MIT School of Bioengineering Sciences & Research

(A constituent unit of MIT ADT University, Pune, India)

5th INTERNATIONAL CONFERENCE

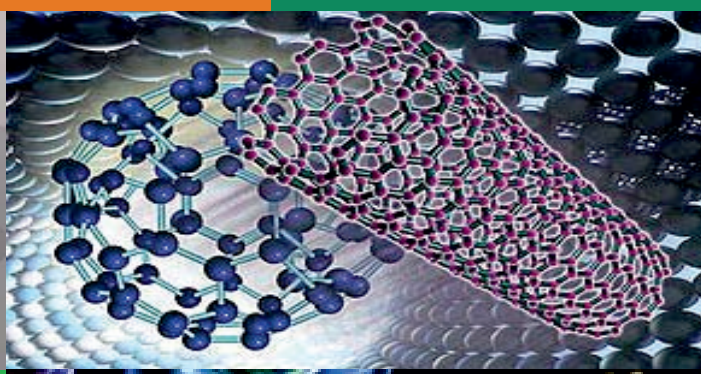
ON

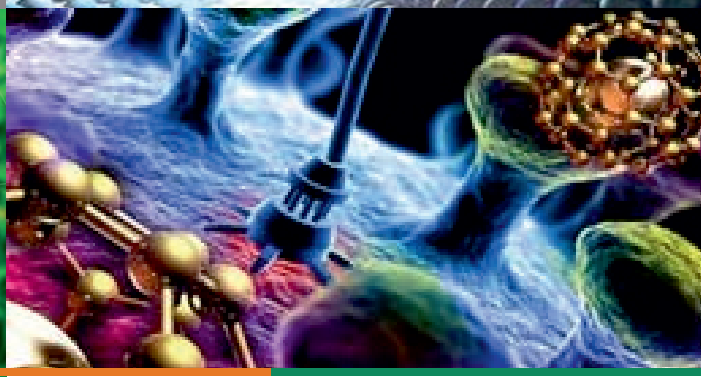
RECENT TRENDS IN BIOENGINEERING

(ICRTB 2022)

12th - 13th February, 2022

ABSTRACTS



MIT School of Bioengineering Sciences & Research
Pune

MIT School of
Bioengineering Sciences & Research
Breathe Life into Engineering Career!

MIT UNIVERSITY
ART, DESIGN & TECHNOLOGY

MIT-ADT UNIVERSITY
PUNE, INDIA
A Leap Towards The World Class Education

About ICRTB 2022

ICRTB 2022 is the largest technical event in Bioengineering in India to foster interdisciplinary exchange and learning. Its goal is to bring together engineers, medical experts, researchers and practising clinicians, individuals working in academia, industry and government agencies.

Conference Theme Areas

Conference Theme : Nano-biotechnology : Solutions for healthcare and environment

Sub Themes :

- Nano biosensors
- Nanomaterial for clinical diagnostics
- Environment monitoring
- Drug delivery systems
- Nanotoxicity
- Bio-inspired materials
- Nanobots
- Smart materials
- Nano-fertilizers
- Nanomaterials based devices
- Nanoinformatics
- Tissue engineering
- Bioinformatics
- Biomedical imaging
- Nanomaterials based scaffolds
- Bioremediation
- Biomimetics

5th International Conference on

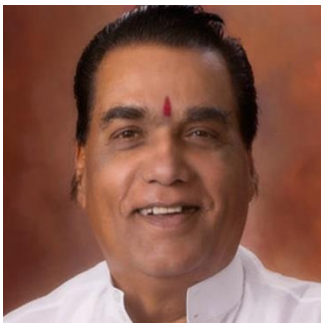
Recent Trends in Bioengineering (ICRTB-2022)

Editors
Prof. Vinayak Ghaisas
Dr. Renu Vyas

Organized by

MIT School of Bioengineering Sciences & Research
MIT, Art, Design and Technology University, Pune-412201, India

Messages



Hon. Prof. Dr. Vishwanath Karad

My heartfelt congratulations to MIT School of Bioengineering Sciences & Research for its upcoming annual flagship event viz. the 5th International Conference on Recent Trends in Bioengineering (ICRTB 2022). Thanks to the convenors for consistently organizing this event to bring together researchers from multiple domains. My blessings to all the faculties and wishes for good health to the speakers and delegates.

Prof. (Dr.) Vishwanath D. Karad
Founder Pesident, MAEER's MIT Group of Institutions
President, MIT- ADT University

Hon. Dr. Suresh Ghaisas

It give me a deep sense of satisfaction and pride to learn that MIT School of Bioengineering Sciences & Research is making rapid strides in research and innovation. The 5th International Conference on Recent Trends in Bioengineering (ICRTB 2022) promises to be a great event like every year with amazing speakers drawn from both industry and academia. My warm wishes to the team and looking forward to the deliberations.

Dr. Suresh Ghaisas
Founder Trustee
MAEER's MIT Group of Institutions

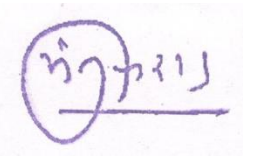
Dr. Mangesh Karad

Dear Delegates,

I would like to congratulate the MIT School of Bioengineering Sciences & Research for their commitment and superb drive in organizing the 5th International Conference on Recent Trends in Bio-engineering (ICRTB 2022) in virtual mode. I am very certain that this occasion will be able to provide a platform towards strengthening our relationships in knowledge sharing while at the same time providing the necessary thrust in joint research collaborations and product commercialization within the research society. It is my aspiration that this conference will be a foundation for the growth of new ideas towards a better tomorrow.

Friends, I would also like to stress that in this era of rapid technological advancement, we as researchers will not survive without working in a community, supplementing and supporting each other's work. I believe that this conference would serve as an effective platform for academic staff, researchers, and engineers to learn, network, share and create an environment for intellectual exchanges that would benefit all parties greatly. As a consequence, inputs from our peers would greatly help improve the standard and quality of the projects one is working on. Lastly, may I ask that we work hand-in-hand in our effort to further enhance our research and development (R&D) arena, especially in healthcare & the environment, which this country and the world needs. With your continued support and interest in us, I am sure that the quest of making MIT-ADT University a nationally-reputable university is not going to be impossible to achieve.

On behalf of MIT ADT University, I extend a warm welcome to the delegates and eminent speakers. Best Wishes for the conference.



Hon. Dr. Mangesh Karad
Executive President
MIT-ADT University

Prof. Vinayak Ghaisas

It gives me great pleasure to host our 5th International Conference in Recent Trends In Bioengineering. Every year we bring together experts from multiple disciplines exchange ideas and collectively improve our knowledge of Bioengineering. Covid pandemic has taught us many things about life and helped us think about providing healthcare solutions in many different ways. This year's theme for ICRTB is Nano-biotechnology solutions for healthcare and environment. We strongly believe that the amalgamation of thoughts & ideas on this theme from participants from around the world will help society at large.

I wish to extend a warm welcome to all our speakers and participants and I am looking forward to meeting you all on the virtual platform.

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

Dr. Renu Vyas

It is with great pride and enthusiasm that I invite all the delegates, guests and speakers to the 5th International Conference on Recent trends in Bioengineering (ICRTB 2022) a two days online event. The annual flagship event of the institute is growing every year in magnitude. We have received more than 100 abstracts from all premier academic and research institutes. The profile of the speakers at the event is amazing in terms of domain knowledge and interdisciplinary research areas.

The theme of this year's conference is Nano biotechnology solutions for healthcare and environment. As knowledge in medical and environmental engineering disciplines advances, nano biotechnology holds tremendous promise for providing sustainable, safe and efficacious solutions. Clinical applications of nano biotechnology such as illness detection, targeted medication administration and molecular imaging are of paramount importance in healthcare. Environmental nanotechnology applications are wide ranging including wastewater treatment, remediation, sensors and energy storage. I am sure everyone will benefit from the plenary speaker sessions as well as the delegate talks.

Looking forward to meet everyone online.

Please stay safe and healthy,

Dr. Renu Vyas
Head of the School
MIT School of Bioengineering Sciences & Research
Convenor ICRTB 2022

Eminent Speakers

Prof. Dr. SABU THOMAS PhD, FRSC (UK), DSc (UL,France), DSc(UBS,France)
Vice Chancellor,
Mahatma Gandhi University, Kottayam, Kerala, India -686 560
Director,
School of Energy Materilas & Former Director, School of Chemical Sciences
&
Founder Director,
International and Inter University Centre for Nanoscience and Nanotechnology,
Mahatma Gandhi University, Kottayam, Kerala,
India -686 560

Profile

Professor Sabu Thomas is currently the Vice Chancellor of Mahatma Gandhi University, Kottayam, Kerala, India. He is also the Director of School of Energy Materialsand the Founder Director and Professor of the International and Interuniversity Centre for Nanoscience and Nanotechnology and former Director of School of Chemical Sciences.

Prof. Sabu Thomas is one of India's most renowned scientists known for his contributions in polymer science and nanotechnology. He is an outstanding researcher, administrator and an excellent teacher who has students all over the world. He had his bachelor's degree from Cochin University of Science and Technology in 1983 and Ph.D in 1987 from the Indian Institute of Technology, Kharagpur, India

Prof. Thomas is now an outstanding leader with sustained international acclaims for his work in polymer science, polymer nanocomposites, elastomers, polymer blends, interpenetrating polymer networks, polymer membranes, nanoscience, nanomedicine and green nanotechnology. Prof. Thomas has established a state of the art laboratory in the area of polymer science and nanoscience by securing mega grants from a large number of funding agencies in India and abroad.

Professor Thomas has received a number of national and international awards which include: Fellowship of the Royal Society of Chemistry, London FRSC, Distinguished Professorship from Josef Stefan Institute, Slovenia, MRSI medal, Nano Tech Medal, CRSI medal, Distinguished Faculty Award, Dr. APJ Abdul Kalam Award for Scientific Excellence – 2016, He is in the list of most productive researchers in India and holds a position of No.5. Because of the outstanding contributions to the field of nanoscience and polymer science and engineering, Prof. Thomas has been conferred HonorisCausa (D.Sc) Doctorate by the University of South Brittany, Lorient, France and University of Lorraine, Nancy, France. Very recently, Prof. Thomas has been awarded Senior Fulbright Fellowship to visit 20 Universities in the US and he received the most productive faculty award in the domain Materials Sciences. He was also awarded with National Education Leadership Award – 2017 for Excellence in Education. In 2019 Professor Thomas has been selected as a member of Prestigious European Academy of Sciences.

He was also selected as the Fellow of International Academy of Physical Sciences and was honoured with Life Time Achievement award from Indian Association of Solid-State Chemists and Allied Scientists (ISCAS). Last year he was selected for the DST Nano mission award and was selected for the “Honoured Professor of Siberian Federal University,Russia”. This ishis third Honoris Causa from a foreign University. Very recently he was honoured with Fellow of the International Association of Advanced Materials (FIAAM) Sweden.This year he was awarded with Bailey Medal Award 2021 and Kairali Lifetime Research Award 2021 by Kerala Government.

Prof. Thomas has excellent publication track record. Professor Thomas has published over 1200 peer reviewed research papers, reviews and book chapters. He has co-edited 150 books published by Royal Society, Wiley, Wood head, Elsevier, CRC Press, Springer, and Nova etc. He is the inventor of 15 patents. The H index of Prof. Thomas is 115and has more than 62,000 citations. Prof. Thomas has delivered over 350 Plenary/Inaugural and Invited lectures in

national/international meetings over 30 countries. Prof. Thomas has been ranked by the Sandford University, USA last year among the top researchers in the filed of Polymer Science.

Talk synopsis

Polymer Nanocomposite Scaffolds for Tissue Engineering

Prof. SABU THOMAS

Vice Chancellor, Mahatma Gandhi University, Kerala, India

Biodegradable polymer scaffolds are useful materials to integrate the femoral part of the implant with the bone, and provide a matrix for cellular growth. Synthetic biodegradable polymers can provide temporary scaffold for cell adhesion and expansion both in vitro and in vivo and guide tissue regeneration with defined sizes and shapes. The fibrillar structure is important for cell attachment, proliferation and differentiated function in tissue engineering. The structure allows for growth and is convenient for transport of nutrients. The synthetic polymers such as Polycaprolactone (PCL), Poly l-lactic acid (PLLA), and their copolymers have attracted wide attention for their biodegradation in the human body and are used for tissue engineering. Several methods have been practiced to create highly porous scaffold including fiber bonding, solvent casting/ salt leaching, gas foaming, phase separation and electrospinning. Out of which electrospinning is the simple and cost-effective technique for producing nanofibers from polymer solution. Introduction of organically modified clay in polymers leads to different types of structures which include intercalated or exfoliated morphology. The nano reinforcement increases the mechanical rigidity, mobility, stiffness and biodegradability in biodegradable polymers. Moreover, it also increases the porosity of the polymer nanocomposite. Nanoparticle reinforced scaffolds are yet to achieve importance. In fact they have wide range of interest in tissue engineering. Literature reports regarding nanoparticle reinforced scaffolds are very scant. Hence the present investigation will be interesting and will find application in tissue engineering in the foreseeable future. In the present talk the state of the art on the synthesis, morphology, structure, properties and applications of dual porous nanocomposite scaffolds will be presented.

Aliasger K. Salem, Ph.D., FAAPS, FAIMBE

Bighley Chair of Pharmaceutical Sciences
Professor of Pharmaceutics, Chemical and Biochemical Engineering, Biomedical Engineering, Chemistry and Dentistry
Co-Leader, Experimental Therapeutics Program, Holden Comprehensive Cancer Center
Co-Director, Nanotoxicology Core, Environmental Health Sciences Research Center
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Profile

Dr. Salem has extensive research leadership experience and specific and extensive peer-reviewed expertise in the development and testing of novel cancer therapies and cancer drug delivery formulations. Dr. Salem has served as Leader of the Experimental Therapeutics Program at the Holden Comprehensive Cancer Center for the last 9 years. Dr. Salem is a nationally prominent cancer therapeutics development and formulation expert as evidenced by his election to Fellow of the American Association of Pharmaceutical Scientists and his election as Fellow of the American Institute for Medical and Biomedical Engineering. In 2020, Dr. Salem was awarded the Hancher-Finkbine Medallion and the Leadership in Research Award by the University of Iowa for life-time achievements in research over his career to date. Dr. Salem has experience as the PI/PD of a wide range of private foundation and federal grants as well as his tenure as the Bighley Chair and Professor of Pharmaceutical Sciences. Dr. Salem currently mentors one T32 surgical resident, one research scientist, 3 postdoctoral fellows and 19 PhD graduate students. He has previously graduated 24 PhD students under his primary mentorship with each former student going onto academic, government and industry positions.

Prof. Sangeeta Kale
Professor in Physics & Director (Policy & Planning)
Defence Institute of Advanced Technology (DIAT), Pune
Co-Director, Navyukti Innovations Private Ltd., Pune
Contact: ermail: *sangeetakale2004@gmail.com* / *sangeetakale@diat.ac.in*

Profile

Sangeeta Kale, graduated from University of Pune, India and did her Masters in Electronic-Science and Doctoral studies in Material Science from same university. She did her post-doctoral studies from University of Maryland, College Park, U.S.A. She is working at Defence Institute of Advanced Technology, as Professor and Director (Policy & Planning) of this University. Additionally, she worked as a visiting Scientist at International Centre for Theoretical Physics (2006 – 2020), at Trieste, Italy. She co-owns a start-up company, "Navyukti Innovations Private Limited", where she works as the Director. Earlier, she worked as Officiating Vice Chancellor (2014-15) of DIAT and Dean (Academics) (2013-15, 2018-20), Dean (Student Affairs) (2017-18) of DIAT. At the research front, she works on nanomaterials for their sensing and biomedical applications, typically pertaining to Defence research (DRDO and Tri-Services (Army-Navy-Air Force)). She has successfully executed projects funded nationally from DST, DBT, UGC, DAE, ISRO and DRDO. She has guided more than 17 PhD students for their PhD and more than 50 Masters projects for their dissertations. She has more than 115 International research publications to her credit along with 8 Book Chapters and 4 Books. She has written a invited-chapter in a book entitled "Lilavati's Daughters" published by Indian Academy of Sciences, which is a short biography of Indian Women Scientists.

Talk synopsis

From Research to product-in-market: A classic story in Indian context

Prof. Sangeeta Kale

Defence Institute of Advanced Technology (DIAT), Pune

Any research has its impact only if it is able to reach a beneficiary. Research ideas germinate in the brain of a scientist and it indeed takes a long path before it reaches the market, where it can be showcased as a probable product. This journey is not easy. Research starts with a project fund and then it goes through the tiring path of a student who works on it, publications which are written by a faculty and students together (Technology Readiness Level I-II). The technology comes after that which is a challenge of its own. The parameters which are considered when any scientific research graduates into a technology, are very different. Compactness, feasibility, sensitivity, flexibility and economically prized; are few parameters which play a significant role (an example of a sensor device). The technologically viable research goes through the next cycle of up-scaling and commercialization, which is the next-level challenge (Technology Readiness Level III-V). This product cycle will be discussed in this presentation, where a classic example of Bio-sensor Development will be taken as a case-study.

Prof. Jeremy C. Simpson
Full Professor of Cell Biology
School of Biology & Environmental Science
University College Dublin (UCD)
Dublin, Ireland
Email: jeremy.simpson@ucd.ie, Tel: +353 (0)1 716 2345

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 over 120 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

Nanoparticles as drug delivery systems - what can cell biology tell us?

Prof. Jeremy C. Simpson

School of Biology & Environmental Science, University College Dublin, Ireland

Nanoparticles offer huge potential as therapeutic delivery vehicles. Despite their increasing use, relatively little is understood with respect to how they interact with and enter cells, and how they traffic through the various subcellular compartments to reach their final destination. Our research has focused on the cellular mechanisms exploited by model fluorescently-labelled nanoparticles to interact with various in vitro cell models. We have used genome-wide RNA interference approaches applied to cells growing in 2D cultures to dissect the machinery that they use to deal with nanoparticles, providing the first systematic view of how this process occurs (1). Although these classical 2D-grown monolayers of cells have served biologists well for many years, there is a rapidly growing interest in probing cell function in more a physiological context. In this regard, 3D assemblies of cells, so-called spheroids, provide an attractive model. We have therefore developed pipelines to reliably produce spheroids and then image them using automated confocal high-content screening microscopy (2). We have recently shown how this model can also be applied to study nanoparticle penetration across multiple cell layers (3), as well as how nanoparticle-toxicity occurs (4). Our approaches enable quantitative information at the population, single cell and subcellular levels in 3D to be obtained, paving the way for a deeper understanding of the therapeutic potential of nanoparticles.

(1) Panarella A et al. (2016) Sci. Rep. 6:28865.
(2) Chalkley AS, Mysior MM & Simpson JC (2021) J. Vis. Exp. 178; doi:10.3791/63436.
(2) Cutrona MB & Simpson JC (2019) Small 15(37):e1902033.
(4) Kelly S et al. (2021) Nanoscale 13(41):17615-17628.

Dr. Nathan T. Johnson
Investigator at H3 Biomedicine,
Greater Boston

Profile

Nathan Johnson is currently an Investigator at H3 Biomedicine. H3 Biomedicine is a privately held biopharmaceutical company focused on the discovery and early development of novel, targeted anti-cancer compounds for the unmet needs of genetically defined patient populations. H3 has leveraged its integrated expertise in genomics, tumor biology, bioinformatics and innovative synthetic organic chemistry to create an integrated drug development ecosystem to deliver patient-based, genomics-driven, small molecule drugs.

As a former Research Scientist at Harvard Medical School (HMS) and Dana-Farber Cancer Institute (DFCI), he was responsible for merging his biological expertise with computer science and data science in order to achieve breakthroughs in breast cancer and Alzheimer's therapeutic research. He used AI in order to drive new insight into how to recognize relevant patterns that would be difficult to impossible without it. He has been involved in research for almost 15 years across a number of challenges for diseases such as Duchenne Muscular Dystrophy, Polycystic Kidney Disease, Acute Lymphoblastic Leukemia, and on how to prevent parasites from infecting soybeans. Prior to pursuing his graduate studies, he worked as a microbiologist testing food products such as Hershey's, baby formula, and meat for pathogens. He holds a BS in Biology with a minor in Chemistry from Evangel University in Springfield, MO, an MS in Biomedical Sciences from the University of Missouri in Columbia, MO, and a Ph.D. in Bioinformatics and Computational Biology from Worcester Polytechnic Institute (WPI) in Worcester, MA.

Justin Dauwels
Associate Professor, TU Delft

Profile

Dr. Justin Dauwels is an Associate Professor at the TU Delft (Circuits and Systems, Department of Microelectronics). He was an Associate Professor of the School of Electrical and Electronic Engineering at the Nanyang Technological University (NTU) in Singapore till the end of 2020. He was the Deputy Director of the ST Engineering – NTU corporate lab, which comprises 100+ PhD students, research staff and engineers, developing novel autonomous systems for airport operations and transportation.

His research interests are in data analytics with applications to intelligent transportation systems, autonomous systems, and analysis of human behaviour and physiology. He obtained his PhD degree in electrical engineering at the Swiss Polytechnical Institute of Technology (ETH) in Zurich in December 2005. Moreover, he was a postdoctoral fellow at the RIKEN Brain Science Institute (2006-2007) and a research scientist at the Massachusetts Institute of Technology (2008-2010). He has been a JSPS postdoctoral fellow (2007), a BAEF fellow (2008), a Henri-Benedictus Fellow of the King Baudouin Foundation (2008), and a JSPS invited fellow (2010, 2011).

He served as Chairman of the IEEE CIS Chapter in Singapore from 2018 to 2020, and serves as Associate Editor of the IEEE Transactions on Signal Processing (since 2018), Associate Editor of the Elsevier journal Signal Processing (since 2021), member of the Editorial Advisory Board of the International Journal of Neural Systems, and organizer of IEEE conferences and special sessions. He is also Elected Member of the IEEE Signal Processing Theory and Methods Technical Committee and IEEE Biomedical Signal Processing Technical Committee, both since 2018.

His research on intelligent transportation systems has been featured by the BBC, Straits Times, Lianhe Zaobao, Channel 5, and numerous technology websites.

Besides his academic efforts, the team of Dr. Justin Dauwels also collaborates intensely with local start-ups, SMEs, and agencies, in addition to MNCs, in the field of data-driven transportation, logistics, and medical data analytics.

Talk synopsis

AI for automated EEG analysis

Justin Dauwels
Associate Professor, TU Delft

Many tasks in medicine still involve substantial manual work. In many cases there is strong potential for intelligent automation by Artificial Intelligence (AI), 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 neurology, specifically, the automated analysis of EEG.

We are developing a low cost validated system to automatically interpret EEG via remote access. Diagnosis and management of neurological disorders rely on visual review of EEG data by specialized physicians. As the duration of EEG recordings ranges from 30 minutes to several days, the visual review is time consuming, and accounts for approximately 80% of total cost associated with EEG reading. Our system has the potential to reduce expenses associated with EEG testing and allows physicians to devote more quality time to their patients. One of the applications that we have explored so far is diagnosis of epilepsy of EEG and detection of epileptic seizures from EEG. In this talk, we will show numerical results on large EEG datasets of epilepsy patients and healthy control subjects for multiple centers.

Dr. Himanshu Gadgil
Director and CSO
Enzene Biosciences Ltd., India

Profile:

Dr. Himanshu Gadgil is the Chief Scientific Officer and is responsible for all operations at Enzene. He holds a PhD in Biochemistry, and has a proven track record of managing multi-layered organizations toward successful global product launches of Biosimilars and development of Block-buster novel Biologics. He is a passionate innovator with over 50 publications/patents in field of Biologics drug development. Dr. Gadgil has a PhD in Protein Purification, Biochemistry from The University of Tennessee Health Science Center, Memphis, USA and post doc from UT Medical Centre. Prior to joining Enzene, Dr. Himanshu Gadgil was associated with Intas Biopharmaceuticals, Amgen and Waters Corporation.

Dr. Abbasi Asl
Professor, Neurology, Bioengineering and Therapeutic Sciences
University of California
San Francisco, UA

Profile

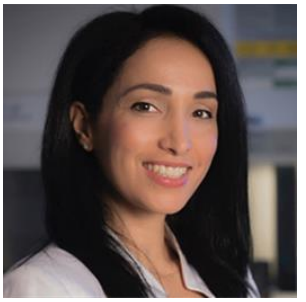
Dr. Abbasi Asl is an Assistant Professor in the Department of Neurology and the Department of Bioengineering and Therapeutic Sciences at UCSF. He is a Weill Neurohub Investigator and serves as the director of Data Analytics and Visualization at the Weill Institute for Neuroscience at UCSF. He completed his PhD and MSc in Electrical Engineering and Computer Sciences at UC Berkeley in 2018, where he developed interpretable machine learning tools with applications in computational neuroscience. His research has led to the development of interpretable computational models for large volumes of data in domains such as neuroscience, medicine, and imaging. He is currently a core member at the Neuroscape Labs at UCSF, Bakar Computational Health Sciences Institute, and Kavli Institute for Fundamental Neuroscience. He received his MSc in Biomedical Engineering from Sharif University of Technology in 2013 and BSc in Electrical Engineering from Amirkabir University of Technology (Tehran Polytechnic) in 2010. Dr. Abbasi Asl is the recipient of the Next Great Idea Program Award from the Weill Neurohub, the New Frontiers Research Award from the Sandler Program for Breakthrough Biomedical Research (PBBR) in 2021 and 2022, and the Eli Jury Award from UC Berkeley, Department of Electrical Engineering and Computer Sciences in 2018. He received the May J. Koshland Fund in Memory of H.A. Jastro Award from UC Berkeley Graduate Division in 2016, the Excellence Award in Biomedical Engineering from the Sharif University of Technology in 2013, and the Excellence Award in Electrical Engineering from Tehran Polytechnic in 2010.

Talk synopsis

Stability-driven interpretation of deep learning models: A neuroscience case study

Dr. Abbasi Asl
Professor, Neurology, Bioengineering and Therapeutic Sciences
University of California, San Francisco, UA

In the past decade, research in machine learning has been exceedingly focused on the development of algorithms and models with remarkably high predictive capabilities. These predictive models have wide applications in large-scale data-driven domains including neuroscience, healthcare, and computer vision. However, interpreting these models still remains a challenge, primarily because of the large number of parameters involved. We will introduce two frameworks based on (1) stability and (2) compression to build more interpretable machine learning models. These two frameworks will be demonstrated in the context of a computational neuroscience study. First, we will introduce a stability-driven visualization framework for models based on neural networks. This framework is successful in characterizing complex biological neurons in the mouse and non-human primate visual cortex. This visualization uncovers the diversity of stable patterns explained by neurons. Then, we will discuss two neural network compression techniques based on iterative pruning and low dimensional decomposition of filters. These model compression techniques increase the interpretability of networks while retaining the high accuracy and diversity of filters. The compressed models give rise to a new set of accurate models for neurons but with much simpler structures.



Dr. Natalie Artzi
Harvard Medical School, Massachusetts,
US

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 the next- generation biomaterials to improve outcomes following internal surgeries.

Talk synopsis

Nanoparticles have been increasingly used for cancer drug delivery and gene therapy to enhance their accumulation in the tumor microenvironment and their uptake into cancer cells, with the goal of improving the therapeutic index. The same nanoparticle libraries are now being used to target the immune system to attain robust and long-lasting antitumor immune responses. This paradigm shift requires understanding of nano-bio-interactions in the context of the immune

system. Nanoparticles can be used to study the role of administration mode on drug distribution and accumulation in different organs and cells and the associated tumor responses, as well as the effect of combination therapies and their synergy with clinically-available modalities in eradicating cancer and generating anti-tumor immunity. Stimulator of interferon genes (STING) agonist is a promising activator of antitumor immunity. However, the systemic delivery of STING agonist, based on cyclic dinucleotides (CDNs), yields limited anticancer activity owing to poor serum stability and cellular internalization. Here, I will show, in multiple models of murine cancer, the design of a CDN-nanoparticle that enables targeting immune cells following intravenous administration and the resulting potent innate and adaptive antitumor immune responses.

Dr. S. K. Jana
Director R & D and Manufacturing,
Serum Institute of India Pvt. Limited, Pune, India

Profile

Dr. S.K. Jana is a Ph. D. on recombinant Hepatitis-B vaccine development, an M. Tech. in Biochemical Engineering, B. Tech. in Chemical Technology, B. Sc. in Chemistry, PGDOM (Post Graduate Diploma in Operations Management).

He is University Gold Medalist, National Scholarship holder & GATE qualified, Govt. of India, SRF & JRF (DBT & DST). BEST Scientist & Employee award from Shantha Biotechnics Ltd. (A Sanofi group), Hyderabad, India.

For last 31+ years, he is into the Biopharmaceuticals industry, Vaccine industry, Biosimilar product development at early stage, late stage development, pilot scale products development & commercial scale production, Upstream & Downstream Process Development, Bio-analytic methods development, Polysaccharide-protein conjugate vaccine, Technology Transfer, Project planning & execution. Extensive experience is in process & Technology development, optimisation, validation & Technology transfer. Application of Advanced Data Analytics in Vaccine development & Manufacturing.

Since December, 2008, he has been working with Serum Institute of India Pvt Ltd., Pune for the development & manufacturing of Pneumococcal conjugate vaccine + other recently launched vaccines. Patents filed & granted: 15 nos. (National & International Patents, US, EU, Japan, etc)

Synopsis of Talk

Development of Vaccine or Biologics are complex in nature and very challenging, but it has great opportunities. This talk is going to address the scientific concerns during development phases of upstream/downstream

processing with the theme of smart & integrated bio-manufacturing with the application of Advanced Data Analytics in smart & Integrated manufacturing. World class manufacturing integrates the latest-generation machinery with production process systems to facilitate manufacturing with aim of high accent on product substitution or New Product Development.

The rate of technology absorption and the integration of multiple unit operations involving technology add value to Biologics manufacturing. The distinction between traditional & integrated high throughput manufacturing is volume and scale economies, labor and skill content, and the depth of integrated unit operations with flexible & disposable types process vessels with more automation.

Extensive use of computer with data analytics and information technologies integrated with a high-performance online sensor in a production system increases efficiency & monitoring production processes. There are still no universal scalable and high-throughput manufacturing technology that meet the criteria for large-scale applications, but the future is going to have that with extensive use of PAT towards smart manufacturing of vaccines/biologics.

Dr. Geeta Manjunath
CEO, Niramai health analytix,
Bangalore.

Profile

Dr. Geetha Manjunath is the Founder, CEO and CTO of NIRAMAI Health Analytix, and has led the company to develop a breakthrough AI solution for detecting early stage breast cancer in a non-invasive radiation-free manner. Geetha holds a PhD from IISc and management education from Kellogg's Chicago. She comes with over 25 years of experience in IT innovation. She has proposed and led multiple AI projects at Xerox Research and Hewlett Packard India. Before starting NIRAMAI, Geetha was a Lab Director for Data Analytics Research at Xerox India. Geetha has received many international and national recognition for her innovations and entrepreneurial work, including CSI Gold Medal, BIRAC WinER Award 2018 and is also on the Forbes List of Top 20 Self-Made Women 2020. She was recently awarded the Accenture Vahini Innovator of the Year Award from Economic Times and Women Entrepreneur of the Year 2020 by BioSpectrum India. Geetha is also an inventor of 16 US patents and more pending grant.

Dr. Andreas Bender

Director of Digital Life Sciences at Innovation Campus Berlin (ICB)/Nuvisan Berlin.

Profile

Dr Andreas Bender is a Reader for Molecular Informatics with the Centre for Molecular Science Informatics at the Department of Chemistry of the University of Cambridge, leading a group of about 22 postdocs, PhD and graduate students and academic visitors. In his work, Andreas is involved with the integration and analysis of chemical and biological data, aimed at understanding phenotypic compound action (such as cellular readouts, and also organism-level effects) on a mechanistic level, predicting molecular properties related to both compound efficacy and toxicity, as well as drug repurposing. Of particular interest to Andreas' work in recent years have been the modelling of compound mixtures, which is funded via an ERC Starting Grant, and which also interfaces with his work on understanding the mode of action of traditional medicines. Andreas received his PhD from the University of Cambridge as a Cambridge Gates Scholar in 2005 and worked in the Lead Discovery Informatics group at Novartis in Cambridge/MA as well as at Leiden University in the Netherlands before his current post. Andreas' work is documented in more than 170 scientific publications in the cheminformatics, bioinformatics and drug discovery fields.

Dr. Shiladitya Sengupta
MIT Harvard, MIT Health Science and Technology
USA

Profile

Dr. Shiladitya Sengupta received his PhD in Pharmacology from the Universit of Cambridge in 2002, where he worked on the mechanisms underlying hepatocyte growth factor-induced angiogenesis. Shiladitya moved to MIT for his postdoctoral work, where he invented the first layer-by-layer nanoparticle, termed a nanocell, which could be used to target different compartments of a tumor (Nature, 2005) His eatly training was in medical pharmacology at the All India Institute of Medical Sciences. He was awarded the Geeta Mital Gold Medal.Dr. Sengupta joined the Brigham and Women's Hospital as a principal investigator and assistant professor of medicine and HST at Harvard Medical School and Harvard-MIT Division of HST. He also served as the co-chair of the BWH Center for Regenerative Therapeutics. Dr. Sengupta was one of the first to use nanotechnologyto target oncogenic patways in cancer (PNAS, 2010). His team discovered a novel mechanism of intercellular communication during metastasis, where cancer cells transfer miRNA to endothelial cells via physical nanotube (Nature Commun. 2015). The team is also described a novel behaiour of cancer cells, where the cells switch to a dormant state in response to chemotjerapy. using mathematical models, they described novel strategies of targeting these cell states (Nature Commun. 2015). Recently, they invented a Reporter Nanoparticle that allows real time imaging of an anticancer drug in action, including immunoterapy. (PNAS, 2016) . Dr. Sengupta has been recognized as one of the top 35 innovators of the world under 35 (TR35 award), by Technology Review magazine. He has been awarded the Era of Hope Scholar award by the Department of Defense, ta Coulter Foundation career award, and is a TED fellow. He was a Nehru Scholar at Trinity College, University of Cambridge, and is one of the youngest recipents of the Shakuntala Amir Chand Prize from the Indian Council of Medical Research. Dr. Sengupta is a serial entrepreneur, and has cofounded Cerulean Pharmaceuticals, Vyome Bioscences, Invictus Oncology, Akamara Therapeutics and Mitra Biotech.

Dr. Sandip Gaudana
Project lead, Reliance Industries,
Gujarat.

Profile

Dr. Sandeep B. Gaudana completed his PhD from Maharaja Sayajirao University of Baroda and post doctorate from IIT Bombay and Michigan State University. His key technical strengths include: basic and advanced microbiology, genetic engineering in diverse hosts, probiotics, basic and advanced applications of ion exchange resin technology, wastewater treatment, algal biotechnology. He has 15 years of experience in handling DNA, RNA and proteins. His key soft skills include: optimism and empathy driven people development approach, passion and technology driven project leadership. He is currently leading a cutting edge synthetic biology project at the breakthrough R&D of Reliance Industries Ltd. He has Published 14 peer reviewed research articles in journals of international repute.

Talk synopsis

Role of Biotechnology in Health and Environment Sustainability

The unprecedented, and exponential growth and development that we have been experiencing in the last 5 decades, have also resulted into drastic depletion of natural resources. The pace of consumption of natural resources, which currently stands around 100 billion tons per year, is simply unsustainable. Hence, serious and urgent interventions are required, such that all the advances that have been made in diverse facets of science and technology collaborate with a single aim to ensure that our growth not just continues on its exponential trajectory, but is also sustainable. The talk will touch upon few of such ideas and initiatives, mostly pertaining to wastewater management, and lower carbon footprint in energy, nutraceuticals and materials production.

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5TH INTERNATIONAL CONFERENCE ON RECENT TRENDS IN BIOENGINEERING (ICRTB-2022)

(FEB 12 – FEB 13, 2022)

Online Platform

Detailed Schedule

Day 01: 12th February, Saturday 2022

8.30 am to 9.30 am	Spot registrations, logins by guests, speakers and delegates
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 digital 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 10.00 am	Brief remarks by Chief Guest
10.00 am to 10.10 am	Speech by Prof Mangesh Karad, Executive President, MIT ADT University
10.10 am to 10.20 am	Motivational Talk by Hon. Dr. Vishwanath Karad sir Founder MIT group of institutes Pune
10.20 am to 10.25 am	Release of abstract book and CD by Director
10.25 am to 10.30 am	Vote of Thanks
10.30 am to 10.45 am	Inauguration of e poster session by guest and Tea break
11.00 am to 1 pm	**Keynote addresses**
11.00 am to 11.30 am	Prof. Sabu Thomas, VC, Mahatma Gandhi University, Kottayam, Kerala, India
11.30 am to 12 .00 pm	Dr. Sangeeta Kale, DIAT, DRDO, Pune
12.00 pm to 12.30 pm	Dr. Andreas Bender, Digital Life Sciences at innovation Campus Berlin (ICB)/Nuvisan, Berlin, Germany Pvt Ltd.
12.30 pm to 1.30 pm	Lunch Break , e poster session and Industry Expo

1.30 pm to 4 pm	Plenary Session I
1.30 pm to 2 pm	Dr. Geetha Manjunath, Niramai Health analytix, Bengaluru, India
2.00 pm to 2.30 pm	Dr. Himanshu Gadgil, Enzene Biosciences Ltd, India
2.30 pm to 3.00 pm	Dr. S. K. Jana, Serum Institute of India, Pune
3.00 pm to 3.20 pm	Tea break

3.20 pm to 3.50 pm	Prof. Jeremy Simpson, Dean Academics, University College of Dublin, Ireland
4.00 pm to 5.30 pm	Oral presentations by delegates (parallel sessions)
5.30 pm to 6 pm	Dr. Nathan Johnson, CEO, Verne Analytics USA
6.00 pm to 6.30 pm	Dr. Natalie Artzi, Harvard Medical School, Massachusetts, USA
6.30 pm	Day One conclusion

Day 02: 13th February, Sunday 2022

9 am to 11am	Key Note Addresses
9.00 am to 9.30 am	Dr. Shiladitya Sengupta, MIT Health Science and Technology, Harvard, USA
9.30 am to 10 am	Prof. Aliasger Salem, College of Pharmacy, University of lowa, USA
10 am to 10.30 am	Dr. Sandeep Gaudana, Reliance Industries, Gujarat, India
10.30 to 11 am	Tea Break, e poster session, industry expo
11.00 am to 1.00 pm	Plenary Session II
11.00 am to 11.30 am	Prof. Reza abbasi-Asl, Bioengineering & Therapeutic Sciences University of California, San Francisco USA
11.30 am to 12.00 pm	Talk by Assocham on Health Care
12.00 pm to 1 pm	Lunch break and e poster sessions
1.00 pm to 1.30 pm	Prof. Justin Dauwels, TU Delft University of Technology, Netherlands
1.30 pm to 4 pm	Oral presentations by delegates (parallel sessions)
4 pm to 4.30 pm	Innovative projects session by MIT School of Bioengineering Sciences & Research Pune
4.30 pm to 5.00 pm	Valedictory function, announcement of Prizes, feedback from delegates, concluding remarks by Director, National Anthem
5 pm	Conclusion of the event

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Oral Presentation

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February 12-13, 2022

Nanovaccine Combined with Anti-PD-L1 for Enhance Tumor Photo-Immunotherapy

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Bio-Nano Therapeutics Research Laboratory, Cancer Research Program, Bharathiar University, School of Life Sciences, (CRP), India.

Abstract: The study reports on the photothermal material combined with immunotherapy called photo-immunotherapy(PIT) to targeting the estrogen receptor-positive (ER+) breast cancer using the biological near-infrared window-I (650-900) (NIR-I). Tannic acid expressly targets the estrogen receptor-positive ER+ breast cancer cells. As a proof of biological acid /polymer/Imiqumoid nanoparticle-TA-PANi@R837 NPs and well appropriate as Photothermal platform for versatile combination for immunotherapy. Immune checkpoint anti-PD-1/PDL-1 blockade developed as an immunotherapy strategy to activate the immune system and target the cancer cells for the best therapeutic effect. In this study, we concentrate on the therapeutic tactic combining PD-1/PDL-1 blocking with photothermal ablation for tumor via co-encapsulating anti-PD-1 and TA-PANi@R837 NPs, not only ablating cancer calls upon NIR irradiation also revenue the strong anti-cancer immunity to destroy the tumor progression post PIT. In both in vitro and in vivo experiments demonstrated that TA-PANi@R837 NPs could efficiently activate PTT induce an immune response and immune resistance based on PD-1 checkpoint to ablate the tumor and inhibit the tumor recurrence. we validate the potency of TA-PANi@R837 NPs exhibits high photothermal conversion efficacy and stability. The results demonstrate that TA-PANi@R837 nanovaccine combination of PIT and suppress the cancer cells growth of the tumor margin beyond effective PTT and immunotherapy.

Keywords: Nanovaccine, NIR-light, Photothermal therapy, Immunotherapy, Cancer

In-Silico analysis for the confirmation of insulin receptor as a target for reported GLUT4 anti-diabetic natural compounds

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Abstract: There are 425 million people with diabetes in the World. There will be 629 million people with diabetes in the World in 2045. The insulin receptor controls glucose homeostasis, a physiological mechanism that can lead to diabetes and cancer if disrupted. Here, we used the crystal structure of the Insulin Receptor (PDB ID: 1IR3). This protein is a 2 chain structure with a sequence from humans. This study aimed to confirm the Insulin Receptor target for reported GLUT4 anti-diabetic natural compounds based on their pharmacokinetic properties, drug-likeness, toxicity prediction, molecular docking, target analysis, and similar FDA approved drugs prediction. Initially, we performed ADME analysis for the selected 24 compounds. Among these 24 compounds, it has been found that 18 compounds were following the Lipinski Rule of Five. Further, we did toxicity analysis, and it has been found that 15 of the compounds showed toxicity, and the rest of the compounds were non-toxic in nature. We performed molecular docking of screen compounds after ADME and toxicity analysis. It has been found that Apigenin selected as the best compound as it showed the lowest binding energy and satisfied all our study parameters. We also checked the similarity of Apigenin from the FDA-approved drugs, but no similar molecule was found. Our promising findings based on preliminary and *in-silico* analysis need to be validated further by in-vitro and in-vivo studies.

Keywords: Insulin receptor; anti-diabetic natural compounds; ADME, toxicity, molecular docking, SwissSimilarity

Carbon nanotube performing role in Nano biosensors

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Abstract. Nanomaterials possess specific functions which lead them to in particular attractive for biosensing applications. Carbon nanotube (CNT)-based complete biosensors have been recognised as a next-generation building block for ultra sensitive and ultra-fast biosensing devices. Carbon nanotubes (CNTs) in particular can act as scaffolds for the stabilisation of biomolecules at their outer surface, and they possess a number of high-quality physical, chemical, electrical, and optical properties, making them one of the most important materials for the transmission of signals related to the recognition of analytes, metabolites, or disease biomarkers. Biosensors have become a vital component of modern life, from diagnosing life-threatening illnesses to detecting natural entrepreneurs in combat or terrorist operations. Carbon nanotubes are used in many current biosensors, and a growing body of research is striving to do the same with graphene, a newly found nanomaterial that is an unrolled nanotube. With the growing use of carbon nanomaterials in biosensors, now is a good time to look at how this trend is influencing biosensor creation and design.

Keywords: Biosensor, carbon nanotube, applications of carbon nanotube.

Nanomaterial based biosensor for liver cancer detection

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Abstract: Annexin A2; ANXA2 biomarker shows distinguished sensitivity, specificity and high diagnostic accuracy for liver cancer (LC) detection which is the 3rd deadliest cancer in the world.[1–3] It is produced in the serum samples of LC infected patients with an optimal cut-off concentration measuring 18 ng/mL, offering a less intrusive technique for LC diagnosis.[4] As an exemplary nanomaterial, functionalized multi-walled carbon nanotubes (*f*-MWCNTs) modified using amine ($-NH_2$) moieties were utilized to fabricate biosensor for ANXA2 detection. The biosensing platform is developed by initially electrophoretically depositing *f*-MWCNTs onto indium tin oxide (ITO) modified glass platform by employing constant DC voltage (80 V, 180s), with further attachment of monoclonal antibodies (anti-ANXA2) involving activation-coupling mechanism of EDC-NHS. Lastly, bovine serum albumin (BSA) is drop-cast to diminish the non-specific attachment sites. X-ray diffraction spectroscopy and Fourier-transform infrared spectroscopy were employed to investigate the purity of *f*-MWCNTs and immobilization of anti-ANXA2 onto *f*-MWCNTs@ITO electrode, respectively. The electrochemical attributes of fabricated electrodes were analysed through cyclic voltammetry. The developed immunosensor (BSA@anti-ANXA2@*f*-MWCNTs@ITO) reveals wide linear detection range (0-60 ng/mL), remarkable sensitivity (1.805 µA.mL/ng.cm^2) and excellent selectivity coefficient as ~1. Also, the electrochemical response is recorded using spiked serum sample to validate the accuracy of the developed biosensor, which aligns favourably with the recorded calibration plot of standard samples of ANXA2.

Keywords: Biosensor, Annexin, Biomarker, Liver cancer, MWCNT

Electrochemical biosensor based on graphitic carbon nitride nanosheet modified ITO electrode for food toxin detection

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Abstract: The *Aspergillus Parasite* and *Aspergillus flavus* produce Aflatoxins that are harmful metabolites by polyketide pathway. One of the most hepatotoxic and hepatocarcinogenic is aflatoxin B1 (AfB_1) [1], and primarily wheat, cotton seeds, corn, peanuts, tree nuts, walnuts, and other cereal crops are susceptible to contamination[2]. The AfB_1 mainly targets liver tissue and its extensive exposure cause hepatocellular carcinoma, which is the third most common cancer globally [3,4]. The food toxin (AfB_1) was quantitatively diagnosed by electrochemical ultrasensing platform comprise of electrode modifier i.e., graphitic carbon nitride nanosheet (g-C_3N_4 NS) and linker molecule i.e., thionine, which covalently immobilized the biomolecules. The g-C_3N_4 NS synthesized using precursor melamine via polycondensation followed by chemical exfoliation and on thionine treatment (Thn@g-C_3N_4 NS) amine moieties were introduced onto g-C_3N_4 NS surface. The ultrasensing platform fabricated by electrophoretic deposition of Thn@g-C_3N_4 NS onto the indium tin oxide (ITO) modified glass electrode, the covalent attachment of carboxyl groups (-COOH) of Aflatoxin B1 antibodies (anti-AfB_1) and amino groups (-NH_2) of Thn@g-C_3N_4 NS@ITO electrode were acquired via EDC-NHS coupling chemistry and, nonspecific sites were obstructed by bovine serum albumin (BSA). To analyse the structural and functional aspect of synthesised nanomaterial, X-ray diffraction and Fourier-transform infrared spectroscopy were utilized and the topology and morphology were examined by atomic force microscopy, scanning electron microscopy, and transmission electron microscopy. The cyclic voltammetry method was employed for electrochemical characterization/studies of fabricated electrodes, and for developed ultrasensing platform i.e., BSA@anti-AfB_1@Thn@g-C_3N_4 NS@ITO achieved results are: lower detection limit 0.328 fg/mL, wide linear detection range 1 fg/mL to1 ng/mL and 7 weeks shelf stability with sensitivity 4.85 μA[log mL/ng]cm^2.

Keywords: Graphitic carbon nitride, aflatoxin B1, thionine, biosensor, nanosheet.

Cigarette Butts: A tiny Nocuous particles inciting ecotoxicity via oxidative stress in Pila virens

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Abstract. Cigarette butts (CBs) are one of the major emerging pollutants which contribute open threats to the aquatic ecosystem and ultimately lead to the turndown of the water-life. Nevertheless, the toxicity of CBs on *Pila virens* remained unexplored. In the present investigation we have reported the ecotoxicity of CBs on freshwater snails (*P. virens*). Our results determined the lethal concentration of CBs on *P. virens* was 50% for both 24 h and 48 h among 10%, 25%, 50%. The CBs exposed P. virens showed the alterations in the anti-oxidant enzymes. We noticed the significant upsurge in the carbonylation of protein (PC), Glutathione sulfotransferase (GST), peroxidation of lipids (LPO) and glutathione peroxidase (GPx) when compared to the experimental control. The decreased amount of reduced glutathione (GSH) and catalase (CAT) were noticed in P. virens treated with CBs in contrast with control. The present results indicates that CBs incited nocuous to the consumable apple snail *P. virens* through oxidative pressure. The *P. virens* fills in as the best model for the toxicological assessment of CBs tainting the aquatic environment.

Keywords: Cigarette butts, *Pila virens,* anti-oxidants

A Progressive Review on Early Stage Breast Cancer Detection

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Abstract. Breast cancer is one of the persistently diagnosed diseases in women which lead to the primary cause of cancer-related death in women. The early detection of cancerous tissue will aid in recovery and treatment of it and can save more lives. The detection of breast cancer is challenging using mammography, as dense tissues can overlap in screening. Now and again, ultrasound has likewise been utilized for breast cancer growth screening. Numerous methods have been utilized for the location of inconsistencies in the breast. For breast malignant growth discovery at the underlying stage, many examination works have been finished. Machine learning is frequently used for detection. For the classification of images, deep learning algorithms like Convolutional neural networks can be used. In this study, we have presented a progressive review of deep learning algorithms for early-stage breast cancer detection using imaging modalities. Breast malignant growth is the main source of disease passing in ladies in the current year. According to the World Health Organization (WHO), in 2020, there were more than 5 million cases and 2.3 million women diagnosed with breast cancer and 685,000 deaths globally. As per the recent report of the National Cancer Registry Programme (NCRP), the number of cancer cases in India is expected to increase from 13.9 lakh in 2020 to 15.7 lakh by 2025 which shows a nearly 20% increase in cases. For accurate diagnosis and staging of breast cancer, mammography and ultrasound image processing helping to identify cancer in the early stage of development.

Keywords: Breast cancer, image processing, machine learning, deep learning.

Review of Bioprosthetic Heart Valves

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Abstract: First ever successful implant of bioprosthetic heart valves in 1960 by Dr. Dwight Harken was a major breakthrough in the cardiology field addressing the problems of valve stenosis and valve failures due to rheumatic disorders. The first valve that came into use was the mechanical type. It is the most widely used and durable type with 60 years of replacement history. This is because clinically, the risk of complications like thromboembolism and anticoagulation in these mechanical valves outweighs the risk of reoperation and low durability of biological valves. Heart valves that resemble or mimic the natural leaflet structure have also been in existence. The bileaflet and trileaflet valves have been designed using carbon coated metals or polymer or made of a knitted fabric. The most upcoming valve under research is the synthetic leaflet valves. Globally, over 45% of implanted heart valves are biological. At present, the biological valves that are in use are either directly taken from bovine or porcine sources or they are tissue engineered. Owing to rapid aging of population, surgical replacements seemed unsuitable with structural stenosis and regurgitation. The first implantation of transcatheter valve offers minimal non-invasive procedure of catheter-based technology, performed in 2000. Based on clinical trials, it had shown improvements in life expectancy and effective redo surgical procedures. With this evolving landscape, the future holds promise of innovations in design and development of valvular technology with even more efficient functionality along with total elimination of valvular failures for a long run prospect.

Keywords:

Mechanical heart valves, valvular failures, biological, tissue valves, transcatheter valve implantation, evolution of valves.

Metal Nanotoxicity on pigments of *Zea mays*

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Abstract: Nanoparticles have existed in nature since the very beginning, but the concern of their safety gained attention in late 1990s due to the availability and usage of anthropogenic nanoparticles (ANPs). This opened a whole new field of study – nanotoxicology, to evaluate the safety of ANPs. The studies on nanotoxicity on plants, although, has not been very exhaustive primarily because they do not exhibit pronounced effects as observed with other terrestrial and aquatic life systems. In this current study, we have focussed on elucidating the effect of metal nanoparticles (ZnO, TiO_2 and Al_2O_3) on fundamental pigments of Zea mays along with the plant height. Comparison of the effect was performed between the plants grown in soil and under hydroponics setup with identical exposure to nanoparticles. The range of nanoparticles (0.1 to 100 ppm) did not exhibit a dose dependent toxicity with any of the nanoparticle exposed set. Zn, because of its role in chlorophyll synthesis and a stabilizing agent for many metalloenzymes, was used both in nano and bulk form to differentiate between their individual effects. It was interesting to observe that bulk ZnO showed dose dependent toxicity on all the evaluated pigment concentration, viz. chlorophyll A, B, carotenoid and xanthophyll. Even when significant decrease in cholorophyll A is observed (only pigment with significant variation), height of the plant was hardly affected when grown in soil, but, invariably showed an increase in hydroponics. Current observation suggests detailed evaluation of growth indicators and parameters for a molecular level understanding.

Keywords: Nanoparticles, nanotoxicology, metalloenzymes, chlorophyll.

Ecotoxicity and oxidative stress responses in *pila virens* expose to titanium oxide nanoparticles

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Abstract: The common medium to get rid of industrial waste is water bodies. In spite of having norms for disposal based on solubility and dispersion rate of the water body, it might end up being harmful for the aquatic life. The increasing number of industries lead to wide spread contamination in effecting the aquatic life. Titanium (III) oxide NPs are thermally stable and insoluble in nature, they are typically used for glass, ceramic, fuel cells and optic works. Titanium oxide NPs being heavy metals they lead to bioaccumulation and bioaugmentation, also due to their size and unique properties nano particles pose a potential threat to aquatic ecosystem. In the following research work, the toxic effects of titanium (III) oxide NPs are studied by using fresh water snails Pila Virens (P. Virens) as a bio monitor. Different experiments were exercised to calculate the contents of lipid peroxide, protein Carbonyl, superoxide and reduced Glutathione. In regards to the experiments conducted, the P. Virens where subjected to 1/2 (601.13 µg/L) and 1/4 (300.56 µg/L) and 1/12 (100.18 µg/L) LC50 concentration for a duration of 24hr and 48hrs. A substantial growth of lipid peroxide, superoxide dismutase, protein carbonyl was observed with a decrease in total glutathione content as compared to with their respective controls

Keywords: Nanoparticles, heavy metals, bioaccumulation, aquatic ecosystem.

The pursuit of Al_2O_3 nanoparticles toxicity on *Pila virens*

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Abstract: The toxicity of aluminium oxide nanoparticles (Al_2O_3NPs) on fresh water gastropods is scarce although their toxicity has been reported on other aquatic organisms. The Al_2O_3NPs are extensively used in both biomedical and industrial applications. As a consequence, vulnerability to these NPs is recurrent, moreover no concrete evidence of toxicity to fresh water molluscs are evident. The present study is aimed to investigate the Al_2O_3NPs induced toxicity and oxidative stress on the fresh water snail *Pila virens*. The *P. virens* were exposed to ½ (433 µg/L) and ¼ (216 µg/L) of LC50 concentration for 24 and 48 h. The lipid peroxidation levels increased significantly in P. virens exposed to ½ and ¼ LC50 concentration for 24 and 48 h respectively. Similarly, an increase in GST, PC was also observed after exposure to two different concentrations for 24 and 48 h. The P. virens which are treated with sub lethal concentration for 24 h and 48 h respectively has shown changes in glutathione peroxidase (GPX) and reduced glutathione (GSH). The Pila virens makes the best exemplar for the ecotoxic assessment of Al2O3 NPs polluting the environment.

Keywords: Nanoparticles, ecotoxic, gastropods, oxidative stress.

Review of Body Composition Analysis (BCA)

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Abstract: Body Composition Analysis (BCA) is defined as the amount and distribution of fat and muscle in the human body. Although every hospital routinely acquires hundreds of cross-sectional imaging studies from whole body or abdominal Computed Tomography/Magnetic Resonance Imaging, Dual-energy X-ray absorptiometry scans every day, that would be suitable for deriving precise body composition measurements, this potential currently remains unutilized. Measuring fat and muscle mass would require manual interventions especially in selecting the appropriate slice from a stack of scanned images and performing segmentation of adipose compartments, which is a labour-intensive and time-consuming task often leading to manual errors. Segmentation of a single scan may require 15-20 minutes of analysis time. The anatomical variability in the abdomen poses a substantial challenge to segmentation. Advancements in the development of machine learning and deep learning algorithms paved the way for an automated analysis pipeline in slice selection and segmentation of muscle and adipose tissue compartments in scans, thereby enabling the radiologists, clinical researchers to routinely add body composition measurements in their reports. Next to deep learning algorithms, BCA is being increasingly recognized by researchers and medical professionals as an interpretive component in many practical applications in clinical routine care like disease prognosis and monitoring treatment or therapy responses. In this way, BCA can be made a cost-effective method for estimating the required clinical outcomes, eliminating manual interventions, and understanding the widespread applications for large-scale research applications and population studies.

Keywords:

Body composition analysis, manual interventions, deep learning algorithms, slice segmentation, BCA significance, clinical outcomes, research applications.

Phytoactive molecule engineered biodegradable nanofibers against wound associated fungal biofilms

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Abstract: Colonization of fungal cells at wound site is of particular concern, as it attracts other bacterial pathogens and develops complex architectures in the form of biofilm. Biofilms are a dreadful factor that delays wound healing process and worsen the wound management for clinicians. To address the problem of biofilm and its associated delayed wound healing, a nano-scaffold based on acacia gum (AG) and polyvinyl chloride (PVA) containing molecular complex of phytoactive molecule (PM) in β-cyclodextrin was synthesized using electrospinning, and its physico-chemical properties were extensively characterized. The encapsulation efficiency of PM in fabricated nanofiber matrix (PM-NF) was ~ 38 %, and also evidenced for a sustained release of PM from the matrix. The PM-NF inhibited the planktonic growth and also eradicated the mature biofilm of *Candida* species and their clinical isolates. Wound healing activity of PM-NF studied through in vivo murine model of excision wound highlighted the enhanced re-epithelization and speedy wound healing upon PM-NF treatment as compared to blank NF. In conclusion, the data establishes the anti-biofilm and wound healing potency of synthesized eugenol loaded PVA/AG nanofibers and strengthens its bi-functional application as transdermal substitute along with antifungal potency.

BSA nanocarrier for enhanced anticancer activity of Evodiamine

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Abstract: Evodiamine (Evo) is a natural indolequinone alkaloid extracted from the fruit of Evodiae fructus. It exhibits myriad of pharmacological activities, such as anti-tumor, antidiabetic, anti-allergenic, analgesic, neuroprotective etc. It has gained increasing interest as a potential anticancer agent but poor water solubility and low bioavailability limits its clinical use for cancer treatment. Hence, to overcome these limitations and enhance its anticancer activity, we synthesised Evo-loaded Bovine Serum Albumin (BSA) nanoparticles by Desolvation method. The synthesised nanoparticles were physicochemically characterized by DLS, FESEM, FTIR, DSC, TGA and XRD analytical techniques. The hydrodynamic radius found to be 150 nm. Further the morphology, size and shape was confirmed by FESEM images, which implies that the nanoparticles are of spherical shape. The FT-IR spectra, XRD patterns and DSC thermograms confirmed the encapsulation of Evodiamine in amorphous form in BSA nanoparticles. The cellular uptake study proved that Evodiamine was successfully delivered at its target sites and further AO-EtBr staining suggests that BSA nanoparticles were more effective and enhanced the anticancer activity of Evodiamine as a therapeutic agent. *In vitro* cytotoxic studies proved that Evo loaded BSA nanoparticles were more toxic towards Breast cancer cells and kill more cells as compared to pure Evo. In summary, Evo loaded BSA nanoparticles as drug delivery system could be clinically effective for breast cancer.

Keywords: Cancer, Human Serum Albumin, Nanoparticles, Drug, Biocompatible

A Molecular docking approach for targeting the Alzheimer's disease caused by the Beta- amyloid protein - A drug Keto-Curcumin

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Abstract: The main two hallmark pathologies required for a diagnosis of Alzheimer's disease (AD) are the extracellular plaque deposits of the β- amyloid peptide (Aβ) and the flame-shaped neruofibrially tangles of the microtube binding protein tau. Beta-amyloid (A beta) protein a 42-43 amino acid polypeptide. A beta protein cause the toxic to neuronal cell types and its early deposition may be an important event in the pathogenesis of AD. In our present study effect of Keto-curcumin against amyloid Beta peptide was carried out by using computational approaches. In molecular docking, keto curcumin interacts with A chain of amyloid fibril and forms energy of -6.7 kcal/mol, vander Walls contribution (VDW) -38.87, total gas phase energy (GAS) -45.26, non-polar and polar contribution to salvation (PBSOL/GBSOL) is 25.38 and 28.18 respectively. RMSD, RMSF, Rg and SASA plot further used to study the stability of complex and effect of keto-curcumin. The *in-silico* analysis of keto-curcumin against beta amyloid protein which is the key molecule for responsible of pathogenesis of AD provides a distant task in the drug design for the managing the Alzheimer's disease.

Keywords: Beta amyloid, Keto-curcumin, Alzheimer's disease, Molecular docking, Simulation.

Soft, flexible, breathable and waterproof membranes for healthcare applications

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Abstract: Soft, flexible and stretchable membranes allowing the transmission of water vapors while resisting the water droplets simultaneously are of great significance as can be employed in wide range of applications in the emerging fields. Here, we have made a successful attempt to fabricate such polymeric membranes possessing the water-resistance and breathability with the required morphological structures by using a phase inversion method. In this method, the precursor polymer is processed with a suitable combination of solvent and non-solvent system, in a defined proportion, so as to have a microstructural changes allowing the water-vapors to pass through it while prohibiting the water-droplets. As synthesized membranes presented a water-contact angle of $111^0 \pm 2^0$ and water vapor transmission rates > 11.3 kg m^{-2} d^{-1} . In addition to being soft and flexible, the membranes also exhibit excellent mechanical properties. Further, the applicability of the membranes has been demonstrated in potential healthcare applications.

A drug discovery study: Targeting the Amyloid beta protein with a Curcumin as a potent drug for Alzheimer's disease

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Abstract

Background: The brain is the centre and control system of the body. With aging populations and stress in the world the persons with neurodegenerative and brain diseases are a common cause and which are responsible for the mortality and morbidity rates; these are increasing day by day in the health science community**.**

Aim: The study describes Alzheimer's as a disease which causes 60-70 percent of dementia where the death of brain cells takes place and it causes memory loss and congenital decline.

Methodology: In the present study we used the sophisticated bioinformatics approaches of drug discovery. Retrieval of structures from publicly available databases (PDB & PUBCHEM) for specific amyloid beta precursor protein and inhibitor as ligand compound. Receptor and ligand interaction of the compound were analyzed by using molecular docking and dynamic simulation models.

Results: In our present study effect of di-o-picolinoyl curcumin against beta peptide has showed interacts with A chain of amyloid fibril and forms energy of -7.7 Kcal/ mol. RMSD, RMSF, Rg and SASA plot further used to study the stability of complex and effect of di-o- picolinoyl molecule.

Conclusion: The present computational study put forward that the identified compound can be further exploited as a potential protein-ligand compound for the design and development of new drug for the treatment of Alzheimer's disease.

Keywords: Alzheimer Disease, Brain, Curcumin, *In-silico*, Molecular docking, Molecular dynamic simulation

Design of Alginate-Schwann cell bioink by suspension bath 3D bioprinting for peripheral nerve tissue engineering

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Abstract: 3D bio printing has emerged as an important tool for peripheral nerve tissue engineering applications by controlling layer-by-layer depositing bio compatible materials, neural cells and bioactive factors. Bioink contains the living cell and the biomaterial which mimics the extra cellular environment of the cell enables the cell adhesion, proliferation, and differentiation after printing. Cross linking of bioink changes a liquid polymer into 'solid' or 'gel' by restricting the ability of movement which influences the network property like swelling and degradation.

In the current study, we use Sodium Alginate (SA) and Rat Schwann cells based bioink for peripheral nerve tissue engineering application. SA hydrogel has served as a cell delivery material for many tissue engineering applications due to ease of preparation and relatively good cell compatibility. SA is negatively charged bio polymer by which water and other molecules can be encapsulated into it by capillary action. Due to this, it can also be used to diffuse the media with growth factors making it an ideal bio-ink for printing. To achieve desired fabricated scaffold, we chemically crosslink by suspension bath process for the hydrogel to maintain the structure thereby holding the integrity of the printed structure. We performed the preliminary tests such as swelling, degradation, rheology tests and printability of the hydrogel by assessing different nozzle sizes and pressures. To understand the cytocompatibility of bioink, we have performed the MTT and live-dead assays. Our results show that prepared bioink had shown good swelling ratio, printability and cell compatibility.

Keywords: Schwann cells,3D bioprinting, suspension bath, bioink, sodium alginate, peripheral nerve tissue engineering

Designing and Fabrication of 3D Bioprinted PVA-Chitosan hydrogel for Hepatic Tissue Engineering Applications

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Abstract: Liver failure is one of the leading causes of morbidity around the world. Although whole liver transplantation has proven to be a successful therapeutic strategy for individuals with chronic liver disorders, it is limited in its applicability due to the lack of organ donors and high cost. Culturing hepatocytes in three-dimensional (3D) scaffolds has been a promising strategy for promoting liver tissue regeneration. Natural and synthetic polymer-based hydrogels polymers have attracted interest in tissue engineering, which aims to repair and regenerate a variety of tissues and organs. Polyvinyl alcohol (PVA) hydrogel is known for low toxicity, biocompatibility, and favourable physical features, but it has limitations in cell-biomaterial interaction and needs to be mixed with other materials to improve it. Chitosan (CH) has structural similarity to glycosaminoglycans, that are a component of the liver ECM and also has a good biocompatibility, biodegradability, low toxicity, non-immunogenicity. Meanwhile, as a natural crosslinker, genipin is used to crosslink the blend of PVA-CH. In this study, we used Fourier-transform infrared and scanning electron microscopy to prepare and characterise PVA-CH 3-D scaffolds crosslinked by genipin and printing parameters were investigated. Further, bioink was prepared by using PVA/CH and HepG2 cells and the cytocompatibility of PVA-CH scaffolds crosslinked with varying concentrations was investigated using cell viability assays such as MTT and live-dead assay. Liver specific functions such as albumin secretion, urea synthesis, and Alanine transaminase release were also investigated. Our results were promising to fabricate a potential scaffold for hepatic tissue engineering and treating liver disorders.

Keywords: HepG2 cell line, bioink, polyvinyl alcohol, chitosan, genipin, 3D bioprinting.

Fructose conjugated Polycaprolactone nanofibrous scaffolds for tissue engineering applications

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Abstract: Scaffolds are important physical structures in tissue engineering that facilitate cell adhesion, proliferation, and differentiation, ultimately leading to tissue regeneration. To optimize ingrowing cells and to promote tissue regeneration, choosing the right biomaterial is a critical step when designing a scaffold. Poly(-caprolactone) (PCL) is a biocompatible and biodegradable synthetic polymer with low cytotoxicity that is widely used in a variety of applications. The scaffolds must closely resemble the extracellular matrix (ECM) found in tissue, so an electrospinning process is used to create nanofibrous structures that closely resemble collagen found in the ECM. PCL is electrospun into a nanofibrous scaffold by optimizing various solution and process parameters. It is, however, hydrophobic, limiting its application in tissue engineering. Surface immobilization of carbohydrates on nanofibers is done in order to increase the hydrophilicity of the surface which further helps in increased cell capture, proliferation and cellular compatibility and also to study the carbohydrate-cell interaction. Therefore, in this study we have surface modified PCL scaffolds with fructose using two-step wet chemistry method that included controlled aminolysis of PCL ester linkages by hexane diamine, followed by reductive amination to immobilize the fructose sugar. The surface-modified nanofibers were characterized using contact angle analysis, Fourier Transform Infrared spectroscopy, Ninhydrin assay and Dubios assay. Fibroblast cells were used to study the cytocompatiblity of scaffolds using MTT and live dead assays. Our results show that the modified scaffolds exhibited improved hydrophilicity, confirmed the fructose conjugation and displayed cellular cytocompatibility with fibroblasts which could be used for tissue engineering applications.

Keywords: Polycaprolactone, Nanofibers, Electrospinning, Surface modification, Fructose, Tissue engineering

Anti-cancer effect of novel nano-formulations of β-glucans derived from *Euglena gracilis* and the role of epigenetic factors in ovarian cancer: an *in vitro* study

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Abstract: Phytosomes are novel lipid vesicular drug delivery systems known for formulating herbal extracts for better absorption and bioavailability. *Euglena gracilis* (EG), a freshwater unicellular alga, rich in paramylon (β-1,3 glucan) (BG) about 50-60% of total carbohydrates has various biological and anti-cancer properties. BG being triple-helical and insoluble, the formulation of BG and EG as nanophytosomes was synthesized to improve bioavailability and efficient drug delivery mechanism. The phytosomes were synthesized by solvent evaporation method and characterized by DLS, Zeta potential, FTIR, XRD, and SEM. The biological evaluation of derived phytosomes was studied for cytotoxicity by MTT assay, cell apoptosis by AO/EB, FITC/DAPI staining, wound healing assay, and oxidative stress by DCFH-DA staining. Epigenetic modulators such as Protein arginine methyltransferases (PRMTs), and Sirtuins (SIRTs) play a major role in biomarker identification and anti ovarian aging marker. Molecular docking and simulation studies of PRMTs and SIRTs were performed by Glide and GROMACS software respectively with BG ligand which exhibited strong active site affinity binding, and interaction. The size of the phytosomes characterized were 158.38nm and 134.62nm for EG and BG respectively with spherical morphology and amorphous nature. The EG and BG-derived phytosome were effective in exhibiting anti-ovarian cancer activity by being significantly cytotoxic of $p<0.05$, apoptotic, and anti-migrative in the human ovarian cancer cell lines OVCAR-3 and SKOV-3. Thus, our study highlights the epigenetic modulation of PRMT, SIRT expression of *Euglena gracilis* derived phytosome in human ovarian cancer *in vitro*. Hence, the phytosomes were proven to be promising therapeutic target for further exploration and discovery of biomarkers in ovarian cancer.

Keywords: Nanophytosomes, epigenetics, cytotoxicity, ovarian cancer, biomarkers

Bioactive compounds are assisted through nanobots to lessen the outcomes of recent variants (Omicron); Curcumin and 6-gingerol, 6-Shogaol.

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Abstract: The first diagnosed confirmed B.1.1.529 infection is get off by invasion from a specimen accumulated from South Africa which is the new version of Covid 19 (SARS Cov-2) is called Omicron, through the genetic changes through mutations. This happens via means of spontaneous mutation, which it reasons by the effects of reversion mutation. A small mutation at the spike protein (region) has probably large implications for the way the virus is transmitted. Curcumin and gingerol are almost practically insoluble in water (oil soluble pigment) with low invivo bioavailability. Curcumin and 6-Gingerol,6-Shogaol are famous for their extensive variety of antiviral, antioxidant, anti-microbial, anti-proliferative, anti-inflammatory, neuroprotective and cardioprotective effects. lungs and gut facilitate viral access and function ability of viral invasion. I review that the causes of omicron can be solved by using Nanobots as a mediator to reduce the effects and causes by using antiviral property of C21H20O6 and 6 Gingerol, 6shogoal by drug delivery mechanism by loading the functional change of bioactive compounds in the region of payload, it can be achieved the target by sensing the detective cells by attaching to the specific ligand to target the cells and tissues to reduce the virulence of the virus. Bots will be transported via bloodstream, this may be helpful in the study of epidemiology.

Keywords: (SARS Cov 2), Mutation, Spike protein, Antiviral, Antioxidant, Bioactive, Nanobots, Drug delivery, Blood stream, epidemiology.

DNA Detection by Methylthioninium ions using fluorescence intensity of Hydrothermally Synthesized Carbon dots

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Abstract: The end point and real time detection of DNA is a specific part of Point-of-Care device in microfluidics platform. The carbon dots (CD) possess fluorescence properties under UV radiations caused by the transition of π*- π bond electrons present on their surface functional groups and have negative charge distribution on their surface which allow oppositely charged particle to bind, resulting in quenching of the fluorescence. Here in the study Methylthioninium chloride (Methylene blue) was added to carbon polymer dots, in phosphate buffer. The CD were hydrothermally synthesized by Citric acid and Ethylenediamine, the binding of Methylene blue (MB) to CD surface make functional groups' electrons unavailable for excitation under UV rays, which leads to quenching of fluorescence, then dsDNA isolated from salmonella, a food borne pathogen, was introduced to CD-MB complex solution, the high binding affinity of DNA towards Methylthioninium ions leads to removal of MB from the CD surface, restoring fluorescence of CDs. This process could be used in miniature microfluidic POC device for detection of DNA even with low detection limit, the limit of detection or the amount of DNA present in sample load is determined by UV spectrophotometric analysis of fluoresce restore intensity of CDs.

Keywords: Methylene Blue, Carbon dots, Fluorescence, Microfluidics

A multifaceted bacterial surface display for bioremediation of arsenic metal

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Abstract: Arsenic (As), a toxic metalloid, is reckoned as a dreadful menace to various lifeforms. It has been substantially perceived as one of the most consequential environmental pollutants due to anthropogenic activities. Several conventional methods have been utilized to treat arsenic contamination, such as physical and chemical methods. Notwithstanding, these techniques face hindrances in toxic sludge generation, lack of technical expertise, expensive and low efficiency. So, in this scenario, it is essential to develop novel methods for decontamination and clean-up procedures to get rid of this risk. Bioremediation has recently turned up a potential application due to its public credence and cost-effectiveness. Furthermore, the advancement in molecular and genetic engineering techniques has greatly impacted bioremediation procedures. More recently, one such exciting development strategy is surface display on the bacterial cell, which has been devised and has been the possibility to precisely target proteins on the cell surface of various host organisms. Herein, we comprehensively summarize the speciality of a bacterial surface display for the remediation of arsenic metal from the environment. We manifest that the surface display technique is a robust tool for functionalizing microbes to serve as whole-cell catalysts, library screening of multiple peptides, and vaccine development applications. Its progressing interest is providing a force for broad application of this technique in front of the scientific community.

Keywords: Bacterial surface display, arsenic metal, bioremediation.

Gene Analysis and Protein Protein Interaction study of Alzheimers Disease

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Abstract: Alzheimer's disease (AD) is a disorder that causes degeneration of the cells in the brain and it is the main cause of dementia, which is characterized by a decline in thinking and independence in personal daily activities. AD is considered a multifactorial disease: two main hypotheses were proposed as a cause for AD, cholinergic and amyloid hypotheses. Additionally, several risk factors such as increasing age, genetic factors, head injuries, vascular diseases, infections, and environmental factors play a role in the disease. Currently, there are only two classes of approved drugs to treat AD, including inhibitors to cholinesterase enzyme and antagonists to *N*-methyl d-aspartate (NMDA), which are effective only in treating the symptoms of AD, but do not cure or prevent the disease. Nowadays, the research is focusing on understanding AD pathology by targeting several mechanisms, such as abnormal tau protein metabolism, β-amyloid, inflammatory response, and cholinergic and free radical damage, aiming to develop successful treatments that are capable of stopping or modifying the course of AD. In this paper an attempt has been made to find the proteins involved in AD and extraction of their interactions using bioinformatic tools. These can be potential drug targets.

Keywords: Alzheimer’s disease; neurodegeneration; risk factors; tau protein; β-amyloid peptide, interactome.

Nanoparticle based Delivery of Pertussis Vaccine

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Abstract: Pertussis is a respiratory disease which is transmitted directly from human to human. Whole cell and acellular pertussis are two types of vaccines currently in use for prevention of pertussis. But the recent resurgence of pertussis has highlighted the limitations of these vaccines and led to the conceptualization of new ideas to formulate a pertussis vaccine capable of controlling asymptomatic carriage and blocking the transmission. This study is an attempt to formulate a new pertussis vaccine using *Bordetella pertussis* protective antigens PT, FHA and PRN. These antigens were encapsulated using biodegradable, mucoadhesive PLGA nanoparticles along with mucosal adjuvant CpG ODN. Size, shape and surface morphology of nanoparticles was determined using Scanning Electron Microscopy. The formulation was then delivered intranasaly in mice to generate local immune response at the portal of pathogen entry. The generated immune response against PT, FHA and PRN was estimated as IgG antibody titers and role in protection was established in Intranasal Challenge Assay (INCA) where mice were challenged intranasaly to mimic natural infection. Here it is observed that in combination formulation containing all three antigens and encapsulated using PLGA nanoparticles along with mucosal adjuvant CpG ODN generated a better immune response and provided better protection against intranasal challenge.

Keywords: Pertussis, nasal, nanoparticles, PLGA, CpG ODN.

Electrochemical Sensor for the Detection of Anticancer Drug- Sunitinib Malate

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Abstract. The screening and evaluation procedures for the detection of anticancer drugs in patients is a rather herculean task. The current methodologies such as HPLC, LCMS, immunoassays have many limitations, of which the striking ones are the cumbersome process of monitoring the response at specific masses and a retarded time period for data acquisition. The medical treatment of cancer with antineoplastic drugs is routine, but careful biomonitoring for these powerful drugs in individual patients is necessary to ensure proper dosage of drug. The practical, sensitive, selective and accurate detection of anticancer drugs can be accomplished by electrochemical sensors. The performances of sensors are enhanced by using nanoparticles. They yield higher electrical conductivity, amplify desired signals, and are compatible with biological molecules.

Our work is based on the anticancer drug-Sunitinib malate (SM), which is a yellow color powder in appearance. It is a drug highly recommended for the treatment of advanced renal carcinoma (ARC) and imatinib resistant gastrointestinal stromal carcinoma (IRGISC) and also a multi-targeted tyrosine kinase inhibitor.

Many clinical investigations and studies also show that SM is also constructive against some solid tumors such as “breast, colon, neuroendocrine and lung cancers”. This drug is commercially available for the treatment of ARC and IRGISC as capsule dosage form, with strengths ranging from 12.5- 50 mg. They are weakly soluble in aqueous media and thus oral administration of SM capsules revealed below par in vivo bioavailability. The peak height observed for the concentration 50µM of Sunitinib malate was found to be higher than that of 5µM and 10µM.

Keywords: HPLC, LCMS, antineoplastic drug, biomarkers, nanoparticles.

Nano Based Drug Delivery Method for the Treatment of Cardiovascular Diseases

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Abstract: Drug delivery is the method of administering a pharmaceutical compound to achieve a therapeutic effects in living organisms i.e. humans and animals. This method is gaining importance in the treatment of human diseases like Cardiovascular diseases(CVDs). Nanomedicine and nanodelivery systems have a major impact on recent advancements. İt employed to serve as a means of diagnostic tools or to deliver therapeutic agents to specific targeted sites in controlled manner. The formulations towards treating CVDs is somewhat far away from satisfactory and the reason behinds belongs to poor water solubility, low biological efficacy, non targeting and drug resistance. With the development in nanotechnology provides nano drug delivery systems(NDDSs), a new treatment of CVDs. For effective treatment, bettter prognosis and less adverse effects on non-target tissues. Nanoscience and nanotechnology played a most vital role for the administration and treatment of this disease. The application of nano drug delivery method in the area of cardiology has gathered much attention due to the properties included as actively and passively targeting to cardiac tissues and also improved the target sensitivity and specificity. According to the active records, more than 50% of CVDs can be effectively treated with the use of nanotechnology. The main goal behind this process is to explore the recent advancements in nano particles based on CV drug carriers. İt also summarizes the mode and the struggling barriers associated with the treatment of CVDs through nano based drug delivery system.

Keywords: Drug delivery method, nanotechnology, nano drug delivery system, cardiovascular diseases, nano particles, nanomedicines.

A molecular docking and dynamics studies on mechanistic insight into the interaction of S1 domain Omicron of SARSCOV2 spike protein with antibodies

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Abstract: The whole world has seen the existence of mutated **Omicron** (B.1.1.529) variants of SARSCOV2 which causes rapid transmissibility, increase in virulence and decrease in the effectiveness of public health. The majority of mutations are seen in the surface spike and they are considered as antigenicity and immunogenicity of the virus. Hence, finding a suitable cross antibody or natural antibody and understanding its biomolecular recognition for neutralizing surface spike is crucial for developing many clinically approved COVID-19 vaccines. Here, we aim to design both variants and hence, to understand its mechanism, binding affinity, and neutralization potential with several antibodies. **Omicron** was constructed by imparting mutations on the wild type using pymol software. The impact of mutations was analyzed using SDM server. Molecular docking between the spike protein model and antibodies was performed on the CLUSpro2.0 server. The stability of both variants was studied by molecular dynamics as implemented in GROMACS software. All mutations always increase the stability (ΔΔG) and decrease the entropies which causes the unfolding of mutated proteins. Further, molecular docking analysis on the RBD **Omicron** with some antibodies (G339D, N440K, G446S, S477N, T478K, E484A, Q493R, G496S, Q498R, N501Y, Y505H, S371L, S373P, S375F, and K417N) show many close interactions. Molecular dynamics simulation on the best-docked structures reveals their structural stability (RMSD), Cα fluctuations (RMSF), intermolecular hydrogen bond interactions, the effect of solvent accessibility (SASA) and compactness (Rg) factors. Antibody resistance increased significantly due to the disappearance of many hydrogen bond interactions which clearly indicates that many available antibodies/marketed vaccines will be less effective for **Omicron** variants compared to wild type.

Keyword
SARSCOV2, CR3022, vaccines, Homology modeling, Molecular dynamics simulations.

Effect of various depolymerization methods on antigenicity of polysaccharides obtained from serotype 2 of *Streptococcus pneumoniae*

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Abstract: Before being used as suitable antigen in the glycoconjugate vaccine, considerable depolymerization of bacterial capsular polysaccharides (CPS) is required to enhance product quality and eliminate the side effect of vaccine. On application of depolymerization strategies, the native property of CPS should not be altered. Chemicals, enzymes, mechanical, thermal, and other partial depolymerization methods have all been studied in the past. Microfluidization, acid hydrolysis, ultrasonication, heat, and microwave techniques were used to partially depolymerize CPS obtained from *Streptococcus pneumoniae* serotype 2. SEC-HPLC was used to assess partial depolymerization of the CPS, while ^{1}H NMR spectroscopy was used to ensure structural characteristics. The CPS antigenicity determined by bead-based immunoassay. Thermal and microwave techniques successfully reduce the molecular size of polysaccharides as well as amount of cell wall polysaccharide impurity. However, these two techniques significantly reduce the antigenicity of CPS. The trifluoroacetic acid treatment not only reduces the molecular size of polysaccharides but also completely eliminates cell wall polysaccharides impurity while preserving 92.4 percent antigenicity, making this strategy preferable to others.

Keywords: Partial depolymerization, capsular polysaccharides, glycoconjugate vaccine, antigenicity, S. pneumoniae serotype 2.

Electrochemical Sensor for The Detection of Anticancer Drug- Erlotinib hydrochloride

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Abstract: The research focuses on creating an electrochemical biosensor for detecting Erlotinib hydrochloride (ETHC), an anticancer medication that looks as a white powder. A medication that is used to treat non-small cell lung cancer in certain cases that has advanced to neighboring tissues or other sections of the body in patients who have failed to respond to at least one or any other chemotherapy therapy. Erlotinib hydrochloride (ETHC) is a tyrosine kinase inhibitor that forestalls most cancer cells from proliferating. The drug dose required to sustain effective plasma concentrations were about half of the initial dose which emphasize that therapeutic drug monitoring [TDM] for tyrosine kinase inhibitors is essential in normal chemotherapeutic practice. For sensitive, quick, and precise determination of the drug, cyclic voltammetry and differential pulse voltammetry strategies were used to compare the sensitivity of Pencil Graphite Electrode [PGE] with Glassy Carbon Electrode [GCE] as working electrodes. Glassy carbon electrodes (GCE) and pencil graphite electrodes (PGE) were electrolyzed in 0.1 M PBS pH 7.4 and were studied. Further modifications were done using nanomaterials on it. Differential pulse voltammetry (DPV) techniques were used to evaluate the electrochemical and different behaviors of ETHC on the PGE nanoparticles modified electrode, and the outcomes established its improved sensitivity for ETHC.

Keywords: Erlotinib Hydrochloride, Biosensor, cyclic voltammetry, differential voltammetry, pencil graphite electrode, glassy carbon electrode, sensitivity

Effects of metformin and dipeptidyl peptidase-4 inhibitors on neurobehavior and quality of life in patients of type 2 diabetes mellitus: a cross-sectional study

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Background: A plethora of studies have reported association of cognition and depression with diabetes. Literature hints that metformin and dipeptidyl peptidase-4 (DPP-4) inhibitors possess a beneficial effect on neurological symptoms associated with diabetes. However, there is scarce data in the clinical setting. Thus, the present study aims to compare depression, cognitive impairment and quality of life (QoL) of the newly diagnosed T2DM patients with healthy individuals. In addition, impact of metformin alone or in combination with dipeptidyl peptidase-4 inhibitors on cognition, depression and QoL of T2DM patients will also be compared with newly diagnosed T2DM patients.
Method: The present study was a prospective observational study on 120 subjects. The subjects were divided into four groups: healthy control, newly diagnosed patients of T2DM and T2DM patients taking either metformin per se or in combination with DPP-4 inhibitor. The cognition was assessed using Mini Mental State Examinations (MMSE), depression using Hamilton Depression rating scale (HAM-D), and health status using Short Form Health Survey-36 (SF-36).
Results: There was no significant change in MMSE score was observed among the groups. However, a significant increase in the HAM-D score of newly diagnosed patients ($p<0.001$), T2DM patients receiving metformin alone ($p<0.05$), and co-administered with DPP-4 inhibitor ($p<0.001$) was observed as compared to healthy control ($p<0.001$). Further, DPP-4 inhibitor receiving group reported increased HAM-D score as compared to metformin alone ($p<0.01$). Decrease in SF-36 scores was observed in all the study groups as compared to healthy control.

Conclusion: To conclude, this preliminary study indicates that T2DM patients commonly suffer from depression. In addition, both the conventional and recent antidiabetic agents might aggravate the neurobehavioral complications in these patients. Thus, we suggest the assessment of cognitive functions, depression and quality of life in patients receiving metformin and DPP-4 inhibitors.

Nitric oxide synthesis strategies can be used as: a potential drug target

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Abstract: Nitric Oxide (NO) a critical signaling molecule plays a crucial role in endotoxemia and other inflammatory disorders in animals including humans. Several clinical trials have been done to elucidate the physiological significance of nitric oxide molecules inside the host and its potential impact in disease control. NO, which is produced by different isoforms of NO Synases like: eNOS in endothelial cells, iNOS in macrophage, and nNOS in neurons, has a wide range of biological roles in endothelial cells, immune cells and neurons. We had noticed first time a contact between iNOS and NOSIP and reported in literature while interaction with other molecules are available in litrature. Biophysical & Immunological approaches have revealed interaction in human and mice macrophages as well as in in-vitro conditions in my in my studies. The ability of NOSIP to impact nitric oxide generation in mice and humans identified NOSIP as an essential controller of inflammation, opening up new possibilities for treatment therapies against acute and chronic inflammation. While the impact of this unique NOSIP expression could be useful in finding illness severity and death in the Covid 19 outbreak, further research is needed. We designed small molecules based on NOSIP binding sites which increased the therapeutic potential.

Keywords: Nitric Oxide, NOS, NOSIP, Inflammation, Protein interaction, macrophage

Green Synthesis of gold nanoparticles using *Murraya Koenigii* and evaluation of their antimicrobial activity and antitumor screening of synthesized compounds towards MCF7 cell line (Breast cancer cell line):

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Abstract: This present study demonstrates a simple, eco-friendly and green route for the synthesis of gold nanoparticles (Au NPs) using *Murraya* seed extract as a reducing agent. The obtained nanoparticles were characterized using X-Ray Diffraction (XRD), Scanning Electronic Microscopy (SEM) and UV-Visible and Fourier Transform Infrared (FTIR) spectroscopic techniques. The characteristic surface plasmon band of colloidal solution of Au NPs synthesized from Murraya seed extract was located between 420 – 560 nm. The XRD pattern analysis showed the formation of crystalline nanoparticles from gold chloride tri hydrate ($HAuCl_4$. $3H_2O$) solution. The SEM images of the Au NPs produced from the aqueous extract of Murraya seed displayed high aggregation on the surface of the haemolytic cells.

Keywords: Murraya Seeds, UV-analysis, XRD, Au NPs, SEM, Phyto chemical analysis, FTIR, Anticancer activity.

Biosurfactant and Enzyme Mediated Degradation of Chrysene

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Abstract. Polycyclic aromatic hydrocarbons are organic compounds made up of several aromatic rings that contain only carbon and hydrogen. PAHs are non-polar, uncharged compounds found in coal and tar deposits. The dominant sources of PAHs in the environment are from human activities like burning wood, smoking cigarettes, etc. According to the environmental protection agency, there are 16 PAHs that can cause different types of cancer. Among these 16 PAHs, chrysene is a major component to which humans are exposed. Catechol 1,2 dioxygenase is found to be prominent enzyme in the biodegradation of PAHs. In the present study, crude catechol dioxygenase enzyme was used to degrade Chrysene. The enzyme catalyses the oxidative ring cleavage of catechol to form cis,cis-muconic acid and degradation of aromatic compounds to aliphatic products. The main objective is to coat catechol 1,2 dioxygenase with a polymer that can be used as a filter that reduces the emission of chrysene in the environment and its exposure to humans. Also an attempt was made to enhance the biodegradation of chrysene using biosurfactant. The results were promising and the percentage degradation of chrysene was increased when compared without surfactant.

Keywords: Poly aromatic hydrocarbons,catechol 1,2- dioxygenase, *Bacillus halotolerans, Aspergillus niger*.

Halotolerant *Nocardiopsis* species as Potential Source of Ectoine for Diverse Applications

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Abstract: Halotolerant and halophilic microorganisms are potential sources of biotechnologically relevant compounds. Halophilic bacteria adapt to high salinities by synthesizing organic compounds such as compatible solutes that are of great commercial value. They protect cells from osmotic, cold, heat, UV stress without affecting cellular processes. Ectoine and 5-hydroxyectoine are two such solutes. A large number of bacteria associated with saline and hypersaline environments have not yet been explored. Members of the genus *Nocardiopsis* have been investigated for production of ectoine that has a wide range of biotechnological and biomedical applications.On the basis of this study, a new source of the therapeutic molecules ectoine and 5-hydroxyectoine is envisaged.The aim of this study was to profile compatible solutes from unexplored halotolerant *Nocardiopsis* species and identify promising isolates for further studies. Halotolerant bacteria belonging to *Nocardiopsis* species were procured from DSMZ, Germany and NCIM, Pune. The ability of these isolates to tolerate salt was investigated by scanning electron microscope (SEM). Compatible solutes were extracted by ethanol boiling and bacterial milking methods and analysed by Liquid Chromatography Mass Spectrometry(LCMS).Among the bacterial strains, *Nocardiopsis dassonvillei* NCIM 5124 showed highest ectoine production and appears to be a promising culture that can be taken up for further scale up.

Keywords: Compatible solutes, ectoine, bacterial milking, halophiles, *nocardiopsis* species.

Effects of hERG K^+ channel beyond prolonged QT syndrome

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Abstract- The human ether -a -go -go - related gene (hERG) potassium channel assumes a focal part in directing cardiac sensitivity; heart activity like repolarization adequately controlling the QT time interval electrocardiogram, Which are communicated in the heart, different cerebrum areas, smooth muscle cells, endocrine cells, and a wide scope of growth cell lines. Adversity in changes in hERG can cause harmful "long" (LQTS) or "short" QT conditions (SQTS), and the uncommon inability of hERG to be harmed by a variety of drugs underpins acquired LQTS, a problem that can lead to serious cardiovascular arrhythmias. Interestingly, a decrease in hERG flows because of either hereditary deformities or unfriendly drug impacts can promote obtained long QT disorders described by activity likely prolongation, lengthening of the QT interval on a superficial level of ECG and an expanded danger for "torsade de points" Arrhythmias & unexpected dying the unwanted aspect impact of non-antiarrhythmic compound has incited the withdrawal of some blockbuster pills from the market. Propels in understanding the underlying premise of hERG gating, its traffic to the cell surface, and the atomic architecture engaged with drug-block of hERG, are giving the establishment to reasonable treatment and counteraction of hERG related long QT disorder. This survey sums up the ebb and flow information on hERG capacity and brokenness, and the spaces of progressing research. Here we discuss the current knowledge of other effects of hERG potassium channel beyond prolong QT syndrome.

Keywords – Lqts, herg, torsade de points , qt interval, arrhythmias.

Biodegradation of polyaromatic hydrocarbons using partially purified Catechol dioxygenase from bacillus species isolated from oil polluted site

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Abstract. Polycyclic aromatic hydrocarbons (PAHs) are uncharged, non-polar molecules produced by various natural and manmade activities. Majority these PAHs are associated with different cancers like lung, liver breast etc. Microbial degradation is one of the dominant methods for PAH removal. Present study focussed on the biodegradation of Chrysene, a predominant PAH using enzyme catechol 1-2 dioxygenase. The enzyme was partially purified from bacillus species capable of degrading chrysene. The organism was grown in MSM with chrysene as the carbon source. The enzyme was purified partially by applying a series of downstram processing steps to the supernatant obtained. The presence of the enzyme in the concentrated sample was confirmed by SDS-PAGE and FTIR.The molecular mass of the enzyme was found to be 35 kDa. Biodegradation studies were performed for both free and immobilized enzymes. Effect of all physiochemical parameters on enzyme activity were also determined.

Keywords: Chrysene, PAH, Catechol 1,2- dioxygenase, Bacillus, Biodegradation

Experimental investigation of surgical needle insertion into soft biological tissue for MIS

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Abstract. Surgical needle inserts for curative or medical practice, especially minimally invasive surgery (MIS) are recognized and considered with the purpose of keeping to the strict regulatory requirements for the therapeutic or surgical device or tool improvement. Even though the devices and methods decide the attainment of every surgical process, marginal consideration was specified to the medium, the insertion or contact force for analysis, the progress apparatuses, and surgical procedures. In this study, we present the contact forces implicate throughout the needle insertion into a viscoelastic gel (tissue mimic), individually measured by an experimental setup developed for this determination. The experimental arrangement and investigation process offer an understanding of the insertion mechanics of needle attachment, possibly helping the design advance on surgical apparatus. A study on the configuration of the insertion force modules helps to explain the biomechanical properties of the soft tissue during invasive surgery. These forces include cutting force, stiffness force, and frictional force. This paper was the initial stage in improving an insertion force feedback controlled surgical tool for needle insertion which will be applied in PCNL (Percutaneous Nephrolithotomy).

Keywords: Surgical needle, Insertion force, Stiffness, Tissue, MIS, PCNL.

SARS CoV-2 Non-Structural Proteins Targeting: An *In-Silico* Perspective

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Context: The global pandemic that the world is currently witnessing, COVID-19, even with vaccines available, the test positivity rate (TPR) tends to remain highly threatening. This research focuses on identifying flavonoids, previously known for their broad-spectrum antiviral properties which can be potential drug candidates of the coronavirus. **Methods:** A total of 250 phytocompounds are docked against three structural proteins of SARS Cov2 using the PyRx docking platform which has inbuilt OpenBabel and Vina applications. The target proteins include NSP15, NSP 13, and NSP 9. They are screened according to their binding affinity values and the filtered phytochemicals are then subjected to various analyses including ADME properties (preADMET, swissADME), bioactivity score, molecular properties (molinspiration), drug-likeness (preADMET), lipophilicity, water solubility, and pharmacokinetics (swissADME). The receptor-ligand interactions and the amino acid positions are obtained using Discovery Studio Visualiser. Molecular Dynamic Simulation analysis is performed to analyze the ligand stability of the screened compounds in target protein crystal structures. **Results:** Out of the 250, 3 compounds showed the best scores, and more probability for drug action for each target were identified. The research herein provides new possibilities for *in vitro* and *in vivo* analyses of the proposed ligands to develop new drugs against coronavirus.

Keywords: NSP, ADME, receptor-ligand interaction, binding site pockets, MCDM

Oral cancer genomics guided precision medicine for improved management of oral squamous cell carcinoma: A review

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Abstract. Oral cancer [OC] genomics is unveiling innumerable genetic mutations using high throughput omics technology making the development of precision medicine for oncology feasible. Employing these cutting edge advanced genomic technologies in the field of OC several tumour promoting genes had been detected including p53, CDKN2A, PIK3CA from the cancer tissue samples. A large array of genes was detected both in pre-cancerous oral lesions and OC. Several genes such as p53, CDKN2A have been detected in pre cancer lesions also demonstrating similar mutational patterns which suggested that these genes could be used as biomarkers to diagnose pre-cancer lesion transformed OC. Nevertheless, there is no particular subset of mutated genes detectable across all the OSCC cases, rather each sample has its distinct set of altered genes giving rise to tumour heterogeneity w.r.t its level of prognosis. Precision oncology has shown promising results when compared to conventional anti-cancer treatments. Based on the genomic data analysis several target therapeutics had been developed directed precisely towards the most frequently mutated oral cancer related genes to diagnose and reduce cancer progression at an early stage but most of them are in trial with limited application in OSCC. This study concluded that despite of application of omics technology, cancer genomic testing and genetic medicine OC genomics is in its initial phase. Tumour heterogeneity and lack of professionals to interpret gene annotations for clinical utilizations of genetic datasets are some of the greatest challenges in OC genomics and precision medicine researches have to deal in the coming years.

Keywords: Oral cancer, genomics, precision medicine, mutation.

Comparative *insilico* study of the degradation of chrysene by the enzymes catechol 1, 2-dioxygenase and laccase

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Abstract: Polycyclic aromatic hydrocarbons are environmental pollutants that present as a chief component in crude oil, creosol, asphalt, and coal tar. These hydrophobic compounds bind with the particulates in soil and make biological uptake is difficult. Catechol 1,2 dioxygenase and Laccase are enzymes present in some of the soil microbes, have the ability to degrade the high and low molecular weight aromatic hydrocarbons like Chrysene. An *Insilico* attempt is made to find out how effective these enzymes can break down the polyaromatic hydrocarbons. 11 different aromatic compounds are selected as ligands and it docked against the targets Catechol 1,2 dioxygenase and Laccase by using PyRx docking software which has an inbuilt open babel and vina applications. By analyzing the binding score it is found that some compounds are more susceptible to degradation by the targets and the receptor-ligand interactions were visualized using discovery studio visualizer and found out the binding regions and main amino acids that are involved in the receptor-ligand binding. A molecular dynamic simulation study was done for checking the structure stability of the target and the compound. The docking results revealed that some of the ligands have strong hydrogen bonds and van der Waals interactions with the active site of amino acid residues. Simulation studies show that the structure of the target and the compound have stability in 20ns.

Keywords: Cyclic and poly aromatic hydrocarbons, docking, binding affinity, receptor-ligand interactions, chrysene, molecular dynamic simulation

Study of effect of metal/metal oxide nanoparticles on agricultural crops

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Abstract: With increase in population, food demand has also risen. With this more effective ways of cultivation is in demand where the control of pests and plant nutrition is given importance. In recent times nanoparticles is being used both in plant nutrition delivery and also in pest and herb control system. Studies have been done on different nanoparticles and plants. There have been reports of both positive and negative effects of nanoparticles on agricultural plants. At a very high concentration, nanoparticles affect plant growth. In here we report the synthesis and application of different nanoparticles such as zero valent iron and silver over chickpeas (*Cicer arietinum*) and mung (*Vigna radiate*) seeds at different concentration ranging from 0.25 to 20 mg mL^{-1}. Morphological changes such as seed germination rate and growth of roots and shoots, bioaccumulation in plants and effects on different proteins will be studied. Also interaction between nanoparticles and proteins of seed germination will be studied.

Keywords: Nanoparticles, agricultural plants, zero valent iron nanoparticles, silver nanoparticles, *Cicer arietinum, Vigna radiate.*

Cellulosic nanogels and their role in treatment of Industrial Wastewater contaminated with Heavy metals

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Abstract: Industrial wastewater is one of the major concerns due to rapid industrialization. WHO reported overall 9.1% of the global burden of disease and 6.3% of all deaths are due to unsafe water. Heavy metals possess high toxicity at very low concentrations and are non-biodegradable in nature; accumulate in the plants, animals and human bodies leads to various side effects. As per the reported data, different heavy metals such as Zn, Cr, Cu, Cd and Pb has been reported in various water bodies majorly of West Bengal; leads to diseases like gastrointestinal, cornea dysfunction and Cobalt, Copper, Manganese, Iron, Nickel in Uttar Pradesh which leads to kidneys, lungs, liver, brain disfunction. It is also reported that 239 million Indians or 18.8% of India's total population drink Arsenic contaminated water every day. In India, Uttar Pradesh (32%), Bihar (60.7%), West Bengal (44.3%) and Assam (65.1% of state population) have been reported for Arsenic pollution leads to skin diseases. There are various conventional treatment methods for wastewater. However, researchers have a keen interest in nanomaterials, Cellulosic nanogels are in the spotlight of the research with advantages; huge surface area, high loading, stability, response to stimuli, possess gelling property, easy to retrive and reuse. This review comprises of inimical effects of heavy metals, conventional methods for treatment, in the treatment of heavy metals from polluted wastewater recent research reported that have thus far been undertaken, which provides researchers a far vision links the gap between the previous, current and forthcoming of a nanogels.

Keywords: Industrial wastewater, heavy metals, cellulosic nanogel.

In vitro seed germination and early development study in *Arachis hypogaea plant using* biomodified copper nanoparticles

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Abstract: *Arachis hypogaea*, commonly called as peanut, is a vital oil, food and feed leguminous crop worldwide. It is a valued food crop since it has great oil and protein percentage, and provides vitamins and minerals. After oil removal, the remaining peanut cake is directed into animal feedstuff. So, *Arachis hypogaea has many economic and environmental benefits.* In the present study, bio modification of Cu-NPs is done using flower extract of *Butea monosperma* and tested their effects on germination and growth of seed of *Arachis hypogaea*. *Butea monosperma* flower extract is rich in different phytochemicals like alkaloids, tannins, steroids, saponin, glycosides, and flavonoids. Firstly, flavonoid estimation of *Butea monosperma* flower extract was done using various solvents and then biomodified the copper nanoparticles with the extract containing the highest amount of flavonoid. The UV visible spectroscopy, FTIR, and FESEM and X-ray diffraction analysis report confirmed the synthesis and biomodication of Cu-NPs. Biomodified Cu-NPs were examined on *Arachis hypogaea seed* to evaluate the effect on seed germination and seedling growth with different concentrations (25ppm-200ppm). Additionally, various parameters like root fresh and dry weight, root length or elongation were also noted and compared with the unmodified Cu-NPs and control. This experiment revealed that the *Butea monosperma* flower extract's biomodified Cu-NPs could enhance germination and early development in *Arachis hypogaea.*

Keywords: *Butea monosperma*, copper nanoparticles, flavonoid, *Arachis hypogaea*, seed germination.

In-silico anticancer evaluations of bioactive compounds from Pteris V and Adiantum V.

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Abstract: Cancer is uncontrolled growth of cells that may further metastasized to the other body parts. Anti-cancer drugs are those which are used for the treatment of cancer, other than that several treatments like surgery, radiotherapy etc. Nowadays, due to the less toxicity profiling various herbs are widely used in the treatment of the cancer. Pteridophytes such as *Pteris Vittata*, *Adiantum* species etc. were field of research nowadays due to its therapeutic profiling. Therapeutic activities of Pteridophytes are due to the presence of various bioactive moieties such as flavonoids, steroids, polysaccharides etc. *In-silico* evaluation of bioactive agent of Pteris Vittata and Adiantum species for their potential inhibitory action of cancerous cells using the docking analysis. Major component present in the fern species were screened against the HSP90 protein (causative protein for skin cancer). Subsequently more, *in-silico* molecular docking approach has been employed to understand the mechanism and perceive a few potential lead compounds against more protein involved in skin cancer. This study is majorly focusing on the presence of prominent bioactive compounds in both ferns and inhibitory action on HSP90 cancer protein.

GMOs: Way to sustainable development

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Abstract: GMOs are amongst the most controversial areas of science. Biotechnology is applied in many fields but although applications like GM insulin is widely accepted, but debate heats up when it comes to food and agriculture.

GM Crops are genetically modified crops that are immune to various environmental stresses and produce a good yield. For so many years humans are modifying plants and animals using crossbreeding to attain a more dominant breed. If humans are modifying genes for centuries, what makes a 'GMOs' different?

Selective breeding is primarily hoping for lucky hits, recombinant DNA technology eliminates this aspect. We can choose the traits and implant the desire gene of interest, make the fruit larger, and be pest resistant and best example of this is BT Corn which produces its own toxin that kills the pests, but this toxin is harmless to humans. Bt corn has insect-killing genes derived from the bacterium called Bacillus thuringiensis.

Genetic Engineering opens different aspects and helps in the sustainable development. We can develop of our need and eliminate the characters that are not of our concern. It is possible that we can program plants to make their own nutrients and reduce their reliance on additional nutrients provided externally. Genetic engineering provides a wider range to work on and key to suitable development.

GM Crops aren't only increasing the yield of the crop but also decreasing our reliance on pesticides and insecticides too.

With this, I conclude that GMOs may be become new organic and will be the foremost powerful weapon to protect our biosphere.

Characterization and biological activities of a biomaterial exopolysaccharide from marine bacteria

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Abstract: There are many more undiscovered bioactive materials /compounds from marine bacteria, the list of the isolated marine strains to date, does not reflect the diversity of forms present in the sea. Marine environment having higher source of natural bio-compounds or polysacharide based biomaterials which are associated with solid surfaces as biofilms. Bacterial exopolysacharides is a biomaterials which showing a growing interest especially from biofilms and extreme marine environments. This study aimed to characterize the bacterial exopolysacharide (EPS) and demonstrate the biological activity profile. Optimization of EPS production from MRN-01, higher with the growth conditions of 96 hrs of incubation , 27^0C , 44.9 gm/L and optimize the total carbohydrate and total protein with various parameters , more production at 96 hrs , 27^0C, pH 9 , ie, 128.23 gm/L, 100.26 gm/L respectively . EPS characterization by SEM, FT- IR analysis and revealed the presence of COOH, glucan, uronic acid, etc. EPS exhibit biological activities against pathogenic bacteria and plant pathogenic fungi, and express cyto toxicity against HELA cells .Exo polysacharide production on steel surface influence corrosion with increased incubation.

Keywords - EPS, Biofilm, SEM, FT- IR, Biomaterial, Bioactive compound.

Identification of an alternatively spliced novel isoform of α-1-antichymotrypsin (ACT) in human liver using bioinformatics

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Abstract: α-1-antichymotrypsin (ACT) is a serine proteinase inhibitor which belongs to the clade A of SERPIN and acts against cathepsin G, mast cell chymase and chymotrypsin. The deficiency of ACT results in liver diseases and is also associated with Alzheimer's disease. ACT protein is coded by four exons E1, E2, E3 and E4. Its synthesis occurs in liver and its concentration is found to be increased during the acute phase of inflammation. In this study, we have identified and validated the existence of one alternatively spliced novel isoform of ACT in liver. With the help of the computational tools like **FGENESH, BLAST, FEX and Test code** novel exons were predicted from the intronic regions of ACT gene. These novel exons were then subjected to RT-PCR for the confirmation of the predicted novel exons. We have found one **novel exon N6** which is located between native exons E1 and E2. N6 splices with exon E2 and replaces N-terminal exon E1 from the native ACT generating an isoform with a different N-terminal. This isoform was found to lack signal sequences and is smaller in size but the reactive centre loop (RCL) remains intact. We have further modelled the isoform by **RCSB swiss model server** followed by its structural and functional annotation using computational tools such as **Expasy's Protpram server**, **SecretomeP 2.0, STRING etc.** Since this novel isoform carries RCL, therefore it is expected to have the proteinase inhibitory activity. However, due to change in promoter regions, it is expected to be regulated differently.

Keywords: Antichymotrypsin, alternative splicing, Computational tools, transcript, isoform

Analysis of phytochemicals isolated from ethanolic bark extract of *Nyctanthes arbor-tristis L.* through GC/MS for screening of potential antiarthritic compounds using chemoinformatics analysis

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Abstract: *Nyctanthes arbor-tristis L*. show a wide range of biological activities and the same has been recorded over the years. Each plant part is known for specific activities. Bark is used to treat the rheumatic joint pain, eye disorders, malaria, as an expectorant to treat coughs and even as a decoction for treating bleeding gums. This study focuses on the isolation and analysis of phytochemicals through GS/MS for screening of potential antiarthritic compounds using Spark, software by *in silico* method. Arthritis is a prominent joint inflammatory disorder found worldwide in adults, older & even in some cases amongst younger generations. The most common symptoms include inflammation, redness, pain, stiffness & under extreme conditions, loss of functions. The most common forms are Osteoarthritis (occurs with ageing) & Rheumatoid arthritis (an autoimmune disorder). Both types are characterized by low calcium level, high levels of inflammatory molecules (cytokines & interleukins) & high rate of damage to the joints. The drug therapies are responsible for severe side effects and the target remains to find out new alternative drugs which would provide high efficacy with minimum side effects. So current study focuses on the scaffold hopping to find out new lead-like novel compounds for arthritis from the compounds obtained from GC-MS analysis.

Polysaccharide modified nanomaterials used as an electroactive material: application in clinical diagnostics

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Abstract. In current study, Zno and ZnO nanocomposites and Ag Nanoparticles-ZnO nanocomposite (ZnO/PS/Ag) were synthesized and further characterised. Zinc oxide has a very broad and versatile range of application including, cosmetics, and pharmaceutical uses and chemical sensing etc. Zinc oxide nanoparticles (ZnO NPs) are one of the most important metal oxide nanoparticles popularly employed in various fields due to their peculiar physical and chemical properties. These NPs and nanocomposites were studied for different characterisation techniques such as FTIR SEM, XRD etc. Electrochemical behaviour of these nanoparticles were studied and can be further used as a tranducer to modify electrode surface for further studies in detection of pathogenic bacteria. ZnO can be used as a promising material in electrochemical studies. Zn NPs were modified by different polysaccharides and compared its effectiveness as an electroactive material. Polysaccharides like chitosan and LBG were used for modification of ZnO Nps. This study shows the comparative analysis of ZnO and Nanocomposites for further use as a transducer. This material can be used as a transducer in diagnostic assays as well.

Keywords: Nanocomposite, pathogen, electrochemical, transducer.

Poster Presentations

Investigating the differentially expressed genes and therapeutic drug molecules in Glucocorticoid resistant Multiple myeloma by comprehensive bioinformatics analysis

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Abstract: Multiple myeloma (MM), second most common haematological malignancy, still remains incurable because of acquirement of drug resistance. Glucocorticoid (GC) therapy which is used as one of the key therapies against MM, is hindered by the incidence of GC resistance. The underlying mechanism of this acquired GC resistance in MM is not fully elucidated.

Therefore, the current study was aimed to examine the differentially expressed genes (DEGs), associated micro RNAs (miRNAs) and transcription factors (TFs) from the microarray datasets of GC resistance and GC sensitive MM cell lines, obtained from Gene Expression Omnibus (GEO) database. DEGs were identified using GEO2R tool from two datasets and common DEGs were obtained by constructing Venn diagram. Then the Gene ontology (GO) and pathway enrichment analysis were performed by using DAVID database. Genetic alterations in DEGs were examined using COSMIC database. Protein-protein interaction (PPI) network of DEGs was constructed by using STRING database and Cytoscape tool. Network of interaction of DEGs and miRNAs as well as TFs were obtained and constructed by using mirDIP, TRRUST and miRNet tools. Drug gene interaction was studied to identify potential drug molecules by DGIdb tool. Six common DEGs, CDKN1A, CDKN2A, NLRP11, BTK, CD52 and RELN were found to be significantly upregulated in GC resistant MM and selected for further analysis. miRNA analysis detected hsa-mir-34a-5p that could interact with maximum target DEGs. Two TFs, Sp1 and Sp3 were found to regulate the expression of selected DEGs. The entire study may provide a new understanding about the GC resistance in MM.

Keywords: Multiple myeloma, glucocorticoid resistance, bioinformatics analysis, differentially expressed genes, miRNAs, transcription factors, drug molecules.

Injectable Nanofibrous Micro-Carrier with Tailored Degradable Properties as a Next Generation Cell Delivery System for Specific Tissue Engineering

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Abstract: Injectable cell carriers offer great prospects in the field of tissue engineering and are well-suited to fill in the irregular shape of defects more conveniently than other scaffolds facilitating cell delivery without any critical invasive procedure leading to regeneration. However, injectable cell carriers have their own limitations and a lot of research is going on its various applications. To overcome these limitations, we have fabricated injectable nanofibrous gelatin microspheres as a next-generation injectable cell carrier using Emulsion Technique followed by Thermal Induce Phase Separation Technique (TIPS). The effect of various process parameters, namely, the concentration of gelatin solution, temperature, stirring speed, and degree of chemically mediated zero-length cross-linking, surface and core morphology were studied and biological evaluation was performed using human bone marrow-derived mesenchymal stem cells (hBMSCs).The fabricated gelatin microsphere possess microporous architecture resembling the native extracellular matrix as revealed by scanning electron microscopy (SEM). They exhibit superior cell adhesion, proliferation and stimulate the growth of hBMSCs compared to non-nanofibrous (solid) and commercially available (Cytodex-3) microspheres. The in-vitro studies validate that these injectable nanofibrous cell carriers are capable to facilitate cell differentiation into osteogenic and chondrogenic lineages with excellent results. Reported nanofibrous gelatin microspheres are non-toxic, facile, economical and do not require any specialized instruments for fabrication. All out-turns stipulate that nanofibrous gelatin microspheres are an eminent choice as injectable cell carriers for tissue regeneration.

Keywords- nanofibrous microsphere, injectable cell carrier, tissue regeneration, gelatin, biocompatible.

COVID-19 Contact Tracing & Vaccine Sentiment Analysis Using Machine Learning

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Abstract: Machine learning is one of the modern innovations of humankind. It has applications in day-to-day lives of people. It is being utilized well in the healthcare sector to combat all sorts of diseases and complications. Machine learning based models are being developed for diagnosis, risk-prediction, imaging, etc. COVID-19 is a highly infectious virus with an increasing number of variants, for example, the Delta and the recent Omicron variant. One such practice is contact tracing applications based on the machine learning models. Contact tracing apps help reduce the spread of Covid-19 virus by notifying people that are at the risk of contamination. These applications work using technologies like Bluetooth, GPS or Wi-fi and have made it possible to keep the population on the lookout for dangers that come with a pandemic. Sentiment Analysis has made extracting human-related emotional information achievable. Valence Aware Dictionary for Sentiment Reasoning (VADER) model allows us to detect various range of sentimental data present in a dataset. A vaccination tweets dataset was selected to perform this study. Ease of internet access has made it possible for the masses to express their views on the vaccine efficiently. Social media has played a crucial role in providing people with a platform to speak up on topics such as the Coronavirus vaccine. In this paper, contact tracing with the implementation of DBSCAN algorithm is discussed. Another goal of this paper is to provide knowledge about the Sentiment Analysis of the novel coronavirus vaccine with the application of the VADER machine learning model.

Keywords: Machine Learning, Contact tracing, Sentiment analysis, DBSCAN, COVID-19, Vaccine, VADER.

CancerStats: A Dashboard for visualisation of Indian Cancer Data

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Abstract: Cancer is one of the leading causes of death around the world, accounting for 10 million deaths in the year 2020. This has led to numerous international organisations to work towards efficient data collection and analysis of cancer data from various hospitals, labs and research facilities. However, the data collection systems of developing countries like India are currently inefficient in deducing the detailed incidence, mortality and geographical insights for a particular locality or region, making diagnosis and treatment a difficult task. National cancer data obtained from various registries across India was visualised using Power BI which helps map the location of registries and identify local trends in cancer cases based on type, site of origin of cancer and cause of protein mutation. The cancer dashboard is developed with a user-friendly interface with clear visualisation of various graphs, charts and identifies effects of various factors like exposure to toxic chemicals, radiation, chemotherapy, pollution, alcohol, smoking and usage of tobacco. CancerStats has been developed with the aim to help doctors, statisticians, health informaticians and public healthcare professionals to identify patterns in cancer statistics, on the other hand being able to predict future changes to reduce mortality rate and have better treatment. The data is collected from 28 local Indian registries consisting of 121 different types of cancer.

Keywords: Cancer Data, Hereditary linked Cancer, Power BI, Protein Mutation, Cancer Dashboard, User-friendly Interface, Registries, Incident, Mortality.

Designing, construction and characterization of genetically encoded FRET based nanosensor for in vivo measurement of Exosomes.

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Abstract: Most organisms dynamically produce extracellular vesicles (EVs). These EVs are generate from all cells, containing tumor cells, immunogenic cells, cancer cells and other diseased or normal cells into their neighboring surroundings, with inclusion and budding of multivesicular body (MVB) with or from the plasma membrane respectively. They are performing as a mediator of intercellular communication by transferring biological information between cells. Most of the extracellular vesicles like exosomes have been understood to prevail for many years. Exosome secretion has been reported first time for reticulocytes through their differentiation pathways. Isolation and detection of exosomes are quiet challenging and cumbersome due to the deficiency of fast, delicate, reproducible and cost effective methodologies. So we require to develop a tool that is non-invasive and enables real-time detection of flux in cellular and sub-cellular compartments. Here, we have developed a FRET-based tool using GFP variants as FRET pairs. Enhanced cyan fluorescent Protein (ECFP) and Venus were attached at N and C terminal respectively with exosomal's markers binding protein-MIG6 (mitogen inducible gene 6) for the development of genetically encoded nanosensor in the bacterial expression vector pRSET-B. The binding of exosomal EGFR with the recognition domain brings about a conformational change large enough to interpret the exosome binding into a change in FRET ratio. The nanosensor constructs pRSET-B-ECFP-*MIG6* -Venus was expressed in *Escherichia coli* successfully to allow a non-invasive ratiometric analysis of the exosomes in living cells.

Keywords: FRET, Exosome, Nanosensor, GFP, MIG6.

In silico screening and identification of dietary polyphenols as potential CXCL12-CXCR4/CXCR7 axis inhibitor to target breast cancer

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Abstract: Breast cancer is one of the leading cancers among women. Breast cancer is regulated by complex interactions with the components of the tumor microenvironment through networks of cytokines. Chemokines are specific cytokines, and the importance of chemokines and their receptor interactions in breast cancer is now well reported. The CXCL12-CXCR4/CXCR7 axis has been shown to play a critical role in tumor cell communication and downstream signaling pathways. Dietary polyphenols were reported to target cancer stem cells, suggesting that these compounds might be potential therapeutic agents for breast cancer prevention with no/minimal adverse effects. Accordingly, we selected a library of 501 dietary polyphenols from the Phenol-Explorer database in the present study. We further evaluated the chemical absorption, distribution, metabolism, excretion, and toxicity (ADMET) parameters of the compounds. Further, we perform molecular docking by using the crystal structure of CXCL-12 and CXCR-4. The homology modeling approach was used to extract the CXCR7 structure. After the docking result, we selected our hit compounds on the basis of their best binding energies. Furthermore, molecular dynamics (MD) simulation was used to show that the lead compounds maintain their stability in complex with the CXCL12-CXCR4/CXCR7 axis throughout the MD simulation. Overall, our results not only propose dietary polyphenols for further experiments and clinical trials but also pave the way for discovering novel and less toxic therapeutics with optimal efficacy to target the CXCL12-CXCR4/CXCR7 axis in breast cancer.

Keywords: Breast cancer, chemokines axis, CXCL12, CXCR4, CXCR7, ADMET, molecular docking, MD simulation.

An *in-vitro* based platform to detect the EpCAM positive in HELA cell line

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Abstract. Cancer metastasis, which is defined as the spread of cancer cells from a primary site to other organs, is a substantial cause of cancer-related death in patients. Since critical early studies indicated that differentiated tumors had a greater risk of metastasis and treatment resistance, the notion of dedifferentiation and phenotypic plasticity has been a prominent issue in metastasis research. Tumor cell dedifferentiation in the current scenario states that the cancer cell heterogeneity was observed during metastasis which includes the occurrence of the epithelial to mesenchymal transition, mesenchymal to epithelial transition, the cancer stem cell, disseminated tumor cells, circulating tumor cells, have all been used to describe this notion. To demonstrate the heterogeneity, we utilized the *in-vitro* model of HELA cell line co-culture systems with THP-1 cell line in a controlled isolations using Quantum Dot antibody conjugates (QD^{Ab}). The results revealed the occurrence of heterogenity based on the uptaken QD^{Ab} which are positive for the EpCAM+, CD44+, and CD45+. The relevance of a typical cancer cells and heterogeneity in metastasis and the severity of infections in these individuals might be shown by this *in-vitro* model study. We were able to

effectively report the existence of cancer cell heterogeneity (CCH) based on the fluorescence ratios of the co-culture cancer cells. These short-term mimic co-cultures provide a robust and well-connected model for predicting early treatment responses in various cancer types.

Keywords: Cancer cell heterogeneity, Circulating tumor cells, Co-cultures, Epithelial to mesenchymal transitions, Heterogeneity, Metastasis.

Bioinformatic analysis of pheromone binding protein from *Trichogramma chilonis*

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Abstract: Food production and ecosystem health are mainly threatened by invasive pest species. When we look into the global health scenario more than 10,000 insect species are responsible for food crop damage. There are 15 - 20 % yield losses in food due to insect pests. *Trichogrammatids* are one of the most important biocontrol agents with an eminent interest in the suppression of lepidopterous pests. For further studies, *Trichogramma chilonis* transcriptome analysis was carried, in which a total of 18,372,639 high-quality reads were generated using Illumina pair-ended sequencing platform. By homology study of 24,488 transcripts, 14,772 (60.32%) were found significant to *N. vitripennis*. In the present study pheromone binding protein or odorant-binding protein (PBP) was identified and bioinformatically analyzed, Physiochemical characteristics analysis of PBP has revealed an approximate molecular weight of 15514.74, with theoretical Isoelectric point 5.52, composed of 138 amino acids, and contains 7 cysteine residues with 4 disulfide bonds. Multiple glycosylation sites indicate signal peptide consisting of N- terminal amino acids at 1-20, with likely cleavage position at Glys 19 and Lys position at 20. Based on results, PBP protein was confirmed and its evolutionary relationship was also identified which was known to form a cluster with *Copidosoma floridanum.* Bioinformatic analysis and structural aspects help to perceive the structure of PBP and to design the compatible ligand which ecologically helps in insect-plant interaction and concludes that PBP may involve in physiological process to evaluate foods, hosts, breeding substrate, oviposition sites and to avoid predators and pathogens.

Keywords: *Trichogramma chilonis,* pheromone binding protein, bioinformatic analysis.

Synthesis, Optimization and Antibacterial Activity of Silver Nanoparticles using *Musa acuminata* and *Citrus limon* Peel Extract

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Abstract: Large quantity of different types of waste produce from hospitals, agricultural, domestic, industrial activities. Waste management is major concern worldwide. Household waste like fruit peels is effective material for synthesis of nanoparticles. These particles range from 1-100 nm and are gaining importance for their variety of applications. Silver nanoparticles are used in medical, environmental fields and shows antifungal and antibacterial effects. Banana and lemon peels are used in this study as they are consumed throughout the year worldwide. These peels are used as reducing agents. Freshly prepared extract of both the peels were added in 2mM silver nitrate stock solution. Change in colour of solution prove that silver nanoparticles are formed. Reduction of silver nitrate is monitored using calorimeter. To check optimum time and temperature for synthesis of silver nanoparticles 2mM stock solution was monitored at various temperature (0-100°C) and time points (0-220 min). Antibacterial activity of synthesized silver nanoparticles tested against *Bacillus subtilis* (Gram positive) and *Pseudomonas aeruginosa* (Gram negative). Result of this study show that after 24 hours synthesis of silver nanoparticles slow down. Temperature does not affect synthesis of silver nanoparticles. Silver nanoparticles showed zone of inhibition against both micro-organisms *Bacillus subtilis* and *Pseudomonas aeruginosa*. In future study these synthesized silver nanoparticles can be used to treat skin infections such as bromodosis.

Keywords – Silver nanoparticles, peel extract, reduction of silver nitrate, antibacterial activity.

Protective role of selenium in reducing paracetamol toxicity on cyanobacteria

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Abstract: Now a day's pharmaceutical drugs have become a major threat to ecosystem as emerging pollutant. These drugs are structurally diverse class of emerging pollutants in aquatic system and detected throughout the world. The present work aimed at evaluating the interactive effects of paracetamol and selenium on cyanobacteria. Selenium is an essential trace element, present in mammals, plants, and photosynthetic micro-organisms. It worked as a dose dependent manner. At high doses it may induce toxicity whereas at low concentration it defends the plants from variety of abiotic stresses like drought, cold, metal stress and desiccation. To find out the protective role of selenium in *Nostoc muscorum*, we treated the selenium dioxide and sodium selenite with paracetamol (113.68 mg/L) stressed culture. Growth of culture showed positive response in the presence of both selenium. Photosynthetic pigments (chlorophyll, carotenoid and phycobiliprotein) increased as compared to stressed culture. Reduction of oxidative stress found in the presence of selenium in paracetamol treated culture. Higher amount of antioxidant activity showed the enhanced defence system of test organism. Sodium selenite shown the better response as compared to selenium dioxide for reducing oxidative stress of paracetamol toxicity.

Keywords: *Nostoc muscorum*, Free radicals, Antioxidant, Selenium, Paracetamol, Amelioration, emerging pollutant

Preparation of Extracellular Vesicles from Umbilical Cord Wharton's Jelly derived Mesenchymal Stem Cells for Regenerative Medicine Applications

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Abstract. Mesenchymal stromal/stem cells (MSCs) are specialized cells having self-renewal and multi-lineage differentiation capacities and play a key role in nature as well as engineered regeneration of tissues. Though first discovered in bone marrow, these MSCs are now found in almost all tissues in the human body. Umbilical cord Wharton's jelly-derived MSCs (WJ-MSCs) gained popularity amongst all owing to less ethical concerns, the non-invasive nature of collection and ease of cell isolation. Much of the therapeutic effects of MSCs are now being gradually attributed to the extracellular vesicles (EVs) that carry communication signals from MSCs to other cells. Having equal clinical relevance but fewer regulatory concerns as MSCs, the EVs are rapidly gaining momentum in the regenerative medicine field. In this study, we established the primary culture of human WJ-MSCs and characterized them as per ISCT criteria. The cells were serum-starved for up to 48 h to induce the release of EVs. The conditioned media was subjected to ultracentrifugation to purify the EVs. The isolated EVs were systematically characterized using biochemical methods for protein/nucleic acid quantification, DLS assay for particle size distribution, SDS-PAGE and western blotting for CD63, CD81 and TSG101 marker analysis. In vitro uptake assay with A549 cells was performed using fluorescently tagged EVs to confirm the cellular internalization. Application of WJ-MSC-derived EVs in lung regeneration is currently being investigated in vivo in model animals.

Keywords: Regenerative medicine, cell therapy, stem cells, exosomes, lung regeneration.

Acknowledgment: The study was funded by Science and Engineering Research Board, New Delhi through COVID special core research grant scheme (grant number CVD/2020/000224).

Visual Detection of LAMP reaction products using Carbon dots

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Abstract: The interest of researchers to examine the disease caused by infected food items have grown vastly in recent years. PCR is the most trusted technique for amplification and detection of nucleic acid until isothermal amplification techniques were introduced which proved to be more efficient than the PCR. Loop mediated isothermal amplification (LAMP) is the most researched topic after PCR for amplification and diagnostic technique. During amplification, pyrophosphate (PPi) moiety is released as a by-product of the synthesis reaction. Different types of nanoparticles were used to detect inorganic pyrophosphate in which carbon dots have shown a greater efficiency. Carbon dots (CDs) have a tuneable fluorescence emission which can be quenched under suitable reaction conditions. CDs were synthesized using various carbon (Galactose, Citric acid, Glycerol) and amine (Histidine, Ethylenediamine, Cystine) sources via bottom-up approach. These CDs were able to show fluorescence under presence of UV light and this property of CDs is used for nucleic acid detection. Direct interaction between o-Phenylenediamine and H_2O_2 produces 2,3-Diaminophenazine which can be catalysed using carbon dots showing peroxidase mimic activity. Fluorescence of these carbon dots is quenched during this reaction. When PPi is introduced, it blocks electron transfer between OPD and H2O2 resulting in inhibition of DAP formation and retaining the fluorescence of carbon dots. LAMP reaction products which contain PPi when incorporated in this reaction inhibits the formation of DAP. This study will be useful in future for development of miniature devices for rapid diagnosis of diseases caused by food borne pathogens.

Keywords: Isothermal amplification, carbon dots, fluorescence, bottom-up approach

Nanoparticle Biosynthesis and Characterization with the Antifungal PGPR isolate

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Abstract: Plant Growth Promoting Rhizobacteria (PGPR) are basically group of heterogenous bacteria, promoting plant growth and possess pathogen combat activity and nanoparticles stand out in this field, as they can be employed to deliver PGPRs and their active chemical agents in a regulated manner, i.e. focusing on specific types of cells or tissues, at specific times. Therefore, the current study has carried out the pathogen combat activity assay of the five PGPR isolates CBK2007, CBK3005, CBK5001, CBK6004 and CBK17001 against *Rhizoctonia solani, Alternaria alternata and Sclerotium rolfsii* and then the biosynthesis of Silver Nanoparticles from the most potential screened PGPR, CBK6004, who has showed antagonist activity against most of the fungal pathogens. Then, we have performed characterization studies of those nanoparticles i.e. to know about their size by DLS (Dynamic Light Scattering) assay and negative ion attraction by *Z* (zeta) potential, absorbance by UV- Vis spectroscopy, elemental composition by powder XRD (X Ray Diffraction) analysis, morphological characteristics by FESEM (Field Emission Scanning Electron Microscopy) analysis, functional group composition by FTIR (Fourier Transform Infrared) analysis, and thermal stability by the TGA (Thermogravimetric analysis). The DLS assay has given an average particle size of 103.81 nm and a *Z* potential of -10.6mV, which basically resides around the nanoscale. The UV- Vis spectroscopy has provided the result of increasing absorbance, which is been a conformation of nanoparticle synthesis. XRD has provided sharp peaks in the range of 2θ= 20- 80̊, which implies the presence of crystalline structures. FESEM data has proved the existence of nanoparticles, from the FTIR data we have come to know about the presence of different types of amine group in our nanoparticles like primary, secondary and aliphatic ones in the wavenumber range of 3000- 3500 cm-1 and lastly the TGA analysis has depicted about the percentage of mass loss of 96.319 % of the nanoparticle. In future we are thinking about developing bioformulations with these nanopartcles, by checking some of their activity and applying them on the crop plants,

basically rice plants to study their growth promotion and pathogen combat activity through several physiological, morphological and biochemical parameters.

Keywords: PGPR, Silver Nanoparticle, pathogen combat activity, plant growth.

Computational Studies Comprising Structural, Electronic and Biological Evaluation of an Indolinone Hydrazine Derivative

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Abstract. The current work involves theoretical studies on 3-hydrazineylideneindolin-2-one employing density functional theory (DFT) with B3LYP functional and standard 6-311++G(d,p) basis set. The optimized structure and molecular geometry of the title compound were calculated with Gaussian 09W and visualised using Chemcraft. HOMO and LUMO energy evaluation in gas phase, as well as MEP map and UV-vis theoretical spectrum generation were computed. Pharmacological evaluation comprising of drug-likeness, ADME, environmental toxicity properties using online tools such as SwissADME, ADMETLab 2.0, and GUSAR, to determine whether the molecule can be a potential drug candidate was performed. Finally, molecular docking against anticancer targets with PyMOL, AutoDock Suite and Discovery Studio Visualizer, was successfully conducted.

Keywords: DFT, MEP, UV-Vis, ADMET, Docking.

Microbial route to reduce greenhouse gas emissions – A review

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Abstract: The major cause of global warming is the green house gases which trap the heat reflected by the earth's surface. The greenhouse gases are carbon dioxide, methane, water vapour and ozone. Out of which carbon dioxide is primely responsible approximately 80% for greenhouse effect. In order to bring the CO2 emissions rate down, scientific techniques aim is to convert the heterotrophic Escherichia coli's food from sugars to CO2 making it completely autotrophic in the process through transgenic intervention to express enzymes necessary for the CO2 fixation cycle (C3 cycle) like RuBisCO to generate more sustainable sources of food and fuel and ultimately lessen the impacts of global warming caused these emissions. The methods involve inoculating the genes that code for enzymes responsible for CO2 fixation and disable genes that are involved in heterotrophic metabolism, secondly to provide reducing power through NADH by oxidation of formate using formate dehydrogenase (FDH). Lastly Adaptive laboratory evolution (ALE) techniques combine genetic variety with the selection of favourable stress induced mutations to metabolically engineer microorganisms. After about 200 days, the bacteria had gone through a complete trophic mode shift, which meant that some of them could now use CO2 as their sole carbon source. The major drawback of this autotrophic strain is that bacteria consume more formate, releasing more CO2 as byproduct. Further research could provide the tools to develop the technology so that it can supply energy through renewable electricity to address the problem of excess CO2 release.

Keywords: Escherichia coli, co2, calvin cycle, RubisCO, photosynthesis, greenhouse gases, adaptive laboratory evolution.

Fusion Protein" approach to develop long-acting Recombinant Human Paraoxonase 1 (rhPON1) for clinical use

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Abstract: Human paraoxonase 1 (hPON1), a catalytic bioscavanger is 355 amino acid long polypeptide, synthesized in the liver and act by association with High Density Lipoprotein (HDL) particles. This multifaceted enzyme acts on a wide range of substrates including pro-atherogenic and pro-inflammatory molecules, quorum sensor molecules and several organophosphate (OP) molecules. The hPON1 exhibits anti-oxidative, anti-inflammatory, anti-atherogenic, anti-diabetic, and OP-hydrolyzing properties. Thus, hPON1 is a strong candidate which can be developed for therapeutic intervention of various PON1-associated disease conditions (including atherosclerosis, diabetes, cardiovascular and neurodegenerative diseases, OP-poisoning). However, this moonlighting enzyme exhibits poor pharmacokinetic (PK) profile including its sub-optimal circulatory half-life. Thus, there is a dire need to develop variant(s) of hPON1 having improved circulatory half-life. In order to overcome this limitation, we have used "fusion approach" to engineer novel variants of hPON1 in which the enzyme is genetically fused with Half-life Extension Partners (HLEPs) via a linker peptide. Here, we present our results describing cloning, expression, purification and characterization of engineered human paraoxonase (EHP) variants. Our results indicate that lead EHP variant exhibit enhanced OP-hydrolyzing activity.

Production of citric acid using Lignocellulosic waste

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Abstract: Citric acid is a versatile organic acid that is widely utilized and readily available. This is commonly utilized in a variety of industrial settings. Citric acid is a 2,3-propanetricarboxylic acid with two hydroxyl groups. It can be found in a variety of fruits and vegetables. Lemons are a good source of citric acid. Citric acid has a global demand of around 6.08x10 5 tones per year, and its use is growing by the day. Citric acid is made by **Aspergillus niger** and **Aspergillus flavus** species. Citric acid was produced from several waste substrates such as banana peels, coconut husk, and rice straw in this work utilizing Aspergillus niger isolated from soil sample. Microscopic inspection using lactophenol cotton blue staining was used to identify and characterize the samples. Other species including Aspergillus oryzea, Pencillium citrinium, and Trichoderma viridea are isolated and citric acid is produced. The manufacture of citric acid was carried out using solid state fermentation and predicted based on varied fermentation days, pH levels, and substrate concentrations

Keyword: Substrate, Characterize, Isolate

Study to understand Drug Induced Acute Kidney Injury using bioinformatics approach

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Abstract. Acute Kidney Injury (AKI) is a clinical condition that results in increased accumulation of nitrogenous surplus in blood and reduction in urine volume. Data on Adverse Drug Reaction (ADR) AKI from opensource databases was collected. A database was created using MS-SQL software. Common single Active Pharmaceutical Ingredients (API) reported to cause ADR AKI as reported in our database was identified based on counts. These signals were then validated using databases like SIDER The information on the drugs as well as AKI like their protein targets and pathways involved was retrieved from suitable databases like PubChem, DrugBank, BindingDB, DisGeNET, Genebank, Genecards, Malacard, PathBank, KEGG, Reactome, PharmGKB, SMPDB etc. All the information collected manually was curated into database using MS-SQL. Common chemical entities, proteins, pathways etc. between AKI physiology and drug metabolism was matched using SQL commands. The QSAR models were developed to find the relationship between the structures of the API described in terms of molecular descriptors and the adverse effect AKI. The API and their metabolites computed using GLORY server (Total 1208 ligands), producing the adverse effect AKI were docked with ACE-Angiotensin-converting enzyme, to find their binding interactions and the amino acid residues involved. Top five metabolites with lowest binding energy from 5 pharmaceutical classes were then subjected to molecular simulation studies to finds the stability of the docked complex. The study predicts that renal toxicity could be decreased if the molecular descriptors from regression and toxicophore models are modified. Our docking results show that not only the API but also its metabolites interact with

Angiotensin-Converting Enzyme(ACE) is therefore off-target for drugs causing ADR AKI.

Keywords: Acute Kidney Injury (AKI), Advervrse Drug Reaction (ADR), Quantitative Structure Activity/Toxicity Relationship (QSTR), molecular docking, ACE-Angiotensin-converting enzyme

NANOBOTS - NEW AID FOR KIDNEY STONES

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Abstract: Kidney stones have afflicted humans throughout history, and surgical procedures to remove them have been described. They begin small but develop in size with time, posing a risk of renal and kidney disease. Existing technology, such as lithotripsy, has a number of drawbacks, including the fact that it is painful, does not guarantee total stone removal, and may induce ureter injury. As a result, we set out to design a novel device that would integrate nanobots, biosensors, and nanolasers in order to dissolve kidney stones with customized non-invasive technology. The nanobots can reach any part of the body faster and with precision. In this poster, the sensor identifies the target where calcium accumulation occurs, signaling the laser pathway. The primary goal of integrating sensors with nanobots is to detect calcium kidney stones with detection limits of 10-14 mg/dl. As we externally provide the pump for stimulation emission, the holmium nanoparticles are used to generate spaser wavelengths of interest that break the kidney stones located in the urinary tract. This technology improves stone removal sensitivity and accuracy while also addressing recurrence issues.

Keywords: Kidney stones, Nanobots, Biosensor, Laser.

Application of Nanophyto remediation to eradicate various types of pollutants and contaminants in a sustainable manner with the help of advanced science and Technological Approach to usher Agricultural economy

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Abstract: The accumulation of trace amounts of metallic toxicants and organic and inorganic pollutants causes the degradation of agricultural land, depletion of soil health, and contamination in the groundwater reserve and surface water leading to the threat in food security, contamination of drinking water, and spread of acute diseases in both the life on land and life underwater. The phytoremediation techniques implying the physiological processes of plants viz. translocation, evapotranspiration, bioaccumulation, adsorption, absorption, etc. are proved to be very efficient for degrading, removing, immobilizing the contaminants in the soil, groundwater, and surface water. This technique is more environmentally friendly than the conventional techniques of the application of chemical components as it reduces the appertaining effects of greenhouse gas emission, climate change, waste generation, natural resource consumption, etc. Nanophytoremediation is the application of nanoparticles and plants that reinforce the process of degradation of contaminants more efficiently and sustainably. It also stimulates the healthy growth of crops and the development of soil health due to nanomaterials' effective role in enhancing microbial populations' activities and the particle uptake capacity of plants. The metal components in excess are piteous for the physiological processes in plants which can be resolved effectively by the application of nanoparticles through the implementation of transgenes in the plants. In this paper, we review the application of nanotechnology on plant species, which may be utilized as metal tolerant and hyperaccumulators as economical and effective property measures.

Keywords: Phytoremediation; Nanoparticles; Nanoremediation; Nanotechnology; Bio elements

QuickED: web based application for emergency healthcare management

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Abstract: Emergency room overcrowding is a serious global problem in several countries and has been declared a national emergency in many. It is a scenario in which the Emergency Department's performance is hampered due to an overwhelming number of patients waiting to be seen, assessed, and treated, or discharged. Patients in severe conditions/ emergencies are unaware of the state of the Emergency Room before arriving at the hospital, wasting valuable time and causing delays in receiving necessary treatment. In the emergency department, there is a need to build an effective system to prevent these issues. We have created a web application that displays local hospitals' current locations as well as their ER statuses. It directs patients to the nearest hospitals, informs them of their ER status, and assists them in making an informed selection about their facility of choice. The web application is hosted on a Tomcat Apache server that can be maintained and updated on a regular basis, and the database framework is built using a MySQL Server. The application provides functionalities such as navigation, real time status update**,** number of available beds, list of hospitals in collaboration with us**,** links to hospitals individual websites and an emergency directory.

Keywords: Emergency department, Navigation, Real-time updates, Web Application

Detection of infectious diseases from chest X-ray and CT Images using a new Optimized Classifier

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Abstract- The world has been facing fearful challenges with infectious diseases, the recent one being COVID-19. As per the report given by WHO, SARS-CoV-2 is the virus behind the COVID-19. The standard RT-PCR assay relies upon the nasopharyngeal swabs for examining the existence of ribonucleic acid (RNA) of SARS-CoV-2. However, the accuracy level as well as the sensitivity of the RT-PCR tests sometimes may mislead the results, and is a time-consuming process. Therefore, as an alternative, the CT and chest X-rays are being used as the potential indicators for COVID-19 detection. In this research work, a novel COVID-19 detection framework has been designed with a deep learning-model using CT and X-ray images. The proposed work encapsulates three major phases. Initially, the collected raw chest X-ray (CXR) scan images as well as chest CT images are per-processed via 3 stages: (a) Read (b) Resize and (c) Noise Removal with median filtering. Then, from the pre-processed images, Proposed I-SLBT (Improved shape local binary texture) features are extracted along with supplementary features like color and GLCM (texture feature). In the detection phase, a Transfer learning based optimized Deep belief network (DBN) is introduced. To further enhance the detection accuracy of the classifier, the hidden layers as well as weight function of DBN are fine-tuned via coronavirus optimization algorithm (COA). Finally, a comparative evaluation will be covered to validate the proposed work, the details of which will be presented in the paper.

Keywords—COVID-19 detection; CT images; Chest X-ray images; I-SLBT feature; Transfer learning based optimized DBN; COA.

Galactomannan polysaccharide as a biotemplate for the synthesis of Zinc oxide nanoparticles with catalytic, antimicrobial and anticancer applications

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Abstract: Bio-templates such as polysaccharides, proteins and nucleic acids provide a facile, rapid, and environmentally benign route for synthesizing a variety of nanostructured materials. In this work, Locust Bean Gum (LBG), a galactomannan polysaccharide, has been used as a biotemplate for the synthesis of ZnO nanoparticles (NPs) for the first time. The composition, structure, morphology, and bandgap of ZnO have been investigated by Energy Dispersive X-ray Spectroscopy (EDX), X-ray powder diffraction (XRD), and Scanning Electron Microscopy (SEM). XRD data showed single-phase crystalline hexagonal structured NPs. The crystalline size, theoretical and experimental lattice constants, unit cell volume, and X-ray density values were analyse using XRD data. The presence of M-O bonding in the sample was confirmed by FTIR spectra. The NPs were evaluated for their photocatalytic efficiency towards the toxic organic pollutants. It was observed that the 0.5/ml concentration of NPs can bleach out Rhodamine B under sunlight, displaying excellent photocatalytic activity. These NPs exhibited 74.3%, 94.8% and 89.9% inhibition of biofilm formation by *Staphylococcus aureus* at concentrations of 250µg/ml, 125µg/ml and 62µg/ml, respectively. The NPs also induced cell death and prevented cell migration in ovarian cancer, prostate cancer and in breast cancer cell lines as observed in cytotoxicity assay and in wound healing assay. The inhibition of cell proliferation observed at 1mg/ml, 500µg/ml and 250µg/ml of NP in all three cell lines were equal to or better than that observed using 100µM Doxorubicin. In ovarian cancer cell line, significant cell death of 54.8% was observed at 125µg/ml of NPs also, though it was lower in other cell lines. Wound healing assay showed that the NPs significantly blocked the cell migration at a

concentration as low as 62µg/ml in all three cell lines. Further optimization of the nanostructure properties will make it a promising candidate in the field of nano-biotechnology and bioengineering owing to its wide range of potential applications.

Keywords: Zinc oxide nanoparticles, galactomannan, bio-template, photocatalysis, bactericidal, cytotoxicity, cell migration

Synthesis & characterization of Biopolymeric silver-curcumin nanoparticles as antimicrobial drug delivery systems

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Abstract. The conventional drug delivery system faces multiple challenges in terms of its efficacy and tunability. Also, the uncontrolled drug delivery profile makes it difficult to have control over the required dosage administration. The chemically synthesized systems also have the immense challenge of toxicity when administered. This work was aimed to synthesize biopolymeric nanoconjugate as a significantly effective and improved drug delivery system. Also, curcumin as the model drug is used to evaluate its drug delivery profile and comparative antimicrobial efficacy analysis. The result showed the prepared stable & monodispersed nanoconjugates were successfully adsorbed with the drug curcumin. The release profile projected a duration of 140 hours with a moderate release. The antimicrobial study displayed the successful distribution of curcumin and increased the overall activity of the nanoconjugate and the drug itself. These properties show immense potential for the conjugate to be used in various healthcare applications as a smart drug delivery system.

Keywords: Nanoparticles, drug release, antimicrobial, nanoconjugate.

Production of nanostruvite from cattle urine for agricultural applications

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Abstract: The population is increasing at overwhelming rate and to meet the food demand, it is essential to use fertilizers for increase in crop production. However, the N and P fertilizers are not only expensive but their resources are also depleting and they are at main cause of anthropogenic eutrophication. It is very essential to recover the pollutants from potential nutrient rich wastes such as cattle urine and use them as a fertilizer. Present study has investigated the production of nanostruvite from cattle urine. The main objectives of this study were a) characterization of cattle urine, optimization of Struvite production parameters, selection of magnesium source and concentration, conversion of Struvite to nanostruvite and its characterization. It was observed that cattle urine is a rich source of N and P and these pollutants can be recovered as potential nutrients in the form of Struvite. Studies were carried out by using three different sources of Mg (Magnesium chloride, Magnesium hydroxide and Magnesium Sulphate). It was also observed that the pH of 10 and Mg Conc. 5 %W/V lead to production of good quality and high yield of Struvite. The confirmation of struvite was carried out by using XRD pattern and FTIR spectrum of Struvite crystals.

Keywords: struvite, urine, agriculture, fertilizer, XRD and FTIR

Effect of ionic liquids on self-assembled triblock copolymers

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Abstract. Triblock copolymer micelle is considered as one of the most promising nano drug delivery systems due to its unique structure and function. When polymeric micelle dissolves in water, it self assembles to form nanoscopic core/shell structure. The hydrophobic anhydrous inner core region of the micelle aids in the solubilization of water insoluble medicinal compounds. However, the integrity of the micellar core structure is a critical challenge that must be addressed in order to improve medication retention time. Ionic liquids have recently gained a lot of attention because of their potential applications in the pharmaceutical area. Ionic liquids are a novel type of chemicals with unique properties that make them ideal for specific medicinal uses. Appropriate combination of cations and anions in an ionic liquid reported to improve the formulation stability and bioavailability of the micellar system. The impact of ionic liquids towards effective drug delivery capability of the polymeric micelle will be discussed comprehensively in this chapter.

Keywords: Polymeric micelle, drug delivery system, ionic liquid

Machine learning approach for identification of oncogenic biomarkers by profiling TCGA omics data toward its clinical application

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Abstract: Cancer is a highly heterogeneous disease across the world. Machine learning methods offer new techniques for compiling and analyzing various multi-omics data that allow the discovery of novel biomarkers. These biomarkers have the potential to aid in accurate disease prediction, patient classification and drug response. The advanced multi-omics technology has led to the rapid detection of potential oncogenic biomarkers. Machine learning methods have great potential for pattern recognition in cancer heterogeneous data sets, as evidenced by recent research. To address this, a data-driven machine learning method helps identify oncogenic biomarkers that predict the clinical outcomes of patients with early cancer. In the present work, we investigate breast and ovarian cancer TCGA omics literature data and use python (Natural Language Processing) NLP package containing models for processing based on biomedical, scientific or clinical data. We extract 2,383 abstracts based on keywords such as breast cancer TCGA and 847 abstracts for ovarian cancer TCGA from 2010-2021 using the PubMed database. Further the multi-omics profiling performed for feature selection and model regularization for the identification of significant biomarkers using machine learning algorithms. The TCGA omics data includes gene expression (mRNA), methylation level, miRNA expression and clinical data was used for molecular profiling by applying machine learning algorithms. TCGA breast and ovarian samples clustering perform from multi-omics simulated data to identify biomarkers associated with survival or clinical annotations. We evaluate their performances in retrieving sample clustering from multi-omics datasets to assess their strengths in predicting survival, clinical annotations and known oncogenic pathway. The integration and analysis of molecular data should focus on finding accurate medicine to understand the specific variations of patient and disease. Further the complex relationships in multi-omics data, if mined, can lead to more accurate classification of patient samples according to the phenotypes for designing potential drug targets.

Keywords: Machine learning, (Natural Language Processing) NLP, TCGA omics, Biomarker, Oncogenic pathways.

Developing novel health intervention strategies to identify putative drug targets against clinically important multidrug resistant bacterial pathogens

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Abstract: Bacterial multidrug resistance (MDR) poses major threats to the global human health as described by the World Health Organization (WHO). Conceptually, MDR reflects the ability of bacterial pathogens to combat deadly doses of structurally different antibiotics, which are supposedly used for killing the sensitive strains. Based on previous reports, we have explored different mechanisms known to be involved in drug resistance. These were computationally analyzed to reveal the crucial role players that could be used as drug targets and/or vaccine candidates by future researchers. Essentially, we have integrated four different approaches to explore for the crucial virulent proteins which might be involved in the mechanism causing MDR in bacteria. For example, in this study, we have dealt with the efflux pumps proteins viz. AcrA, AcrB, AcrD, MdtA, MdtB, MdtC, the signal transduction proteins like BaeS, BaeR, the chaperone proteins viz. SicA, DnaK, SigE and other proteins involved in biofilm formation pathways to propose a four-approach based intervention strategy for managing MDR. These approaches were rationally interlinked through screening and identification of drug targets and/or vaccine candidates from the protein interactomes of either virulence factors or pathways present in certain virulent phenotypes or whole genomes of selected alarming MDR bacterial species. These candidates were verified through variant analyses of archived infected patient's bacterial samples to decipher potential drug binding sites. One such unanimously affected target is revealed to be DnaK from Salmonella enterica serovar Typhimurium, Acinetobacter baumannii, Proteus mirabilis, Staphylococcus aureus, Pseudomonas aeruginosa,

Streptococcus pneumoniae and Mycobacterium tuberculosis. To this end, DnaK has been phylogenetically analyzed to be co-evolved with other house-keeping genes upon exhibiting complete clade matches with the 16S rDNA tree across the aforementioned species. Finally, DnaK was found to be inhibited by our screened and proposed ligand XR770, a phenaleno-furanone derivative, to exhibit the highest binding affinity in the active site wherein the amino acid change was found to be located in DnaK. For instance, our study revealed dnaK gene to contain a mutation at position 723401 with the nucleotide changing from C to A causing a change in the amino acid, thereby altering the normal function of the DnaK protein in MDR Salmonella species. Hence, we propose DnaK, to be the plausible target site with the potential for new therapeutic interventions in combating MDR for the selected MDR pathogens.

Keywords: Multidrug resistance, bacterial pathogens, efflux pumps, interactome analysis, Salmonella Typhimurium, Dnak

Development of a portable UV disinfection chamber for air purification in respirators

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Abstract: Highly efficient disinfection systems have an increasing demand among healthcare professionals in the current pandemic situation. Powered Air Purifying Respirators (PAPR) are one among such air purification systems which supply contaminant free air through HEPA filter directly to the face piece. They are battery powered, portable and the user can vary the airspeed according to his needs. Basic microbiological tests were conducted by taking air samples in a closed room at the outlet of HEPA chamber near the face piece. The results showed that HEPA filter alone cannot filter all contaminants and when the air speed increases upto 80L/min, the bacterial and fungal load in the air was found to be increasing. These microorganisms present in air pass to the face piece continuously causing the person to be exposed to the contaminated environment for a long time and hence it is riskier for his health. As a solution to this serious issue, we had designed and developed a UV disinfection chamber which can be attached along with the purifier, in order to remove the microorganisms which were not filtered through HEPA. To ensure complete disinfection, a hexagonal shaped chamber fitting three UV-C lamps of 40.58 mW/cm^2 was designed for the air to flow for 1.3 seconds. The chamber is 3D printed and ensures no leakage of UV light as well as air. Microbiological tests were conducted for the air sample at both the inlet and outlet of the disinfection chamber and the bacterial colony count was reduced significantly thus proving the newly designed system shows maximum efficiency. This devised system is portable and can be used along with respiratory units for ensuring disinfected breathing air for healthcare professionals.

Keywords:- UV disinfection, respirators, HEPA, log reduction, microbial testing

Ultrasound accelerated retting of coconut fibres: an effective technique over conventional processes

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Abstract: In the coasts of India, the environment pollution caused due to the process of retting of coconut fibers is found to be high. Traditionally retting involves dumping coconut husks into water bodies for a period of 6 months to 1 year to soften these coconut fibers. The purpose of this research was to accelerate traditional retting processes by finding an alternate way with the use of NaOH, and to formulate a comparative analysis between the different methods employed, which included ultrasonic cavitation, magnetic stirring and microbial degradation. The raw coconut fibers were first pretreated with NaOH, followed by the treatment to the fibers by different methods such as ultrasonic cavitation, magnetic stirring and microbial degradation. The results were then compared by quantitative analysis such as loss in weight, microscopic images, SEM, FTIR, lignin testing, tensile strength etc. The concentration of NaOH used, the time taken for the experiments and the weight of the fibers were also optimized. It was observed that 2% NaOH was most effective for the pretreatment of the fibers. Ultrasonic cavitation was the most effective method for accelerated retting. The optimization of the drying time was found to be 1.5 h at 700 C in a hot air oven. The ideal weight of retting a particular quantity of fibers was found to be 0.5 g.

Keywords: Accelerated retting, Coconut husks, Ultrasonic cavitation, Lignin

Development of food plates from biodegradable materials such as flower waste

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Abstract: The flowers are very attractive, colourful, and significant in many occasions to decorate temples, houses, wedding halls and graveyards. Flower waste from religious sites, also known as Nirmalya, is usually not mixed with other waste. These flowers form a pile of garbage on the ground and are dumped into rivers, streams, lakes and the sea. Flower waste is a big problem because it pollutes the ecosystem. Organic matter produced by the decomposition of flowers promotes algae growth in water bodies, which in turn lowers oxygen levels, and destroys marine life. Rotten flowers can also cause soil contamination and foul odours. When flower waste is decomposed it releases a methane gas (a greenhouse gas) that contributes to global warming. There are several projects, government agencies or non-government agencies that effectively collect flower waste and turn it into compost or vermicompost. There are several products on the market made from flower waste. For example, incense sticks, gulkand, paints or dyes, essential oils, perfumes, mosquito repellents, biodegradable thermocol. To make flower biomass collected from a nearby temple into a value-added product, plates of various shapes and sizes were made from flower waste. Our flower waste derived food plates have antibacterial and antifungal activity to protect users from mold and foodborne pathogens. In addition, the light weight, hydrophobicity and good mechanical strength of the food plate are on par with the food plates available on the market.

Keywords: Flowers, Flower waste, Food plates, Antibacterial activity, Antifungal activity

Design of Jet-Loop Reactor for effective wastewater treatment

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Abstract: Jet loop is high mass transfer reactor which is used for conducting gas liquid reactions in the gas–liquid ejector. The jet loop reactor is mostly used for waste water treatment like river wastewater, municipal wastewater and enzymatic reactions under optimal operation conditions for removal efficiencies of COD, MLVSS, MLSS and change in concentration. In this work, jet loop reactor was designed for wastewater treatment. The result showed that hydraulic retention time is varied against the different municipal wastewater. The maximum COD removal efficiency is found to be for MLVSS concentrations ranges from 1210 mg/l to 1220 mg/l in all cases while for the MLVSS concentration ranges from 1210 mg/l to 1220 mg/l the COD removal efficiency is found to be less. Treatment of wastewater using jet-loop reactor is proven to be very effective and most used method in the industries because of its simple construction, easy operation and its cost-effectiveness.

Keywords: Jet loop reactor, river wastewater, treatment, waste water, biological treatment

Antibiotics susceptibility in *Xanthomonas citri pv. viticola* isolates causing bacterial leaf spot of grapes

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Abstract: Antibiotics have been used for the management of many bacterial plant diseases. In grapes, *Xanthomonas citri pv viticola* causes severe bacterial leaf spot disease which causes great economical loss. Because of continuous application of antibiotics, many plant pathogenic bacteria had inherited resistance against antibiotics. A study was conducted to examine the antibiotic sensitivity in *Xanthomonas citri pv viticola* collected from Sangli, Nashik, Solapur and Pune district of Maharashtra. The antibiotic susceptibility of 23 strains of *Xanthomonas citri pv viticola* was tested against 10 different antibiotics (mainly beta-lactams, aminoglycosides, chloramphenicol, glycopeptides, tetracycline and ansamycins) at different concentration (100ppm, 150ppm, 200ppm, 250ppm, 500ppm, 1000ppm, 2000ppm, and 3000ppm). The antibiotic sensitivity was studied by paper disk method. Minimum inhibitory concentration (MIC) was calculated by measuring the zone of inhibition at different concentrations. It was recorded that all the isolates were insensitive to antibiotics viz Penicillin, Vancomycin, Amoxycillin, Bacitracin, Rifampicin and Oxacillin at all concentrations. Isolates were observed moderately sensitive to antibiotic Streptomycin and chloramphenicol above 1000ppm wheras sensitive to Tetracyclin and Kanamycin at concentration above 500ppm. Antibiotic resistant variability was observed among different isolates of different regions. The study sets down the foundation to find the correlation of antibiotic sensitivity with the presence or absence of indigenous plasmid or with protein profilling. It also highlights the Xanthomonas acquiring resistant traits thereby hinting an evolutionary significance.

Keyword: *Xanthomonas citri pv viticola,* antibiotics, plasmid, protein profiling.

In vitro study of the Anticancer activity of *Murraya Koenigii* leaf extract against PA-1 ovarian cancer cell line

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Abstract: Ovarian cancer contributes to a significant number of deaths worldwide, with over 313,000 cases annually and the mortality of about 200,000. More than 80% of women, predominantly of older age groups are diagnosed at advanced stages (stage III and IV), leading to less than 30% survival rate. At the advanced stage, therapies become increasingly ineffective due to drug resistance in cancer cells, raising an urgent need to develop new therapeutic strategies. *Murraya Koenigii* is a medicinal plant commonly used in South Asian cuisines. The *M. Koenigii* leaves are known to have antitumor, antioxidant, anti-inflammatory, anti-hyperglycemic, and hypoglycemic properties. The leaf extracts are rich in carotene, nicotinic acid, vitamin C as well as bioactive compounds which have shown cytotoxic activity against various cancer types. However, its potential against ovarian cancer has not been explored in detail. In this study, we investigate the antiproliferative, antimicrobial and antioxidant activity of the *Murraya Koenigii* leaf extract in the human ovarian teratocarcinoma (PA-1) cell line. After confirming the beneficiary effect of the plant extract *in vitro*, the in-depth mechanism of action will be studied through assessment of gene and protein expression levels. This study is expected to have promising applications in developing biopharmaceutical formulations against ovarian cancer.

Keywords – Ovarian Cancer, *Murraya koenigii*, cytotoxicity, antioxidant, PA-1 cell line, MTT, anti microbial assay

Molecular Docking and Dynamic studies of novel compounds against EGFR for Non-Small Cell Lung Cancer

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Abstract: Lung Cancer has reported 2.21 million cases worldwide making it the second most diagnosed type of cancer. Non-small-cell lung cancer (NSCLC) is said to account for around 80 - 85 % of all Lung Cancer. The most prominent protein responsible for onset of NSCLC is the epidermal growth factor receptor (EGFR) which activates when it binds to epidermal growth factor and other growth factor ligands. When activated, the EGFR tyrosine kinase triggers downstream pathways, which results in DNA synthesis, cell proliferation and consequently, tumours escaping the immune system. To identify and find best potential inhibitors for EGFR, we performed structure-based virtual screening and identified 10 different potential compounds which were later subjected to ADME to evaluate their pharmacokinetic properties. Molecular docking studies were carried out using Autodock vina to check the interaction between EGFR and compounds, from where each ligand was retrieved fir further visualisation in PyMOL. Molecular Dynamics simulation and docking validation was done on Desmond where the docked complexes were simulated 100ns and the results were collected n root mean square deviation (RMSD), root mean square fluctuation (RMSF) to check and signify the stability of protein-ligand complex throughout the simulation. The results obtained from *in-silico* studies found the compounds to be useful for further computer aided-drug design and development.

Keywords: Lung Cancer, Non-small cell lung cancer, Epidermal growth factor, DNA synthesis, Cell proliferation, Structure-based virtual screening, Molecular docking studies, protein-ligand complexes, Molecular Dynamics simulation.

Computational and docking studies of Chromone derivatives as selective Src family tyrosine kinase inhibitors.

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Abstract: Src family kinases (SFKs) are a family of tyrosine kinases which play a critical role in signal transduction. *In-silico* studies such as virtual screening and molecular modelling have proven to be useful in developing and designing kinase inhibitors. A library of chromone compounds was synthesized and was prioritized to obtain a lead chromone compound (MMK014) with desired *in-Silico* drug-like properties. Docking study was performed to analyze the binding mode of MMK014 chromone compound against 8 validated target SFK proteins. The best interaction affinity was obtained for Yes protein (-7.61 kcal/mol) and cSrc protein (-6.5 kcal/mol) of the Src family. Further molecular dynamics and simulation based study revealed that MMK014 compound showed selectivity for leucine, valine, lysine and aspartate residues. It is envisaged that the molecular modeling studies will help us in developing a better anti-SFK drug in near future.

Keywords: Src family kinases, chromone derivative, anti-cancer compounds, Molecular Docking, Molecular Dynamics.

Identification of potential biomarkers associated with Oral submucous fibrosis by Insilco analysis.

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Abstract: Oral submucous fibrosis (OSMF) is a precancerous condition with fibrosis of the submucosa tissues which may progress into a malignant growth in 8 to 15% of the cases. In South Asia, areca nut and tamarind seed product chewing is the main etiological factor, but the carcinogenic mechanism is still obscure. In this study, our focus is to identify the differentially expressed hub genes between the OSMF and normal tissue samples in silico, which will help us in the identification of potential biomarkers for OSMF and to ascertain the possible mechanism of transformation of OSF into malignant growth. To investigate possible remedial focuses for OSMF, the expression profile (GSE64216) of the genes was extracted from the Gene Expression Omnibus (GEO) information base. The GEO2R was applied to screen out differentially expressed genes (DEGs). Enricher and Kyoto Encyclopaedia of Genes and Genomes database were utilized to distinguish the basic DEGs in OSF and to identify its functional pathways. The protein-protein interaction (PPI) networks were utilized to additionally investigate the biomarkers with the most interactions in gene modules for the disease. Nearly 10 significant hub genes were identified by the Cytohubba plugin of Cytoscape software. The prognostic value of these distinguished genes was checked by the OSF cancer growth database derived from the Gepia tool. Wherein survival analysis revealed significant DEGs to be associated with worse overall survival of OSF patients. The study clearly conveyed that the identified hub genes may have the potential to be used as a biomarker for early diagnosis and thereby holds promise to reduce the transformation of OSMF into a malignant tumor by targeting suitable drugs for OSMF.

Keywords: Oral submucous fibrosis, hub genes, biomarkers, differentially expressed genes (DEGs).

Identification of Novel Inhibitors for SARS-CoV-2 Spike Proteins from PubChem Database

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Abstract: The new coronavirus (COVID-19) outbreak was declared a Public Health Emergency of International Concern by the World Health Organization (WHO) in January 2020The current work uses molecular docking and molecular dynamic simulation simulations to show how accessible medication candidates might be exploited as possible SARS-CoV2 spike protein inhibitors. The S1 subunit of spike protein in SARS-CoV2 binds to the ACE2 enzyme facilitating virus entry into human cells. Targeting the subunit using covalent inhibitors is a potential means to control the infection. Drug repurposing strategy was applied by using a library of compounds from the DrugBank database. Computational methods like molecular docking and molecular dynamics with Glide from Schrodinger and Desmond software are being used respectively. Studies were performed for the spike protein's closed and opened configuration with the top 5 molecules identified after further study. A 10ns molecular dynamic simulation was performed for these molecules, namely Pubmed ID: 12675190, 20014485, 20014869, 20014862, 91583376. Our study reveals that Arginine 237 formed hydrogen bonds while Arginine 403 and Lysine 417 displayed ionic and hydrophobic interactions respectively.

Elucidating Virulence between SARS-CoV-2 Wild Spike Protein and D614G mutant spike protein using Homology Modeling, Molecular Dynamics Simulations and Molecular Docking of Anti-covid Drugs.

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Abstract: The novel coronavirus (COVID-19) is a contagious acute respiratory syndrome disease, due to its devastating consequences on public health, SARS-CoV-2 has become a major worry worldwide. Due to the mutations and alterations in the genetic material of the Covid-19 virus unable to provide effective treatment to the patients. As a spike mutant of SARS-CoV-2, it was previously recognized as a risk factor for the virus's high fatality rate. The SARS-CoV-2 attaches to the receptor on the host cell and causes viral-cell membrane fusion, which is critical for virus invasion. The D614G mutation, which appears to accelerate SARS-CoV-2 transmission in humans, also improves SARS-functional CoV-2's spike protein. The spike of Covid-19 spike proteins (SARS-CoV-2) is used to gain access to a cell in the human body. The virus enters the body and comes into touch with cells in the nose, throat, and lungs.. The virus enters the body and comes into touch with cells in the nose, throat, and lungs. The natural spike protein and the D614G mutant spike protein were built using homology modeling, followed by all-atom molecular dynamics simulations. This study will help researchers to determine whether D614G mutant SARS-CoV-2 strains are more virulent than wild-type SARS-CoV-2 strains. Batch docking was used as a part of the drug repurposing technique to locate a medication that was suitable for both wild and mutant spike proteins. Drug Bank was used to identify these antiviral drugs repurposing as well as treatment of covid-19 medications. Using some scoring functions, batch docking assisted us in predicting binding affinities. Understanding the differences in virulence between the SARS-CoV-2

natural spike protein and the D614G mutant spike protein is critical for designing COVID-19 prevention and treatment medicines and vaccines.

Keywords: SARS-CoV-2, homology modeling, D614G, molecular dynamics, molecular docking, anti-covid drugs.

Production, characterization and antagonistic potential of biosurfactant produced by *Bacillus* sp. against *Colletotrichum gloeosporioides* causing anthracnose disease in grapes

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Abstract: Anthracnose is an important disease of grape, caused by *Colletotrichum gloeosporioides*. The pathogen infects the tender parts of the vines resulting in decreased yield. Management of anthracnose largely depends on use of fungicides, which is a main concern in export of grapes. The other cost effective and eco-friendly approach is to use of biological control agents for control of anthracnose. Recently, biosurfactants have been studied for their capability to control phytopathogens. Three *Bacillus* sps. were isolated from the surface of grape berry having potential to produce biosurfactant. Primary characterization of the biosurfactant produced showed that they belonged to the class of lipopeptides. The biosurfactant extracted from *Bacillus velezensis* strain Cg2 showed substantial inhibition of growth of *C. gloeosporioides* in *in vitro* study. The study explores the capability of microbial biosurfactant for sustainable agriculture.

Keywords: Grapes, surface bacteria, biosurfactant, antimicrobial activity, *C. gloeosporioides*

Extraction of valuable metals from e-waste powder by using an environmentally friendly chelating agent

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Abstract: E-waste is considered a threat, till it is not recycled properly. The presence of metals in the e-waste makes it a secondary resource of metals. Extraction of these metals is being experimented by using various eco-friendly methods. Apart from the e-waste, the metals are also found in industrial sludge, contaminated water, contaminated soil, etc. Bioremediation of contaminated soil by using chelating agents proved to be very efficient. Many chelating agents like EDTA, DTPA, etc. were used in the removal of metals, however, due to their low biodegradability; they became a potential risk to the environment. The aim of our study was to investigate the extraction ability of the biodegradable chelating agent- GLDA (N, N-Dicarboxymethyl glutamic acid tetrasodium salt) to chelate valuable metals like copper, iron, and zinc. Their content in the e-waste powder was 2.80%, 1.63% and 0.16% respectively. Washing experiments were conducted with two different concentrations of GLDA solution i.e. 1mM and 5mM at two different pH 2 & 7, keeping the contact time constant for 24 hours. Better extraction was observed at 2 pH and 5mM concentrations for copper, iron and zinc. The metal estimation was done by using Atomic Adsorption Spectroscopy (AAS). It was also observed that zinc was extracted only by 5mM concentration of GLDA at both the pH whereas it was not extracted by 1mM concentration of GLDA. Results from this experiment would prove that GLDA can be a potential eco-friendly chelating agent for the extraction of metals from e-waste in a large quantity.

Design and development of virtual reality based lab experience by Metaverse Technology

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Abstract: Virtual-reality-based learning has been demonstrated to improve student engagement and grades, which is more important than ever as Covid-19 continues to disrupt teaching. Metaverse is a new digital reality which is a virtual realm where people can connect with one another using various technologies. A combination of physical hardware and software is used to accomplish this. It focuses on a network of real-time rendered 3D worlds that a large number of people may plunge into at the same time. The metaverse is envisioned as a virtual world in which you can work, learn, communicate, rest, and attend virtual concerts, among other things. The work is focused on creating virtual labs using Metaverse technology to provide experience-based learning and to enable remote access to simulation-based labs in the bioengineering field. Features like video, quizzes and voiceovers are incorporated to make it interactive. The model was designed for tissue engineering labs and will be extended to various bioengineering labs. The main objective is to encourage students interest in conducting experiments by appealing to their natural curiosity and to acquire fundamental and sophisticated topics through remote experimentation.

Multinomial Natural Language Processing based Model for Gene Function Prediction

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Abstract: Natural Language Processing endeavors to augment a machine which responds to text, graphical data and respond with text of its own by recognizing the underlying patterns and inferences. DNA sequencing is the methodology employed to determine the exact sequence of bases (A, C, G, and T) in a DNA molecule. The DNA Sequencing results and analysis are critical and functional in prediction of gene function. The major aim of this project is to employ the NLP approach to predict the function of genes with sequenced DNA. The reference genome is of Homo sapiens. The algorithm accepts the input data sequence in the text format from the user, sequencing a particular unknown genome and thus, classifies the newly sequenced and assembled DNA to predict its function.

The paper specifies a novel approach to classify and thus, predict the newly assembled DNA using NLP for feature extraction. Investigating these essential genes is pivotal for further genomic studies but however, poses a problem due to its complexity in computational biology. A gene function prediction employs various methods of profiling, hashing or homology-based methods in order to annote the function information, utilizing existing resources and thus, characterize an encoding function. This cooperates the stratification of gene expression, followed by categorization and analysis of mutagenesis in organisms of a species or in a population.

NLP is a computational extraction of meaning from natural human language or words analogous to the natural human language and extract the features and patterns. The program is written in object-oriented format. This allows usage of the same model for similar different species datasets, as each object will have its assigned model and input dataset.

The recall of the reported model on 97%, whereas, the f1 score obtained is 98%.

Keywords: NLP model, Gene Function Prediction, DNA sequencing, CountVectorizer, coding genes, k-mers, bag of words, Naïve Bayes classifier**.**

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