cancer cells for measuring the cytotoxicity. DOX-loaded H40-NAG has shown pH-responsive release and higher cytotoxicity against breast cancer cells than the unmodified H40. The results suggested that GLUT transporters targeted hyperbranched bis-MPA polyester dendrimer carrying anti-cancer drug have excellent ability to effectively kill breast cancer cells.

Keywords: Cancer Nanomedicine, targeted drug delivery, EPR, GLUT transporters, bis-MPA polyester dendrimer.

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PP-014

Aptamer tethered hetero-polymer conjugated mesoporous silica nanoparticles (MSNPs) mediated delivery of dual siRNA to induce apoptosis in breast cancer cells

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Abstract: The study aimed to explore the gene silencing potential of multifunctional aptamer-tethered hetero-polymer conjugated mesoporous silica nanoparticles (MSNPs) loaded with dual small interfering RNAs (siRNAs) in MCF-7 breast cancer cells. Objectives included synthesizing and characterizing hetero-polymer conjugated MSNPs, attaching polyethylene glycol (PEG) and MUC-1 aptamer onto the Nano carriers, and evaluating gene silencing efficacy. MSNPs were synthesized via sol-gel technique, conjugated with hetero-polymer molecules, and subsequently modified with PEG and MUC-1 aptamer. Characterization involved dynamic light scattering (DLS), scanning electron microscopy (SEM), and Fourier-transform infrared spectroscopy (FTIR). Quantitative real-time PCR assessed the gene silencing efficacy of dual siRNAs (MCL-1 and Survivin) loaded onto the aptamer-modified MSNPs in MCF-7 cells, complemented by a cell death assay. FTIR and zeta potential measurements confirmed successful hetero-polymer conjugation onto MSNPs. Targeted Nano carriers significantly suppressed the target genes compared to non-targeted ones and lipofectamine 2000. Cell death assays verified apoptosis induction through Caspase assays. In conclusion, aptamer-modified hetero-polymer conjugated MSNPs hold promise for delivering therapeutic agents in MCF-7 cells. Dual targeting of anti-apoptotic genes exhibited enhanced efficacy in inhibiting cancer growth compared to single-gene targeting, suggesting potential avenues for future targeted breast cancer therapies.

Keywords: Gene silencing, Aptamer, siRNA, Mesoporous silica nanoparticles, Targeted therapy, Dual siRNA, Breast cancer, MUC-1 aptamer.

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PP-015

Aptamer-Tethered Hyperbranched Bis-Mpa Polyester Dendrimers for Targeted Delivery of Sirna and Gene Silencing in Breast Cancer Cells

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Abstract: This study investigates the potential of mucin-1 aptamer-tethered hyper-branched bis-MPA polyester dendrimers as carriers for targeted delivery of Survivin siRNA in breast cancer cells. The objectives included dendrimer synthesis, PEG and mucin-1 aptamer conjugation, and evaluating Survivin gene silencing efficacy in MCF-7 cells. Hydroxyl groups of hyper-branched bis-MPA polyester dendrimers were modified to carboxylic groups, then conjugated with tetraethylenepentamine. Mucin-1 aptamer was attached using heterobifunctional polyethylene glycol as a linker. Characterization via 1H NMR and dynamic light scattering confirmed successful conjugation steps. Real-time PCR assessed Survivin gene silencing by the designed siRNA-loaded dendrimers. Positive zeta potential and 1H NMR confirmed tetraethylenepentamine conjugation. Targeted nanoparticles exhibited enhanced serum stability for siRNA and biocompatibility in NIH-3T3 fibroblast cells. Cellular uptake studies in MCF-7 cells revealed efficient internalization of targeted nanoparticles compared to non-targeted ones. Real-time PCR data demonstrated superior inhibition of target gene expression by targeted nanoparticles compared to non-targeted ones and lipofectamine 2000. In conclusion, mucin-1 aptamer-tethered hyper-branched bis-MPA polyester dendrimers effectively silence target genes in breast cancer cells, indicating their potential as promising carriers for precise siRNA delivery in breast cancer therapy.

Keywords: Dendrimer; Mucin-1 aptamer; Breast cancer; siRNA

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PP-017

Genome mining for bacterial biosynthetic clusters with antimicrobial potential

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Abstract: Bacteria synthesize a wide array of secondary metabolites with properties including antimicrobial activity, metal sequestration, antioxidants, and chemo/osmoprotectants, which are of biotechnological and pharmaceutical interest. The aim of the present study was the mining of secondary metabolite biosynthetic gene clusters (BGCs) from bacterial strains phylogenetically identified as *Serratia* sp., *Bacillus* sp., *Paenibacillus* sp., *Pseudomonas* sp., and *Priestia* sp. that were isolated from drain sludge. Whole genome analysis identified the biosynthesis clusters belonging to non-ribosomal peptide synthetase (NRPS) type (prodigiosin, paenibacterin, polymyxin, ectoine), metallophores (yersinopine, bacillopaline) and siderophores (bacillibactin, ochrobactin). Further analysis revealed that the isolated bacteria harbor an array of candidate novel BGCs for synthesis of bioactive molecules. Some of the secondary metabolites, namely prodigiosin, paenibacterin, polymyxin, and bacitracin, have been reported for their antimicrobial activity. The study provided genomic insights into the production of diverse antimicrobial compounds by the isolated strains. Further characterization of the novel clusters will provide the genetic foundation for upscaling secondary metabolite synthesis for biotechnological applications.

Keywords: Genome mining, secondary metabolites, BGCs, antimicrobial activity.

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PP-018

Application of Machine Learning methods to predict Protein Structure

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Abstract: Proteins play a fundamental role in various biological processes, and their three-dimensional (3D) structure is critical for understanding their functions. However, determining protein structures experimentally can be challenging and time-consuming. Machine learning (ML) has emerged as a powerful tool for predicting and understanding protein geometry based on sequence information. Through the years, a diverse set of both supervised and unsupervised machine learning techniques have been employed to address these challenges, making substantial contributions to the advancement of protein structure prediction methodologies. In this study, we explore the application of ML techniques to analyse and interpret protein geometry. In our study we have developed regression-based Machine Learning models to unravel the complex relationships between protein sequence and geometry. The machine learning model have been able to identify the dimers of 3D protein structures. Our Machine Learning study has the potential to revolutionize drug discovery, protein engineering, and our understanding of biological systems.

Keywords: Machine Learning, Protein geometry, Regression model, Machine Learning

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PP-019

Precision Autism Spectrum Disorder Prediction through Machine Learning: A Comprehensive Framework for Enhanced Early Detection and Personalized Intervention

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Abstract: Autism Spectrum Disorder (ASD), a neurodevelopmental condition, poses challenges in social interaction, communication, and repetitive behaviors, exhibiting a spectrum of symptoms with varying severity. Early detection is crucial for timely intervention, but conventional methods are often delayed and subjective. Our project introduces a novel approach, employing advanced machine learning to predict ASD early and enable personalized interventions. Leveraging diverse datasets, including behavioral observations, neuroimaging, and genetic markers, our computational framework focuses on behavioral data to develop a robust predictive model. The classification algorithm achieves high accuracy, outperforming existing methods with up to 87% accuracy. The model's significance is underscored by the limitations of current diagnostic methods, the potential for early intervention, and the global rise in ASD prevalence. Beyond accurate prediction, our framework facilitates personalized interventions based on individual characteristics and response patterns, marking a paradigm shift toward precision medicine in neurodevelopmental disorders. The application provides real-time evaluation and user-friendly questions for both parents and children. Rigorous validation on diverse datasets confirms the model's efficacy, emphasizing improved sensitivity and specificity. In conclusion, our innovative project revolutionizes ASD prediction and intervention through machine learning. By integrating diverse datasets and prioritizing individualized strategies, we contribute to advancing diagnostic and therapeutic approaches for ASD. Anticipating a substantial impact, our work aims to enhance outcomes and deepen the understanding of the complex factors influencing ASD.

Keywords: Autism spectrum disorder, machine learning, personalized intervention, neuroimaging, genetic markers, predictive modeling, precision medicine.

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PP-020

Identification of AMR markers associated with Mutations via computational tools

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Abstract: Recent years, exploitation and misapplication of antibiotics has given rise to a phenomenon called AMR viz. Antimicrobial resistance has become a major global threat of this century, leading to high morbidity and mortality rates. Various pathogens involved in AMR such as Staphylococcus aureus, Pseudomonas aeruginosa or Escherichia coli evolve with high rates of resistance towards antibiotics, this has become a challenge to find an accurate solution. Therefore, identification of mechanisms through which resistance occurs and detection of these genes called ARGs are the major processes for understanding AMR. A bioinformatics approach to AMR has an advantage, as its time effective, large data analysis gives a clear idea for clinical research. The aim of the study is to focus on identification of molecular markers coding for AMR. A pipeline designed to procure molecular markers through computational tools was developed.

Keywords: Antimicrobial resistance, *staphylococcus aureus*, molecular markers, SNPs, mutation, ARG.

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PP-022

Development of patterned paper devices with specified surface characteristics for bioanalytical applications.

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Abstract: This paper introduces an innovative technique for creating hydrophobic patterns on paper surfaces, enabling the development of paper-based analytical devices for point-of-care diagnostics. The sensor's reaction zone was modified to be hydrophilic while surrounding areas were strategically made hydrophobic using an agarose layer and subsequent polydimethylsiloxane (PDMS) deposition. Circular reaction zones undergo layer-by-layer agarose deposition, effectively masking the surface against PDMS layering. Scanning Electron Microscopy (SEM) analysis demonstrates successful capillary blocking in PDMS-rendered hydrophobic paper areas. Subsequently, an assay reagent specific to glucose detection is loaded into the reaction zones, leading to a distinct color change from colorless to blue through the glucose oxidase-catalyzed reaction, indicating the presence of glucose. Incorporating SiO_2 NPs in the assay formulation further enhances the sensing response. This novel approach shows enormous potential for creating patterned paper platforms in point-of-care diagnostics, particularly in resource-limited settings.

Keywords: Paper-based analytical devices, hydrophobic patterns, agarose, polydimethylsiloxane (PDMS), Bioanalytical applications.

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PP-023

Identification and characterization of endophytic fungi from Gloriosa superba for pharmaceutical application

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Abstract: *Gloriosa superba* stands as a significant crop with immense medicinal and industrial importance, widely utilized across traditional and modern medicinal practices. Various parts of this plant, notably its tubers, and seeds, harbor a plethora of valuable phytochemicals, prominently featuring alkaloids such as colchicine, colchicoside, and gloriosine. This species naturally thrives in regions spanning Africa, India, and Southeast Asia, having proliferated extensively throughout tropical zones. While cherished as an ornamental in temperate climates through cultivation in conservatories and greenhouses, it spans multiple regions within India. Colchicine, a potent alkaloid, historically derived from the autumn crocus (*Colchicum autumnale* L.), has found contemporary application in treating ailments like Gout, Familial Mediterranean fever, and Bechet's disease. *G. superba*, notably its corms, contains approximately 0.9% colchicine, with seeds holding 2-5 times more colchicine content than corms or tubers. However, the rampant exploitation of these tubers may pose a threat to biodiversity, prompting exploration into alternative sources, particularly endophytes, known for producing similar bioactive compounds as the host plant. This study focused on isolating and identifying endophytic fungi from the roots, stems, and leaves of the glory lily, specifically within the Western Ghats of Maharashtra. These endophytes not only mirror the bioactive compounds of medicinal plants but also aid in metabolite degradation, mitigating potential harm to plant and microbial biodiversity. Furthermore, their beneficial presence demonstrates the potential to sustain crop yield by countering bacterial and fungal pathogens.

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Keywords: *Gloriosa superba,* Colchicine, endophytic fungi, Western Ghats

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PP-024

Enhancing Color Perception: Daltonization Software for Color Vision Deficiency

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Abstract: Individuals with color vision deficiency (CVD), or color blindness, face challenges discerning specific hues due to the absence or malfunction of photoreceptor cells (cones) in the eyes. This study addresses prevalent types of CVD, affecting 8% of males and 0.5% of females, including Protanomaly/Protanopia, Deuteranomaly, Deuteranopia, Tritanomaly, Tritanopia, and Monochromacy. While primarily genetic, CVD can also result from various diseases. The study emphasizes the substantial impact of CVD on daily life, impacting color recognition, education, professional capabilities, safety, and psychosocial well-being. In response, we propose Daltonization, a sophisticated software solution that simulates a color-blind individual's perception of an image. The algorithm generates an error image by quantifying the difference between the original and simulated views, adjusting the original image based on these values to enhance color perception for individuals with CVD. This software-based approach offers a practical solution, contributing to inclusive visual communication and the improvement of daily experiences for individuals with color vision deficiency.

Keywords: Color Vision Deficiency (CVD), Daltonization, Photoreceptor Cells, RGB, LMS Transformation

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PP-025

Isolation, characterisation and biocontrol potential of *Trichoderma* sp. isolated from rhizospheric soil of tomato

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Abstract: *Trichoderma* is a cosmopolitan fungus that represents efficient antagonistic and plant growth promoting activity. Tomato is one of the most important and common horticulture crops which is highly rich in vitamins. The crop is attacked by different types of pest and pathogens. *Ralstonia solanacearum* and *Botrytis cinerea* are two important bacterial and fungal pathogen of tomato. In the present study, *Trichoderma* sp. was isolated from rhizospheric soil of healthy tomato plant. The identification was made on the basis of morphological characteristic. Dual culture assay of *Trichoderma* against *Ralstonia solanacearum* and *Botrytis cinerea* was performed *in vitro*. *Trichoderma sp.* exhibited the highest mycelial inhibition rate (64.25 %) against *Botrytis cinerea*. The growth of *Ralstonia solanacearum* was inhibited by 63%. The fungus also showed good plant growth promoting (PGP) activity. Positive results were obtained for protease, cellulase, siderophore and IAA production. *In vitro* tests against plant phytopathogens indicate that the isolated strain of *Trichoderma* sp. is a promising option for development of biocontrol agent.

Keywords: *Trichoderma*, tomato, phytopathogens, *in vitro* assay, biocontrol, plant growth promotion

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PP-026

Building a programmable, acoustically inducible Escherichia coli cell culture to test growth, viability, protein production yield and gene expression using a soundproof bacterial incubator

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Abstract: Among the various expression systems employed for the over-production of proteins, bacteria still remain the favorite choice of a Protein Biochemist. Various researchers have used many techniques to increase the efficiency of the protein production of their choice, some using temperature, volume, nutrient medium and many other factors. Our team decided to go down a different path to test the effect of sound vibrations on Escherichia coli. The impact of sound on biological systems is a subject that has been previously explored, mainly in relation to its use to increase agricultural production, however, the difference in our experiment is the addition of a sound inducible promoter in a plasmid, specifically to increase production of recombinant protein using synthetic biology techniques and to study the direct impact of various frequencies, amplitudes, durations, intermittences and pulses - individually and in combination on the Escherichia coli DH5-α strain. To prove this, we have also designed a sound-proof box that is incubator-friendly, to allow the proper analysis of the effect of sound on bacterial systems. The integral nature of this study presents a deeper understanding of bacterial systems and also offers a way through which it is possible to explore its application for industrial purposes.

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PP-027

In-Silico Analysis of Bacteriocin 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 like Nor, A efflux pump (PDB id: 7LO7), Staphylococcus aureus Protein A (PDB id: 1BDD) and Penicillin Binding Protein 2A (PDB id: 5M19). In the protein-protein docking analysis involving 105 bacteriocins and AMR proteins, Listeriocin and Acidocin A exhibited the highest docking scores among the candidates. Molecular docking and molecular dynamics outcomes further revealed a stable interaction between Listeriocin and Acidocin A with Penicillin Binding Protein 2A (PDB id: 5M19). This underscores the promising potential of bacteriocins as an alternative avenue in antimicrobial studies for therapeutic interventions.

Keywords: Antimicrobial Resistance, insilico analysis, bacteriocins, molecular docking, molecular dynamics.

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PP-028

A Simulation-Based Approach for Optimizing Microfluidic Systems for Point-of-Care Diagnostics

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Abstract: In the face of global health challenges, particularly in rural and semi-rural areas, the demand for accessible and affordable healthcare remains crucial. This study explores the application of microfluidic technology, utilizing COMSOL Multiphysics software to simulate blood flow within a polydimethylsiloxane (PDMS)-based conduit. The simulations investigate various physical configurations, including capillary action and pressure-gradient environments, to understand the dynamics of blood flow in restricted spaces. The goal is to contribute to the development of Point-of-Care diagnostic tools, addressing the healthcare needs of underserved populations worldwide. The findings reveal limitations in relying solely on capillary effects for blood displacement and emphasize the necessity of a pressure gradient. The study also explores the impact of channel width and geometry on blood flow, with bent geometries showing better performance. Additionally, the particle tracing model highlights the importance of optimizing micro-reservoir shapes for efficient erythrocyte movement. While the study demonstrates the potential for blood flow and cell counting in the given channels, it emphasizes the need for further simulations to refine and establish a reliable model for enhanced Point-of-Care diagnostics.

Keywords: Blood flow simulation, capillary action, COMSOL Multiphysics simulation, microfluidic systems, particle tracing model, point-of-care diagnostic devices, pressure driven flow.

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PP-029

Screening of potential Plant Growth Promoting Rhizobacteria (PGPR) for agrochemical nutrient enhancement

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Abstract: The properties of *Azadirachta indica*, known for its bioactive compounds with pesticidal and antimicrobial properties, render it an intriguing source for bacteria with potential agroecological benefits. This study systematically investigates the suitability of rhizospheric bacteria sourced from *Azadirachta indica* (neem) for utilization as an environmentally friendly biofertilizer. After employing conventional isolation techniques, bacterial strains were rigorously assessed for their potassium and nitrogen-fixing potential application. Further, screened isolates characterized as a notable candidate thorough biochemical characterization, providing insights into its metabolic profile. The experimental phase also involves as significant potential as a biofertilizer via their application with better growth traits by studying their impact on tomato seeds. This research seeks to discern the efficacy of identified bacterial isolate as a potent biofertilizer, presenting promising avenues for the integration of sustainable agricultural practices and advancements in agribiotechnological applications.

Keywords: *Azadirachta indica*, rhizospheric bacteria, biofertilizer, nitrogen fixation, potassium fixation.

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PP-030

GreenNanoCure - Harnessing Oxidized Nano-Cellulose for Advanced Medicated Bandages

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Abstract: The innovative GreenNanoCure stands as a potentially groundbreaking solution in biomedical healthcare, ingeniously utilizing oxidized nano-cellulose sourced from agricultural waste to fabricate advanced medicated bandages. This transformative process involves extracting cellulose from agricultural residue, primarily crop stubble, and refining it into oxidized nano-cellulose, leading to the creation of bandages boasting exceptional hemostatic and therapeutic properties. This breakthrough has the potential to revolutionize wound care and infection control practices significantly. Targeting agro-waste, particularly wheat crop residue prevalent in regions like Punjab, Haryana, Delhi, and Uttarakhand, underscores the promising nature of this cellulose-rich waste for our project. The extraction methodology from materials such as sugarcane and rice straw undergoes crucial stages like boiling, bleaching, and oxidation, yielding vital oxidized nano-cellulose fibres pivotal for enhancing hemostasis and expediting blood clotting. Cellulose's significance lies in its remarkable hemostatic attributes, proving especially advantageous for diabetic patients grappling with inefficient blood clotting due to hyperglycemia. These bandages offer a viable solution by facilitating swift clotting, particularly beneficial for wounds in diabetic individuals. Additionally, for individuals afflicted with haemophilia, these bandages serve as an interim aid in blood clotting until professional medical care is accessible. Beyond specific medical conditions, these bandages boast broader applications, serving as an emergency solution for the general public, and augmenting access to efficient wound care. In military scenarios, these bandages exhibit immense potential by staunching bleeding and stabilizing injuries, a crucial intervention where immediate medical assistance might be logistically challenging. The GreenNanoCure represents a convergence of

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sustainable agriculture, material science, and healthcare innovation. By repurposing agro-waste, it not only diminishes environmental impact but also confronts pressing healthcare challenges head-on. The development of Medicated Oxidized Nano-Cellulose Bandages signifies a significant leap in wound care technology, promising safer, more effective, and widely accessible solutions for a healthier future, effectively transforming waste into a valuable resource.

Keywords: Nano-cellulose bandages, biomedical innovation, agro-waste utilization, hemostatic wound care, healthcare sustainability.

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PP-031

SaniSafe - Technological Solutions for Safe Disposal of Menstrual Waste

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Abstract: The proposed solution SaniSafe heralds a groundbreaking innovation aimed at the responsible disposal of diverse menstrual waste, including pads, tampons, and cups, signifying a pivotal stride in women's health and environmental sustainability. Its distinctive system efficiently manages various menstrual waste types by commencing with meticulous segregation to tailor subsequent treatment processes. The introduction of ultraviolet (UV) treatment ensures the sterilization of items, guaranteeing pathogen elimination and enhancing overall safety. Subsequent hydrogen peroxide-based treatment removes menstrual blood from pads while melting and remolding cups, and breaking down pads and tampons into constituent materials. This innovative treatment isolates cellulose from pads and tampons, presenting reusable materials to address environmental concerns. Derived cellulose and plastic materials post-treatment hold vast potential across industries, offering sustainable alternatives to traditional resources. Beyond technical advancements, this prototype challenges societal taboos related to menstrual waste disposal, aiming to transform perceptions and practices, and fostering an inclusive environment. Not only does it control menstrual waste, but it also advances a comprehensive understanding of women's health and hygiene. This pioneering prototype stands as a catalyst for global change, offering a method that enhances living standards worldwide. Its innovative approach transforms disposal processes, carrying immense commercial potential. In essence, this technological breakthrough signifies a milestone in menstrual waste management, employing unique collection, segregation, and treatment methods alongside material reutilization possibilities. It marks a step towards an inclusive, sustainable, and hygienic future, bridging critical gaps in waste management and societal attitudes.

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Keywords: Menstrual waste management, sustainable disposal solution, environmental innovation, women's health.

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PP-032

Green Gold Rush: Elevating Biobutanol Brilliance through Smart Pretreatment

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Abstract

Biofuels are a category of renewable energy sources derived from organic materials, such as plants, algae, or waste residues. They represent a crucial aspect of sustainable energy solutions, offering a viable alternative to traditional fossil fuels. The production and use of biofuels contribute to mitigating climate change, reducing greenhouse gas emissions, and enhancing energy security.

This study explores the pretreatment of pineapple peel waste, a cost-effective feedstock, using a high-pressure reactor and various enhancers. Optimal conditions with a binary acid at 130 °C yielded a remarkable 80.17% hemicellulose solubilization. Fermentation of pooled fractions with *Clostridium acetobutylicum* NRRL B 527 resulted in 6.5 g/L butanol production with a yield of 0.14 g butanol/g sugar. This signifies a milestone in utilizing pineapple peel waste for bioenergy, showcasing its potential as an eco-friendly and economically viable resource. The study contributes to sustainable energy solutions by efficiently converting low-cost feedstock into biofuels, addressing both environmental and economic considerations.

Keywords: Biobutanol, Chemical pretreatment, Fermentation, Pineapple peel, Renewable energy

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PP-033

Extraction of silica from Rice Straw and applications in wastewater treatment

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Abstract: Silica, which is an elementary mineral, has numerous applications in a wide range of fields including scientific, industrial as well as biological. In the field of science, the adaptability of silica is employed for its catalytic properties, greatly contributing to the growth of chemical research and catalysis. Silica finds its application from materials used in construction to manufacturing of ceramics and glass, unveiling its pivotal role in the development of modern infrastructure. Furthermore, silica has emerged as a major player in cell processes with the potential to affect structural integrity of cells and organisms under biological conditions. This research is aimed at extracting silica from Rice Straw Ash, an agricultural waste product that is produced in large quantities globally. This was characterized using Scanning Electron Microscope, Fourier Transform Infrared Spectroscopy, X-Ray Diffraction, Brunauer–Emmett–Teller surface area, point of zero charge, and moisture content. The extracted product was then used for adsorption testing of a diazo dye, an industrial effluent that is harmful to the environment, and cancerous to humans. The Pure sample was found to remove approximately 75 % of dye at a dose of 0.8 grams. The optimum time for this removal was 1 hour 15 minutes. Further research is required for various dyes to understand the adsorption properties of silica. The importance of silica is reinforced by its use in environment applications, where it helps to eliminate pollutants and contributes to the development of sustainable technologies.

Keywords: Silica, Rice straw, Adsorption, dye, Chacterization

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PP-034

Synthesis of biopolymer from food waste using genetically engineered bacteria

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Abstract: According to the United Nations, an estimated 17 per cent of total global food production is wasted annually. It jumps to a staggering 40% in India. In 2020, the Global Hunger Index (GHI) positioned India at 94 among 107 nations, and that implies just 13 nations performed more poorly than India when it came to meeting their populace's food needs. As many people still sleep without eating enough every day, food waste remains a serious cause for concern. Since, food waste when processed, either gets decomposed or is turned into biogas which only leads to the excess carbon emissions. Our main aim is to solve the enormous food waste issue while simultaneously minimizing the use of single-use plastics by replacing them with the more sustainable and durable option, bioplastics while incorporating AI. Food waste has been majorly linked to food processing and manufacturing. But on our end, we have observed it happening at the local messes, restaurants daily. Meanwhile, plastic trash is also a major source of contamination in the environment. Hence, by combining these two domains, we wish to execute our solution by exploring the capability of food waste being utilized as a bioplastic material. Subsequently, physical, thermal-compound, and biological approaches expected for preparation of bioplastic raw components from food waste will be accounted for. Alterations of various food waste components (e.g., cellulose, starch, chitin, and caprolactone) for PHA derived items were additionally thought of.

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PP-035

Synthesis of ceramic nanocomposites for dental restoration

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Abstract. This research aims in a new approach to enhance dental cement's mechanical stability through synthesizing nanocomposites using a non-hydrolytic sol-gel process. The composition includes polymer ceramic nanocomposites. The synthesis procedure entails combining methyl methacrylate powder with ceramic nanoparticles and zinc oxide, followed by polymerization with a cross-linker liquid. Fourier Transform Infrared Spectroscopy (FT-IR) characterization revealed distinctive bonds in zirconium and silicate compounds, while X-ray Diffraction (XRD) discerned their structural characteristics. Scanning Electron Microscopy (SEM) scrutinized particle distribution in dental cement, and particle size and radiopacity analyses provided insights into their behavior under X-ray. Biological assessments included a hemolysis assay to evaluate the impact on red blood cells (RBCs) and an MTT assay to assess cytotoxicity in cellular interactions. The findings offer valuable insights into the potential of these nanocomposites to enhance the mechanical properties of dental cement, thereby advancing the field of dental biomaterials. This research holds implications for the broader domain of biomaterial science and its applications in dentistry, contributing to the ongoing progress in dental material research.

Keywords: Polymer, nanocomposites, dental restoration

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PP-036

Jaggery-assisted, cost-effective textile dye treatment through RSM optimization: Eco-friendly approach

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Abstract: Due to the increasing population, the demand for the textile sector has increased in the past few years, causing water pollution a burning issue. Textile industries primarily treat wastewater generated from their various units. Later, the common effluent treatment plant treats it by primary, secondary, and tertiary treatment and tries to meet the effluent discharge limits set by the Central Pollution Control Board (CPCB), before discharging the water into the environment. In previous years synthetic media like yeast extract, peptone, and glucose were used for dye degradation at the laboratory scale, which drawbacks strong odour and gas formation. To overcome these issues, we are currently working on improving biological treatment by using black jaggery as the sole carbon and nitrogen source. The Optimization of jaggery concentration, inoculum volume and dye concentration were optimized with the help of Response Surface Methodology (RSM). The azo dyes mainly break down in anaerobic conditions and formed aromatic amines require aerobic conditions for further mineralization to overcome this situation a Sequencing batch reactor (SBR) is operated in aerobic /anaerobic cycles for complete degradation of dyes using jaggery as a nutrient supplement.

Keywords- *Textile industry, effluent, decolourisation, azo dye, synthetic media, jaggery, sequencing batch reactor.*

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PP-037

Therapeutic potential of medicinal plants for Alzheimer disease treatment: Special emphasis on acetylcholinesterase inhibition.

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Abstract: Alzheimer's (AD) is one of the most common age-related neurodegenerative diseases in the world. Presently about 33.9 billion people suffered and it is concluded that it may get triple in upcoming years. Characteristic features of AD include accumulation of beta-amyloid plaque and hampered activity of acetylcholinesterase (AChE). Several plants are reported for their neuroprotective, memory enhancing and anti-depressant properties. These are impressive source of bioactive molecules recognized for their pharmacological properties. Of late, medicinal plants are being accepted widely because of fewer side effects and significant properties compared to synthetic drugs. In present studies different 35 plant species were screened for the inhibition of AChE enzyme which is collected from various localities. Amongst these *Carissa carandas* exhibited maximum inhibition 87.59± 1.34 %. Subsequently *Royal ponica, Manjifera indica, Couroupita guianensis, and Rosa indica* shown remarkable AChE inhibitory activity ranges between 75 % to 56%. These prominent five species were further studied for their anti-oxidant and anti-inflammatory activity using in-vitro models. This investigation resulted that highest inhibition potential plant species have significant anti-oxidant capacity. It also has utmost anti-inflammatory properties. *Carissa carandas* was selected as potential source of AChE inhibitors with their notable antioxidant capacity. It has remarkable neuroprotective property which can be utilized for symptomatic treatment of AD. Since these plant extracts are able to act on multiple therapeutic targets of AD, further evaluation is required to identify the bioactive ingredients, assess their safety and bioavailability in in vivo animal models.

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Keywords: Neurodegenerative disease, Alzheimer's disease, acetylcholinesterase inhibition, medicinal plant, antioxidant, anti-inflammatory

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PP-038

Phytoremediation: A promising approach for textile dyes

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Abstract- Textile industrial waste contains carcinogenic and mutagenic compounds which are released into the natural resources, causing health hazards to humans and animals. To overcome the water pollution problems bioremediation plays vital role with the help of certain bacteria, plants and fungi species. Among which to degrade textile dyes phytoremediation had shown promising results. In present work total 28 plants have been screened against different dyes at different concentrations out of which 8-10 plants shown higher decolorization. *Coleus decurrens, Green Crossandra infundibuliformis, Sphagneticola trilobata, Percicaria senegalensis, Laggera Crispata, Lantana camara* shown 60-80% decolorization against azo dyes in 5-10 days. Consortia of *Lantana camara, Bryophyllum* and *Mimosa pudica* shows 70% decolorization in 48 hours. Consortia of *Sphagneticola trilobata* and *Lantana camara* shows 70% in 3-4 days. Enzyme induction was observed in roots for degradation of dye focusing on enzymes laccase, tyrosinase, NADH-DCPIP reductase and riboflavin reductase after 48 hours and later increased at 72 hours. Samples were analyzed by HPLC and GC-MS to confirm the degradation.

Keywords: Bioremediation, phytoremediation, textile dyes, decolorization, enzymes, textile effluent.

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PP-039

Molecular docking and simulation studies of Curcumin derivatives against COX-2 in Alzheimer's Disease

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Abstract: Natural compounds, including those from medicinal plants, show promise in healthcare, addressing neurological and cardiovascular disorders. The use of NSAIDs in neurological conditions raises concerns about cardiovascular risks, emphasizing the need for careful consideration. Drug repurposing, particularly with curcumin derivatives, offers a potential avenue for addressing these challenges in drug development. Its potential therapeutic benefits extend to conditions like Alzheimer's disease by influencing immune responses and mitigating oxidative stress. In our research work, curcumin derivatives with 90% similarity were extracted from the PubChem database, resulting in 2561 compounds. The Cyclooxygenase -2 is considered a target protein for docking studies against curcumin derivatives. The inhibitor site was noted in the crystal structure of cyclooxygenase-2 (PDBID: 6COX) and the grid box was determined for site site-directed docking procedure. The docking of the 2561 ligands was executed through Perl programming and AutoDock Vina, generating output files with docking scores. Python code was then employed to extract top scores, stored in a text file, and transferred to Excel for analysis. Finally, PyMol facilitated the preparation of protein-ligand complexes, with the top 20 ligands analyzed and their best configurations saved for further examination. In a comprehensive screening of 2561 curcumin derivatives against COX-2 proteins, *in silico* docking revealed significantly higher scores compared to conventional COX-2 inhibitors. This suggests a strong binding affinity of curcumin derivatives to COX-2. Further steps involve synthesizing novel derivatives for molecular dynamics and subsequent *in vitro* assessments, including toxicity and cell viability, to assess their therapeutic potential.

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Molecular modeling and docking studies of Plumbagin Derivatives against Cyclooxygenase-2

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Abstract: Pancreatic cancer has been researched to be the most lethal and aggressive form of cancer. Cyclooxygenase is one of the best drug targets to treat cancer. The enzyme cyclooxygenase is responsible for the formation of prostanoids, which are important mediators of inflammation and pain. COX 2 was chosen as a target for molecular docking, due to its existence as a significant cancer developer from literature reviews. The plumbagin was chosen as a ligand as it exhibited potent cytotoxicity against pancreatic cancer cells under nutrient-deprived conditions. The plumbagin derivatives 7e, 7f, 7g, 8a, 8b, 8c, 8d, 8e, 8f, 8g, 9a, 9b, 9c, 9d, 9e, 9f and 9g chosen based on SwissADME tool validation. The inhibitor site of the COX-2 was analyzed with Pymol to know the binding site of ligands. The amino acids were observed to be Asp-51, Pro-153, His-388, and Phe-381. Grid formation was done based on this location of the inhibitor site, and molecular docking was carried out using AutoDock Vina. The highest docking energy was observed as -7.4 Kcal/mol for 8d ligand against the target. The interactions within the complex were observed using Pymol and Discovery Studio. These complexes can be further analyzed by molecular dynamics studies to know the better binding affinities through free energy calculations.

Keywords: Pancreatic cancer, Cyclooxygenase-2, plumbagin derivative, molecular modeling and docking

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PP-041

Development of an enzyme inhibition-based optical biosensor for the detection of Hg^{2+} using paper-based platform

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Abstract: In the present work, an enzyme inhibition-based biosensor was developed to detect Hg^{2+} using a functionalized cellulose paper platform. Acid phosphatase (ACP) sourced from *Macrotyloma uniflorum* seeds exhibited pronounced inhibition in the presence of Hg^{2+}. The assay reagent, a blend of α-naphthyl phosphate, aromatic diazonium ion and a polymer matrix, was applied to a patterned paper with circular reaction zones. Hydrolytic cleavage of the substrate resulted in the formation of a chromogenic diazo complex, imparting a reddish-pink colour to the paper substrate. Pre-treatment of the enzyme with Hg^{2+} led to its inactivation, thereby hindering the release of naphthol and causing a reduction in the colour intensity of the paper probe. The diminished colour intensity correlated with an elevated concentration of Hg^{2+}, establishing the biosensor as a viable tool for Hg^{2+} detection. The developed sensor exhibits simplicity, robustness, and cost-effectiveness, rendering it suitable for application in constrained laboratory settings or resource-limited conditions. Furthermore, the potential for future applications in environmental monitoring and point-of-care diagnostics underscores the significance of this innovative biosensor.

Keywords: Paper-based analytical devices, enzyme inhibition, acid phosphatase, biosensor, Hg^{2+}

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PP-042

Valorization of sawdust for enhanced lignin modifying enzymes production and correlated degradation of endocrine disrupting chemicals using *Pleurotus ostreatus*

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Abstract: Increased industrial and agricultural activities, globally, has resulted in the exponential release of hydrophobic emerging pollutants, categorized under endocrine disrupting chemicals (EDCs) which alter the endocrine and homeostatic systems both in humans and animals at each trophic level even at low concentrations (ng/L). The physical or chemicals methods for elimination of these EDCs are either costly or add more toxic secondary metabolites into the environment. Hence, an eco-friendly approach involving white rot fungus (WRF) having an ability to valorize lignocellulosic waste with production of cocktail of lignin modifying enzymes (LMEs) - Laccase, Lignin peroxidase (LiP) and Manganese peroxidase (MnP) proves effective as it catalyzes multiple enzymatic reactions to mineralize such hydrophobic EDCs. With this perspective, inoculum of five days grown WRF isolate showing 99.68 % homology with *Pleurotus ostreatus* was used for EDCs (50 ppm) degradation by incorporating BPA / TCS in minimal salt medium (MSM), pH 5 valorized using 5% saw dust. Enhanced degradation of 90.46% BPA and 86.64% TCS observed in 20 days can be correlated with enhanced expression of laccase (247.22 U/L; 308.33 U/L), LiP (193.54 U/L; 405.01 U/L) and MnP (7.81 U/L; 18 U/L) respectively. Besides degradation potential, WRF also showed plant growth promoting traits with Indole acetic acid production (6.2 µg/ml), ammonia (1.23 µmol/ml), siderophore (43.36 %) and ACC deaminase activity (0.49 mM/ml). Adsorption studies of BPA conducted using composite beads of autoclaved fungal biomass (obtained after degradation experiments), sodium alginate and fly-ash showed maximum adsorption of 13. 61 mg/g at 5th hour.

Keywords: Valorization, lignin modifying enzymes, endocrine disrupting chemicals, white rot fungi.

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PP-043

Nano drugs: An approach towards effective medication

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Abstract: Biocompatibility and acceptability are the two most significant challenges for any drug delivery method as synthetic materials interact quite differently with human body cells than biological ones do. Using large-scale materials for drug delivery presents several challenges, including inadequate body absorption, low bioavailability and solubility, in vivo instability, target-specific delivery concerns, tonic effectiveness problems, and potentially hazardous side effects. By using nanostructures and nanophases in various scientific fields, particularly in nanomedicine and nano-based drug delivery systems, where such particles are of great interest nanotechnology has been discovered to bridge the gap between the physical and biological sciences. The knowledge and techniques of nanoscience are applied to medical biology, disease prevention, and treatment in the rapidly emerging field of nanomedicine. It encourages the use of nanoscale materials for nanorobots, nanosensors for diagnostics, delivery, sensory functions, and actuating materials in living cells. Pharmaceutical compounds have been improved in terms of efficacy, safety, physicochemical characteristics, and pharmacokinetic/pharmacodynamic profile by the use of nano-drug systems. Functionalized nano-drug systems in particular can increase the bioavailability of oral medications and give longer half-lives for pharmaceuticals injected into specific organs. Because of this, nano-drug delivery systems have the potential to improve treatment compliance and clinical results by minimizing systemic adverse effects and increasing pharmacological effects while reducing the frequency of administration. It is anticipated that the use of nanotechnology in medicine, namely in medication delivery, will increase. This poster highlights the usefulness of nanoparticle medications for a range of medical conditions.

Keywords: Drug delivery, Bioavailability, Nanotechnology, Treatments, Nanoparticles

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