A NATIONAL CONFERENCE ON

BIOENGINEERING 2020

10-11 December 2020

ABSTRACT BOOK

Organized by
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and Medical Engineering
National Institute of Technology,
Rourkela, Odisha

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Day1, 10th December Thursday

Bioengineering 2020

Inaugural Session	09.30 AM – 10.00 AM	Titles
Session 1		
Prof. Deepthy Menon Professor, Amrita Vishwa Vidyapeetham Kochi, Amrita Vishwa Vidyapeetham, Kochi, Kerala	10:00 AM -11:00 AM	Innovative Nano Surface Engineering of biomaterials for Improved Device Performance
Prof. Praveen Kumar Vemula Associate Professor Institute for Stem Cell Biology and Regenerative Medicine (in Stem) UAS-GKVK Campus,	11:00 AM – 12:00 PM	Designing Prophylactic and Therapeutic Technologies for Solving Unmet Clinical Needs
Presentation of Participants	12:00PM -1:00PM	
Lunch Break 1:00PM – 2:00 PM		
Session 2		
Dr. Eswaramoorthy K. V Assistant Professor, Indian Institute of Information Technology, Design and Manufacturing, Kurnool Andhra Pradesh	2:00 PM – 2:45 PM	Non-Invasive Sensing of Body Fluid
Dr. Suhail Rizvi Mohd Assistant Professor, Biomedical Engineering Department Indian Institute of Technology Hyderabad, Telangana	2:45 PM – 3:30PM	Mathematical Modeling of Mechanics of Fibrous Scaffolds for Tissue Engineering Applications
Dr. Mohit Kumar Jolly Assistant. Professor, Biosystem science and engineering Department, Indian Institute of Science, Bangalore, Karnataka	3:30 PM – 4:15 PM	Computational Systems, Biology of Cancer: How can Mathematical Models Help us Understand Cancer Better
Presentation of Participants	4:15-5:15 PM	
Poster Presentation	5:15 PM-6:00 PM	

Session 3		
Dr. Binulal Nelson Sathy Assistant Professor, Amrita Centre for Nano-sciences & Molecular Medicine, Amrita Vishwa Vidyapeetham Kochi, Kerala	9:00 AM – 9:45 AM	Human Tissues and Organoids in a Dish: Potentials and Challenges in Recapitulating the In Vivo Environment Ex Vivo
Dr. Akshay Srivastava Associate Professor, Department of Pharmaceuticals National Institute of Pharmaceutical Education and Research, Ahmedabad	9:45 AM -10:30 AM	Bioengineered Cell Instructive Collagen Hydrogel Patch for Intervertebral Disc Repair and Regeneration
Dr. Sakthi Swarrup J Assistant Professor, Centre for Nanotechnology Research (CNR) VIT ,Vellore, Tamil Nadu	10:30 AM – 11:15 AM	Ionic Polymer Metal Composites as Actuators and Sensors for Biomedical Applications
Dr. Alok Jain Assistant Professor, Bioengineering Department Birla Institute of Technology MESRA, Jharkhand	11:15 AM – 12:00 PM	A Combined Atomistic and Coarse Grained Simulation Study of Peptide Based Nanostructures: From Atomistic Details to a Mechanistic Interpretation
Presentation of Participants	12:00PM -1:00PM	
Lunch Break 1:00PM – 2:00 PM		
Session 4		
Dr. Shamik Chowdhury Assistant Professor, Environmental Science and Engineering Department Indian Institute of Technology Kharagpur, West Bengal	2:00 PM – 2:45 PM	Plant-derived Nanomaterials for Sustainable Urbanization
Dr Rabi Narayan Sahu, MCh, DNB (Neurosurgery) Professor & Head Department of Neurosurgery, All India Institute of Medical Sciences, Bhubaneswar, Odisha	2:45 PM – 3:30PM	Neural Bio-Prosthesis in Neurosurgery
Dr. Indranil Banerjee Associate Professor Department of Bioscience and Bio engineering	3:30 PM – 4:15 PM	Proangiogenic Nano-Biomaterials for Bone Tissue Engineering

Indian Institute of Technology Jodhpur		
Dr. Sreerup Banerjee Associate Professor Department of Mechanical Engineering Haldia institute of technology, West Bengal	4:15 PM -5:00 PM	Understanding Gastrointestinal Biomechanics: Role of Medical Image Processing
Valedictory and Student Award Ceremony	5:00 PM – 6:00 PM	

ORAL PRESENTATIONS

S.No	Author name	Timings	Title of the abstract
Session 1 (10-12-2020)			
1	Satyanarayana Murthy Malladi	12:00-12:10 PM	Controlling Breast Cancer Cell Line Proliferation In Humans By Morin, 9,10 Anthraquinone
2	Imdadul Hoque Mondal	12:10-12:20 PM	Trial And Error And Statistical Design Based Parametric Optimality of Tray Dried Musa Splendid
3	Arindam Sain	12:20- 12:30 PM	Exploring the Potential of Apigenin as a Dual PI3K/Mtor Inhibitor to Target PIK3CA Mutant Colorectal Cancer: An In-Silico Analysis
4	Ayushi Chaurasiya	12:30-12:40 PM	Peptide/Protein Engineering for Therapeutic Intervention Against Cancer
5	Muktesh Mohan	12:40-12:50 PM	Investigation of Er^{3+}, Yb^{3+} Doped Gd_2O_3 up Conversion Nanoparticles as a Contrast Agent for Optical Coherence Tomography
6	Nagendran Valarmathi	12:50-1:00 PM	Green Synthesis of A-Fe2O3 Nanoparticles from *Hibiscus Rosa-Sinensis* and Evaluation of their Anticancer and Dye Degrading Activities
Session 2 (10-12-2020)			
7	Anil Sindhu	4:15-4:25 PM	Nano Al_2O_3 Incorporated Chitosan Scaffold for Hard Tissue Engineering Applications
8	Veeramma Yatnalli	4:25-4:35 PM	Wheelchair Control Using Brain Computer Interface
9	S Geetha	4:35-4:45 PM	Lung Cancer and its Association with Chronic Obstructive Pulmonary Disease (COPD): Role of Inflammatory Genes.
10	Sonika kag	4:45-4:55 PM	Chemical Hydrolysis of Potato Peel Waste for Sugars and Value-Added Metabolites Production
11	Uzma Afreen	4:55-5:05 PM	In silico identification of microRNAs and their target genes in Wheat *(Triticum aestivum L.)* responsive to leaf rust infection.
Session 3 (11-12-2020)			
12	Neha Kukreti	12:00- 12:10 PM	A Thermochemical Pre-Treatment Study of Stubble Waste for Value-Added Product
13	Abhishek Indoliya	12:10- 2:20 PM	In-Vivo Investigation of Superparamagnetic Iron Oxide Nanoparticles (Spions) as a Theragnostic Agent for Magnetomotive Optical Coherence Tomography (MMOCT)
14	Menon Divya Ramesh	12:20-12:30 PM	In Silico Analysis of Papillary Thyroid Cancer Patient Samples for HIF1α Responsive Genes as a Prognostic Marker
15	Aditya Dev Rajora	12:30-12:40 PM	Preparation and Evaluation of OKM-G-PAM Graft Copolymer for the Biomedical Applications and as a Biodegradable Food Packaging Material
16	Divyasree Dinesh	12:40-12:50 PM	Nanoparticle-Based Intracellular Delivery of Microtubule Stabilizers Overcome Microtubule Disassembly in Corneal Endothelium Under Hypothermia and Cytokine Stress
17	Apeksha Devadiga	12:50-1:00 PM	Microtubule Disassembly in Corneal Endothelium Subjected To Oxidative Stress, A Hallmark of Fuch's Dystrophy
18	Amitesh Shrivastava	1.00PM-1.10PM	Biomechanical Stress Analysis of 3D Printed Polymer Human Femur Implant using PLA and PEEK: A Comparative Study

POSTER PRESENTATIONS

S.No	Title of the abstract
1	Sustainable Solid Waste Management in Rural and Semi-Rural Areas of Ladakh: A Critical Review of Project Tsangda
2	Pre-Treatment Processes for Production of Bioethanol by Lignocellulosic Biomass
3	Vitamin D Supplementation and COVID-19 Severity – Regulation of Angiotensin-Converting Enzyme 2 (ACE2), Renin Angiotensin System(RAS), Kinin-Kallikrein System (KKS)
4	A Review on the Various Systems Under Forensic DNA Phenotyping for the Prediction of Externally Visible Characteristics
5	The Metabolic Interplay Between Obesity and Breast Cancer
6	Multiple Sclerosis and Antigen Specific Therapy
7	Applications of Internet of Things (Iot) in Healthcare
8	Biodiesel Production from Dairy Wastewater using from Microalgae *(Chlorella Pyrenoidosa)*
9	Pharmacogenomics of Anticancer Drugs for Targeted Therapy
10	Smart Health Care and Tracking System Based on Internet of Things

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Keynote Lecture

Innovative Nano Surface Engineering of Biomaterials for Improved Device Performance

Dr. Deepthy Menon,
Professor,
Centre for Nano sciences & Molecular Medicine,
Amrita Vishwa Vidyapeetham, Kochi, Kerala, India.

Abstract: The response of host organisms to nanomaterials and nanostructures is documented to be unique and significantly different from that of conventional materials. This is mainly attributed to the differences in the interactions of nanoscale materials at the protein and cellular level. Capitalizing on this concept, the emerging field of nano biomedical implants holds the promise of novel and improved implant materials. Concurrently, there is a huge demand for innovative technologies for the regeneration of functional tissues and organs. This talk would focus on how modulations of nanoscale structural features of biomaterials can help to alter cellular interactions in vivo. Specifically, the impact of nano surface engineering of biomedical implants such as the coronary stents and dental implants would be elaborated. There is now ample evidence to prove that this emerging field of nano-engineering definitely holds promise in developing novel and improved nanomedical implants with potential for translation to the clinics.

BIOSKETCH

Dr. Deepthy Menon is a Professor at the Centre for Nanosciences and Molecular Medicine, Amrita Vishwa Vidyapeetham (University), India. She received her Ph.D. in Physics from Indian Institute of Science, Bangalore and completed post-doctoral trainings from the Technical University of Eindhoven, The Netherlands; National Cancer Institute, Maryland, USA and International School of Photonics, Cochin University, India. She joined Amrita Vishwa Vidyapeetham in 2006 as Assistant Professor to work at the interface of nanotechnology and biology for biomedical applications. Her current research is primarily focused on understanding the potential of nanoscale engineering of biomaterials and medical implants for translational applications in the fields of tissue engineering & regenerative medicine and cancer nanomedicine. Her pioneering work in transforming polymeric nanofibers to novel medical textiles has led to the development of

highly dynamic polymeric 3D constructs with defined architecture for a wide range of biomedical applications, especially in orthopedic, dental and cardiovascular areas. She is the inventor of 8 patents and her research team has produced more than 100 research publications. She is the recipient of several recognitions in her research career including the young research award from international union of materials research society, young scientist fellowship and BOYSCAST fellowship, both from department of science & Technology, Government of India. She serves as the council member of materials research society of India and task force member of nano safety regulations in India.

Keynote Lecture

Developing Prophylactic and Therapeutic Biomaterials for Unmet Clinical Needs

Dr. Praveen Kumar Vemula,
Associate Professor,
Institute for Stem Cell Science and Regenerative Medicine (inStem),
UAS-GKVK Campus, Bellary Road, Bangalore, India.

Abstract: Our lab is focusing on clinical translational research through biomaterials and chemical biology programs. By using chemical design tools, we have been developing therapeutic and prophylactic biomaterials for medical applications. A significant leap in drug delivery is an autonomous system that titrates the amount of drug released in response to a disease, for instance, inflammation, ensuring the drug release in an on- demand manner at a therapeutically relevant concentration. These disease-responsive biomaterials have proven to improve the efficacy in i) preventing rejection episodes of the transplanted organs, ii) in the treatment of inflammatory arthritis, and iii) inflammatory bowel diseases. We will discuss a new class of prophylactic materials to prevent pesticide-induce lethality. Additionally, we will discuss our efforts in translating these technologies into the clinic.

BIOSKETCH

Dr. Praveen Kumar Vemula is an Associate Professor at the Institute for Stem Cell Science and Regenerative Medicine (inStem), Bangalore. He has completed Masters in Chemistry from Osmania University, and obtained PhD from Indian Institute of Science, Bangalore. His expertise is developing chemical technologies for medical applications. His work spans the fields of biomaterials, drug delivery, medical devices, and chemical biology. He has published >65 peer-reviewed papers, has given >150 national and international invited lectures including two TEDx talks, and has >25 issued or pending national/international patents which have been licensed to multiple biotech companies. Several technologies developed in his lab have formed the foundation for multiple products on the market and currently under development. His technologies have led to the launch of five companies including Sepio Health (anti-pesticide technologies company, in India), Artus Therapeutics (a drug discovery company for IBDs, in USA), Skintifique (a skincare company, in France), and Alivio Therapeutics (an inflammation targeting company, in USA), and

Color Threads (innovative textile company, India). Thus far, 12 products that are developed based on his technologies are in the market worldwide.

PhD – Indian Institute of Science, Organic Chemistry, 2005

Postdoc-1 – City University of New York, 2005-2007

Postdoc-2 – Harvard Medical School, Harvard-MIT Health Science and Technology, 2008-2012

Faculty – inStem, 2013 to present

Invited Lectures

Non-Invasive Sensing of Analytes in Body Fluid

Dr. Eswaramoorthy K. V,
Assistant Professor,
Design and Manufacturing,
Indian Institute of Information Technology, Kurnool, Andhra Pradesh, India.

Abstract: The non-invasive monitoring of analytes in blood fluid would be useful in the diagnosis and treating the disease. It also pays the way for continuous monitoring of various analytes in the blood through the wearable device. Sample can be interstitial Fluid, tear, sweat, and saliva. However, sensing of the biomarker through a non-invasive method is challenging due to the presence of less concentration of an analyte in the sample. They are various studies being conducted on the correlation between analyte level in sample and blood. Microneedle, ultrasound, near infra-red, microwave resonators, reverse iontophoresis, microfluidics, etc. are methods are used to collect a sample to enable non-invasive sensing. In the talk, we shall discuss various analytes and efficient techniques used to measure body fluid concentration through different non-invasive methods.

BIOSKETCH

Dr. Eswaramoorthy K V is an Assistant Professor at the Indian Institute of Information Technology, Design and Manufacturing, Kurnool India. He received his Ph.D in Instrumentation Engineering from Indian Institute of Science, Bangalore. He joined in Indian Institute of Information Technology, Design and Manufacturing, Kurnool in 2018 as Assistant Professor and his research areas are Electrochemical Biosensor, Biomedical Instrumentation, and Industrial Automation. His skill sets include fabrication techniques like screen printing, MEMS device Fabrication, Experience in clean room protocols and using equipment; Awards and Distinctions: Recipient of fellowship including contingency funds from the Ministry of Human Resources and Development (MHRD), Government of India, during PhD program at Indian Institute of Science, Bangalore, India (2009-2015). Also he is a IEEE member (Annual) and ISOI Life Member.

Mathematical Modeling of Mechanics of Fibrous Scaffolds for Tissue Engineering Applications

Dr. Suhail Rizvi Mohd,
Assistant Professor,
Department of Biomedical Engineering,
Indian Institute of Technology Hyderabad, Telangana, India.

Abstract: Fibrous materials are extensively utilized as scaffolds in many tissue engineering applications. The mechanical properties of the scaffolds have been known to influence the cell behavior. Given the resource and time intensive nature of the experimental methods, mathematical modeling has become an immensely useful tool which has also been utilized to study the mechanical response of the fibrous scaffolds. In my talk I will present our work on the modeling of the mechanical response of the fibrous scaffolds under macroscopic uniaxial and shear loading, and microscopic cellular forces. In this work, we have utilized two approaches- discrete network modeling and peri dynamics to study the scaffold mechanics. I will show that network-like architecture of the scaffold gives it sample size dependent mechanical response, which stands in contrast to the conventional materials which do not demonstrate sample size dependence. The dynamics of cell adhesion on such scaffolds and its dependence on the fiber arrangement (random fiber architecture vs aligned fiber system) will also be presented. We hope that this modeling approach will provide a useful tool to the experimentalist for optimization of the fiber scaffold structure for different tissue engineering applications.

BIOSKETCH

Dr. Suhail Rizvi Mohd did his B.Tech and Ph.D. from IIT Kanpur in the Department of Biological Sciences and Bioengineering. After finishing B.Tech, he worked as a business analyst for Global Analytics (currently GAIN Credit Inc.) in Chennai where he specialized on the decision systems for the microlending platforms. In Ph.D., he studied the mechanical behavior of fibrous biomaterials using theoretical modeling and numerical simulations. Subsequently, he worked as a CNRS post-doctoral fellow at the Laboratory of Interdisciplinary Physics in Grenoble, France. He joined IIT Hyderabad earlier this year. His research interests lie at the interface of biology and physics, particularly mechanics, which include mechanics of biomaterials, role of mechanical forces in embryonic development and tissue engineering.

Computational Systems Biology of Cancer: How Can Mathematical Models Help Us Understand Cancer Better

Dr. Mohit Kumar Jolly,
Assistant. Professor,
Department of Biosystem Science and Engineering,
Indian Institute of Science Bangalore, Karnataka, India.

Abstract: Metastasis – the spread of cancer cells from one organ to another – remains an unsolved clinical challenge and causes above 90% of all cancer-related deaths. It is a highly dynamic process with extremely high attrition rates. Despite extensive ongoing efforts in cancer genomics, no unique genetic or mutational signature has emerged for metastasis. However, a hallmark that has been observed in metastasis is adaptability or phenotypic plasticity – the ability of a cell to reversibly switch among different states (phenotypes) in response to various internal or external stimuli. How do cells switch their states reversibly? This talk will describe how mechanism-based mathematical models have helped identify the origins of such cellular transitions in cancer – the underlying multi stability in biological networks driving cancer metastasis. Our results also suggest how perturbing these networks in specific ways can restrict multi stability and consequently reduce adaptability in cancer cells, providing a rational network-based approach for identifying therapeutic targets to potentially curb the metastatic load.

BIOSKETCH

Dr. Mohit Kumar Jolly leads the Cancer Systems Biology group at the Centre for BioSystems Science and Engineering, Indian Institute of Science. He has made seminal contributions to decoding the emergent dynamics of epithelial-mesenchymal plasticity (EMP) in cancer metastasis, through mathematical modeling of regulatory networks implicated in EMP; his work has featured on the cover of Journal of Clinical Medicine, Cancer Research, and Molecular and Cellular Biology, and he won the 2016 iBiology Young Scientist Seminar Series – a coveted award for communicating one's research to a diverse audience. He is an elected fellow of the Indian National Young Academy of Sciences (INYAS), serves as Secretary of The Epithelial-Mesenchymal Transition International Association (TEMTIA), and co-chair of Mathematical Oncology subgroup at Society for Mathematical Biology (SMB).

Human Tissues and Organoids in A Dish: Potentials and Challenges in Recapitulating The *In Vivo* Environment *Ex Vivo*

Dr. Binulal N. Sathy,
Assistant Professor,
Amrita Centre for Nano sciences and Molecular Medicine,
Amrita Vishwa Vidyapeetham, AIIMS, Kochi, Kerala, India.

Abstract: Engineering healthy or pathological tissues that can recapitulate the *in vivo* conditions *ex vivo* in a reliable fashion have remarkable applications in biology and medicine. Self-assembly of stem/progenitor cells without an artificial matrix, seeding/encapsulating them in suitable biomaterial matrices (scaffolds or hydrogels), and culturing them in the static or dynamic condition are the widely used strategies for developing tissues and organoids *ex vivo*. Although these methodologies have been established as standard approaches for engineering tissues and organoids *ex vivo*, attaining *in vivo*-like functionality in the engineered tissues remains challenging. Facilitating appropriate environmental conditions, including the mechanical environment, oxygen tension, and arranging the cells in a spatially defined manner in the engineered construct using 3D bioprinting, etc., are the recent approaches we use in our lab to overcome this challenge. We have been working on creating functional models of tissues/organoids such as bone, bone marrow, cartilage, and ligament. Besides, developing tumor organoids that can mimic the *in vivo*-like solid tumor is also underway. Among the various approaches we investigate for developing *ex vivo* tissues and organoids, specific focus has been given to examining the significance of the scaffolding matrices' structural dimensions and developing new *in situ* gelating extracellular matrix mimicking hydrogels. Engineering the developmental precursors and growing them through the developmental pathway is another major approach used in our lab to recreate tissues and organs in the dish.

BIOSKETCH

Dr. Binulal Nelson Sathy serves as an Assistant Professor at the Amrita Center for Nanosciences and Molecular Medicine, Amrita Vishwa Vidyapeetham, Kochi Campus. He is a recipient of the prestigious Ramalingaswami Fellowship administered by the Department of Biotechnology, Govt. of India. He started his research career as a Research Assistant at the Institute of Biomedical Sciences, Academia Sinica, Taiwan, in the area of Medical Biotechnology. He obtained his Ph.D. in Bioengineering from Amrita Vishwa Vidyapeetham and was a visiting scholar at Mikos Lab at Rice University, USA. He did his post-doctoral training from Kelly's lab at the Centre for

Bioengineering, Trinity College-Dublin. After his stint as a post-doc, he joined as a faculty member at the Amrita Center for Nanosciences and Molecular Medicine in 2017. His research interest is in the area of regenerative medicine, with specific emphasis on investigating the immunomodulatory and regenerative properties of adult stem cells, biomaterials, and their bioengineered constructs. Developing bioengineered niches for achieving self-renewal of hematopoietic stem cells *ex vivo* is another major focus of his research. He has over 30 peer-reviewed research publications and two book chapters to his credit.

Bioengineered Cell Instructive Collagen Hydrogel Patch for Intervertebral Disc Repair and Regeneration

Dr. Akshay Srivastava,
Associate Professor,
Department of Pharmaceuticals, Ministry of Chemicals and Fertilizer,
National Institute of Pharmaceutical Education and Research-Ahmedabad, Gujarat, India.

Abstract: India Pathophysiology of intervertebral disc (IVD) degeneration, a major cause of low back pain (LBP) is still uncertain, majorly due to limitations in the in-vitro and in-vivo disease models. The IVD microenvironment comprises of central nucleus pulposus (NP), peripheral concentric annulus fibrosus (AF) and cartilaginous endplate (EP) regions which works coherently to maintain the functional integrity of the spine. Inflammatory response along with cellular senescence, reduced synthesis of extracellular matrix (ECM) leads to onset of the disease-causing fissure or tear in the AF region and extrusion of nucleus pulposus. Furthermore, the AF cell niche possess very less reparative capacity for tissue regeneration. Thus, we developed a Hyaluronic acid (HA) functionalized iso-electrically focused align collagen type-I patch which showed high asymmetry and narrow peaks in FFT analysis, validating degree of alignment of collagen fibers. The functional characteristics were confirmed by ATR/FTIR analysis. These patches were further assessed for viability and cellular orientation study using mice annulus fibrosus (AF) cells where GAG modified col-I patch showed high proliferation, allowing cells to proliferate in an aligned manner confirmed by confocal microcopy. Also, these patches were assessed for mechanical properties which showed that GAG modification decreases the tensile strength as well as moduli of iso-electrically focused Col-I patch but show enhance extracellular matrix production which provide improved structural similarity to IVD microenvironment and help in regeneration of herniated AF region.

BIOSKETCH

Dr. Akshay Srivastava is an associate professor in National Institute of Pharmaceutical education and Research-Ahmedabad, Gandhinagar, Gujarat. He is expertise in the field of biomaterials and tissue engineering with 15 years research experience. He worked as a Postdoctoral Research Fellow, Centre for Research in Medical Devices, National University of Ireland Galway, Ireland. His research interest in the translational biomedical research involving fabrication of biomaterial based medical devices, finding novel therapeutic strategies for tissue regeneration and developing in vitro platforms to understand disease pathology. His research group is focused on developing new

methods for the identification and isolation of therapeutic cell types for tissue repair, fabrication of cell and drug delivery platform and designing artificial cellular niches for stem cell homing.

Ionic Polymer Metal Composites as Actuators and Sensors for Bio-Medical Applications

Dr. Sakthi Swarrup J,
Assistant Professor,
Centre for Nanotechnology Research (CNR),
VIT, Vellore, Tamil Nadu, India.

Abstract: Ionic Polymer Metal Composites (IPMC) is a type of Electroactive polymer and a popular choice for biomimetic design and actuators and sensors. IPMC is advantageous compared to conventional materials due to its flexibility, light weight, ease of fabrication, low input voltage and large deformation, fast response operation in both air and water. Its biocompatibility, soft and hydrophilic nature makes it a suitable candidate for bio-medical applications. However, using IPMC for real time applications has certain disadvantages like dehydration of the polymer region in IPMC, time varying behavior and electrolysis after 1.23 V. Therefore, the sensing and actuation performance of IPMC is highly dependent on the ionic polymer layer properties (type of polymer, counter ion, conductivity and the degree of hydration) and the electrode layer properties (type, area and thickness. In this work, mathematical modelling to understand the behavior of IPMCs with a deep insight into the material properties, dimensions, type of materials, optimized fabrication parameters and at various temperature and humidity condition is analyzed. Experimental analysis on IPMCs with the aim of developing high performing IPMCs as actuators and sensors for biomedical applications is been carried out.

BIOSKETCH

Dr. Sakthi Swarrup J is currently working as senior assistant professor at the Centre for Nanotechnology Research (CNR) in Vellore Institute of Technology, Vellore. Before joining VIT, she was working as a postdoctoral researcher in the Department of Aerospace Engineering, Indian Institute of Science, Bengaluru in energy harvesting and sensing capabilities of the smart materials for novel applications. She obtained her PhD degree in Aerospace engineering department and Chemical Engineering department, Indian Institute of Science Bengaluru. She received her MTech degree in Nanotechnology and B.Tech degree in Electrical and Electronics Engineering from Vellore Institute of Technology, India. Her Ph.D. work is on the Ionic Polymer Metal Composite (IPMC) actuators for insect scale flapping wing Micro air Vehicle. Her current research interest are in smart materials and structure, biomimetic system design, micro and nano sensors, MEMS devices-modelling and fabrication, energy harvesting, unmanned aerial vehicles. Her academic

interests are Nanotechnology, MEMS, micro device fabrication technology, smart materials and structures, introduction to aerospace engineering, biomimetic design.

A Combined Atomistic and Coarse-Grained Simulation Study of Peptide Based Nanostructures: From Atomistic Details to A Mechanistic Interpretation

Dr. Alok Jain,
Assistant Professor,
Department of Bioengineering,
Birla Institute of Technology MESRA, Jharkhand, India.

Abstract: Development of new well ordered, functional biomaterials based on the underlying principal of self-assembly has immense application in nanotechnology, nanomedicine and tissue engineering. Peptide based nano-materials are not only biocompatible but also their properties can be altered easily by slight changes in environmental conditions and/or sidechains of amino-acids. Herein, we report a multiscale simulation study of penta-peptides that exhibit very different morphologies upon altering a single amino acid. Atomistic simulations identified governing factors that lead to specific peptide morphology such as peptide flexibility vs rigidity, role of dimerization and the partitioning of hydrophobic side chains. The study was extended with coarse grained simulations. That allowed general conclusions about the mechanistic origin of the different morphologies. Our systematic study with different backbone beads and supportive psedo-dihedral angles illustrate the importance of very careful and delicate selection of coarse grained parameters to reproduce the chemical and structural properties of the system

BIOSKETCH

Dr. Alok Jain is an assistant professor with Ramalingaswami Fellow in department of bioengineering, Birla Institute of Technology, Mesra. He completed Ph.D. in IIT Kanpur in the field of Computational Biology. He had done two postdoctoral researches from the University of Konstanz, Germany and from Max Planck Institute for Polymer Research, Mainz, Germany. Also he worked in Indian Institute of Technology Kanpur, Kanpur as a Project Scientist. He is expertise in the field of Structural Bioinformatics, Computational Biophysics, Computer-Aided Drug Design, and Biomaterials Design. He received prestigious award as Ramalingaswami Fellowship, Biophysical Society-USA Travel Award and from DST, CSIR, INSA funding agencies. He published more than 30 research articles from the reputed journals and book chapters from the Royal Society of Chemistry. He had several conferences proceeding from national and international journals.

Plant-Derived Nanomaterials for Sustainable Urbanization

Dr. Shamik Chowdhury,
Assistant Professor,
Department of Environmental Science and Engineering,
Indian Institute of Technology Kharagpur, West Bengal, India.

Abstract: With the current exorbitant rate of consumption of fossil fuels, and the subsequent and anticipated increase in their demand in the foreseeable future, the development of inexpensive and highly efficient CO2 capture and conversion technologies is critically important from the perspective of climate change mitigation. Attributing to its enormous specific surface area, intrinsic hydrophobicity, outstanding electrochemical stability and superior mechanical properties, two-dimensional (2D) graphene holds significant promise for such advanced clean energy related applications. However, the graphene that is synthesized to address these tasks is typically derived from non-renewable resources and involves complex synthetic approaches that are often difficult to scale. Therefore, to increase the efficiency of the existing sectors and to elaborate sustainable energy provision in the foreseeable future, graphene must be manufactured via industrially appealing, cost effective processes based on renewable and sufficiently abundant resources. This presentation will target this aspect amongst others, with an objective to provide a systematic overview of my latest research efforts towards developing graphene nanosheets from waste biomass, and exploring these materials to tackle the pressing global sustainability challenge of 'carbon-free energy'.

BIOSKETCH

Shamik Chowdhury is an Assistant Professor in the School of Environmental Science and Engineering at the Indian Institute of Technology Kharagpur, India. He obtained his B.Tech. from the West Bengal University of Technology (Kolkata, India) and M.Tech.(Gold Medalist) from the National Institute of Technology (Durgapur, India), both in Biotechnology. He then earned his Ph.D. (2017) in Environmental Engineering from the National University of Singapore (NUS), Singapore. His current research activities focus on the design and development of advanced functional materials, with an emphasis on two-dimensional (2D) materials, for sustainable energy applications and environmental remediation. Dr. Chowdhury takes keen interest in dissemination of his research findings, and has authored/co-authored more than 60 scholarly publications (including research articles, review papers, and book chapters) with over 5000 citations. In addition, he has presented over 50 oral communications at national and international

conferences/symposia. His research endeavors also include serving as an ad-hoc referee for over 60 high-impact journals. In recognition of the quality, impact and practical relevance of his research, Dr. Chowdhury has been honored through several intra- and extra-mural awards, notably the ‘Green Talents Award’ by the Federal Ministry of Education and Research Germany, in 2016.

Neural Bio-Prosthesis in Neurosurgery

Dr. R N Sahu, MBBS, MS, M.Ch, DNB (Neurosurgery),
Professor & Head,
Department of Neurosurgery,
AIIMS Bhubaneswar, Odisha, India.

Abstract: Many people are disabled because of neuro-paralysis due to brain stroke, spinal cord injury diseases of brain etc. Some of these people can still be able to see the object they want to hold (for example a glass of water) and can still process the information commands inside their brain, the action cannot be executed because of neurological deficits in limbs. Similarly, in case of specialized function such as micturition the same set of commands doesn't reach the target organ (urinary bladder) to empty in case of spinal cord lesion & paraparesis. If we assume that in most cases the brain of these persons is intact, the possibility of reading brain signals would allow the development of neuro-prosthetic devices, such as a robotic arm or a bladder prosthesis for execution. In the last decade, following the success of cochlear and brainstem implant devices for people who have lost hearing deficits; neuroscientists see a limitless horizon for related devices that are able to read & post process the electrical and chemical signals from the nervous system to stimulate capability and restore quality of life in persons suffering from these disorders. Some of the studies have shown that the posterior parietal cortex (PPC) in brain is a key area in sensory integration process, involved in different types of movement plans & execution. In fact, the PPC lies between the primary visual areas in the occipital lobe and the motor cortex, thus having a privileged location for visuo-motor transformations. The author will discuss some of the existing neural prostheses & implants and highlight some recent scientific developments in details.

BIOSKETCH

Dr R N Sahu,: Dr Rabi Sahu is a graduate from VSS Medical College, Sambalpur University. He completed his masters in Neurosurgery from the prestigious Sanjay Gandhi Institute of PGI in Lucknow, India. He did his fellowship training in Pediatric Neurosurgery from Asan Medical Centre Seoul, South Korea and served as academic faculty as Additional professor of Neurosurgery in SGPGI Lucknow before joining AIIMS Bhubaneswar in 2016. He has more than 100 publications to his credit in different peer reviewed journals and text books. His main areas of interest are pediatric Neurosurgery, Epilepsy surgery & spinal cord diseases. He is presently serving as Professor & Head of Neurosurgery at AIIMS Bhubaneswar, Odisha.

Proangiogenic Nano-Biomaterials for Bone Tissue Engineering

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Assistant Professor,
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Indian Institute of Technology Jodhpur, India.

Abstract: Effective replacement / restoration of traumatized, damaged or lost bone is a major clinical and socio-economic challenge. In recent years, emergence of the bone tissue engineering (BTE) as a therapeutic alternative of conventional clinical modalities especially as a replacement of auto- and allografting has brought new hope in clinical orthopedics. The success of the BTE depends on the integration of the biologically active osteogenic scaffolds (with / without bone cells) to the native osteo-chondral system after implantation at the injury or defect site. It has now been confirmed that such integration process seemingly relies on angiogenesis, which leads to the generation of vascular network in the neo-bone tissue. Angiogenesis is essential for the delivery of nutrients and gases to the cells present at the distal location of an implant, which can hardly be reached through interstitial fluid diffusion. Plenty of clinical evidence showed that impaired vascularization results in atrophic non-union of the bone. Keeping this perspective in mind, people have adopted diverse strategies to improve the extent and the quality of angiogenesis in BTE. However, those strategies have failed to be a commercial success because of number of factors including cost, technical difficulties, genotypic variation of cells and potential health risks. To overcome the stalemate, research focus has now been shifted towards the angiogenic biomaterials, materials that can stimulate the cells for biased production of angiogenic factors, both *in vitro* and *in vivo*. Different research groups have now working on the development of angiogenic biomaterials. We are one of the leading research groups, involved in developing low cost proangiogenic nano-hydroxyapatite (nHAp). Hydroxyapatite is the most common bio ceramic used in bone tissue engineering because of its chemical resemblance with bone apatite. We have adopted a novel strategy that leads to the angiogenesis through the activation of tissue hypoxia mimicking HIF-1α pathway. Following that strategy we have developed several types of proangiogenic hydroxyapatite either by doping 'group - d' bivalent ions like Co^{+2}, Ni^{+2} in nHAp crystal or by conjugating the hydroxyapatite with natural biopolymers like gum tragacanth. All the chemically modified nHAp are subjected for extensive physico-chemical characterization that includes XRD, FT-IR, SEM, TEM, BET, DLS and Zeta potential analysis. We confirm the osteo-conductive property of the modified nHAp by checking the response of the osteoblast cells (MG-63) in vitro. For this purpose, detailed studies pertaining to the cell viability and proliferation (MTT

and flow cytometry based live -dead assay, cell cycle analysis), and cell differentiation (done by RT-PCR and Western blot) was done. We also test the osteogenic properties in vitro using human mesenchymal stem cell. The angiogenic property especially the expression of cellular VEGF and its related mechanistic pathways is proved in both MG-63 cell line and in human mesenchymal stem cells. We finally confirm the formation of endothelial linkage in vitro through tube formation assay. We believe that these set of experimental evidences will help the researcher in designing and developing proangiogenic biomaterials in coming future.

BIOSKETCH

Dr. Indranil Banerjee, Associate Professor, Department of Bioscience and Bio engineering, Indian Institute of Technology Jodhpur to present on Proangiogenic Nano-Biomaterials for Bone Tissue Engineering. I'm proud to introduce sir as the former professor of Biotechnology and Medical Engineering Department, NIT Rourkela. He is expertise in the field of microfluidics, Tissue engineering, Regenerative medicine, Biomaterials, and Theranostic systems. He completed Ph.D from Indian Institute of Technology, Kharagpur. Recently, he is an associate editor for the journal frontiers in medical technology. He has overall 1633 Google citations and 456 citations in the current year. He was awarded the 2018, JNCASR visiting scientist fellowship 2013, and also has been a guest scientist in Max Planck institute of an intelligent system, Stuttgart, Germany.

Understanding Gastrointestinal Biomechanics: Role of Medical Image Processing

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Abstract: How our body processes the food we eat so that it can be assimilated in the body? We read about it from our school days. But how much we know about the role of mechanics in the functioning of gastrointestinal tract? Not fully understood, as it is challenging to examine the intertwining relation of structures and functions of different parts of gastrointestinal tract in health and different disease conditions. Medical imaging and subsequent processing of these images is a non-invasive way to assess the structure and function that allows to partly capture the events without intervening them. To understand the events as slow as the gastric ones, a large number of medical images needs to be processed to carve out the three-dimensional structures of interest. Further post-processing is needed to extract meaningful information that sheds light on the structure-function relationship of the organs of gastrointestinal tract.

This talk will cover advanced medical image processing technique that helps processing large number of medical images in an efficient manner to extract three-dimensional structures. It will also elaborate on post-processing technique to extract geometrical information that gives insight into the accommodation of food in the stomach and its controlled emptying, and approach to assess structure-function relation of upper gastrointestinal geometry to understand disease etiology.

BIOSKETCH

Dr. Sreerup Banerjee is currently serving as Associate Professor in the department of Mechanical Engineering, Haldia Institute of Technology, Haldia, West Bengal. He has 6+ years of experience in academics and research experience in the field of biomedical engineering. His area of research interest is biomechanics and medical image processing. He has done bachelor's degree in Mechanical Engineering in 2004 and master's degree in Biomedical Engineering in 2006. He has obtained his PhD from Department of Biological Sciences and Bioengineering, IIT Kanpur in 2014. He has served in the department of Bioengineering in NIT Agartala and VIT Bhopal University respectively in various capacities before joining HIT Haldia.

ORAL PRESENTATIONS

Controlling Breast Cancer Cell Line Proliferation in Humans by Morin, 9,10 Anthraquinone

Satyanarayana Murthy Malladi, Nagendra Sastry Yarl, Devendra Kumar Pandey,
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Abstract: Morin induces death to breast cancer cells in humans (MDA-MB-231). We can extract a Bioflavonoid having yellow color known as Morin. in vitro and in vivo studies have shown that Morin acts as an anti-inflammatory agent, and having anti-proliferative activity. Anthraquinones have a unique anti-cancer function. After their discovery, a variety of structural changes have been made by medicinal chemists, resulting in the design and synthesis of a significant number of novel anthraquinone compounds with various biological compounds. activities. In 9,10 anthraquinone compounds have been considered to have anti-cancer activity. The peak quantity of Morin and 9,10 anthraquinone compounds can be obtained from Triphala (the three fruits) Bibhitaki (Terminalia bellirica), Amalaki (Phyllanthus emblica), and Haritaki (Terminalia chebula) because of their easy availability, side effects are not seen and having apparent functional properties. Morin, 9,10-anthraquinone both induce apoptosis, can be identified by MTT assay, Annexin V, cell cycle analysis by flow cytometer, mitochondrial membrane potential assay, multi caspase activation assay. Cytochrome-C release, modulation of Bax and Bcl2 ratio by Western blot analysis were also done. Result: Based on the cell dose of Morin, 9, 10 anthraquinone in the MDA-MB 231 cells, decreases cytochrome c release from the mitochondrial membrane potential of the cells, cleavage of PARP and caspase activity. Conclusion: With the present data, we can easily say that Morin, 9, 10 anthraquinone both have therapeutic significance in treating cancer cells and efficiently effects metastatic breast cancer cells in humans.

Trial and Error and Statistical Design Based Parametric Optimality of Tray Dried Musa Splendida

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Indian Institute of Technology, Guwahati, India.

Abstract: This study presents experimental findings associated to the optimality of process variables for periodic airflow assisted tray dried cooking banana (Musa splendida). The optimality study was targeted through trial and error and statistical design approaches to evaluate the associated response variables such as moisture content, vitamin C and antioxidant activity. Subsequently, for optimal drying conditions, proximate parameters have been evaluated. Trial and error based approach involved drying kinetics, fitness of drying models, determination of moisture diffusivity and activation energy. Further, drying time dependent variation of vitamin C and antioxidant have been investigated for various drying temperatures. On the other hand, statistical design based approach was associated with model fitting, analysis of variance and finally numerical optimization of process variables. Based on such investigations, moisture diffusivity was found to be 1.56 – 7.59×10-11 m2/s with activation energy of 34.10 kJ/mol. Among both approaches, statistical design based approach provided superior process parameters for the sample. The optimal drying temperature and time were 58.66 ºC and 400.31 min. Corresponding values for response variables were 5.09% moisture, 90.73 mg/100g vitamin C and 72.34% antioxidant activity. With high vitamin C and antioxidant activity, Musa splendida can be utilized to develop value added food products such soup. Further, it sets a useful guideline to promote food processing industries in North-East India.

Exploring the Potential of Apigenin as a Dual PI3K/Mtor Inhibitor to Target PIK3CA Mutant Colorectal Cancer: An In-Silico Analysis

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Abstract: Exploring the potential of Apigenin as a dual PI3K/mTOR inhibitor to target PIK3CA mutant colorectal cancer: an in-silico analysis. Mutation in PIK3CA (Phosphatidylinositol-4,5-Bisphosphate 3-Kinase Catalytic Subunit Alpha) is found in around 15 to 20% of colorectal cancers (CRC) which lead to activation of the PI3K/AKT signaling pathway. The downstream effector, mammalian target of rapamycin (mTOR) is a crucial regulator of growth and survival in CRC establishment and progression. Therefore, exploration of phytochemicals as a dual inhibitor of PI3K/mTOR devoid of unwanted side effects are need of the hour. Thus, we studied the inhibitory potential of apigenin by in silico studies through examining the interaction of apigenin with the catalytic subunit of PI3K alpha isoform, p110α (5DXT) and mTOR (4JT5) using molecular docking employing AutoDock 4.2. Interactions of apigenin with p110α and mTOR were compared to the known inhibitors of p110α and mTOR; LY294002 (3973) and pp242 (135565635) respectively. The calculated free energy of binding showed that apigenin binds p110α with a higher affinity (-9 Kcal/mol) than the inhibitor (-8.7 Kcal/mol). Apigenin formed three hydrogen bonds (Val851, Asp933), one carbon-hydrogen bond (Ser774), and nine non-covalent interactions with the kinase domain of p110α. The binding energy of the apigenin-mTOR complex was -8.4 kcal/mol with one H-bond (Val2240), two Pi-donor H-bonds (Asp2357, Trp2239), and hydrophobic interactions. Moreover, molecular dynamic simulation revealed that apigenin is able to form stable complexes with the target proteins. The drug-likeness analysis further revealed that apigenin obeyed Lipinski's 'Rule of 5', toxicity profile governed that it is nonmutagenic. Thus, apigenin may be considered as a lead compound in search of a cheap, nontoxic dual PI3K/mTOR inhibitor, however, it may require experimental validation.

Peptide/Protein Engineering for Therapeutic Intervention Against Cancer

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Abstract: Peptides and proteins have emerged as an unique class of therapeutic agents with potential for treatment of various diseases including cancers. Main advantages of these therapeutics are high specificity, low toxicity, and excellent safety, tolerability, and efficacy profiles in humans. A novel approach has been developed to generate de novo peptide or protein libraries (dicodon libraries) using a directed-evolution technique called 'codon shuffling'. Therapeutic application of these libraries has been shown in infectious diseases. This study intended to implicate these codon shuffled libraries for development of novel therapeutics as peptide or protein inhibitors in cancers. Methods: Dicodon libraries constructed as described previously (Chopra & Ranganathan, 2003; Rao, Chopra, Ram, Gupta, & Ranganathan, 2005). Here, selected target protein, Ethylmalonic Encephalopathy 1 protein (ETHE1), over-expressed and involved in various types of cancer development. The ETHE1 and dicodon libraries were cloned in respective vectors and bacterial two-hybrid studies performed for identification of peptide or protein binders. Results: After screening a consistent interaction was discovered. PCR analysis and sequencing results identified 80 amino acid long protein binder of ETHE1. Interaction was found statistically significant ($p<0.05$) in liquid β-galactosidase assay. Selected protein binder is completely de novo in nature and found to have no sequence homology with known proteins. Conclusion: The discovered de novo 80 amino acid long protein binder is a member of synthesized dicodon library and showed strong interaction with ETHE1 with no sequence homology with known proteins that suggested its potential as therapeutic agent for treatment of cancer.

Investigation of Er^{3+}, Yb^{3+} Doped Gd_2O_3 Upconversion Nanoparticles as a Contrast Agent for Optical Coherence Tomography.

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Abstract: Optical coherence tomography (OCT) is non-invasive, contactless, cross-sectional imaging technique used in imaging of various biological tissues. The most commonly used commercial version of OCT is used in ophthalmology. Whereas various research group found utility of OCT in other research areas such as, tumor tissue imaging, dermatology, odontology etc. In the field of tumor imaging, targeted imaging plays a vital role. A biocompatible fluorescent material known as up conversion nanoparticles (UCNPs) having ability of anti-stoke emission used as a targeted molecular probe for the detection of tumor tissue by adding additional contrast during optical coherence tomography imaging. Rather than other fluorescent materials, UCNPs excited two or more low energy photons of higher wavelength (near infrared light) and emits high energy photons of lower wavelength (visible light). The phenomenon is known as up conversion emission. In this study, we showcase the fabrication of Gd_2O_3 host matrix doped with Er^{3+}/Yb^{3+} rare earth elements and also investigate the synthesized UCNPs as a potential candidate for targeted molecular imaging probe for OCT by characterizing on different parameters. Finally, we show ex-vivo OCT imaging of tissue phantom with implanted UCNPs to investigate the potential application as targeted molecular probe.

Green Synthesis of A-Fe_2O_3 Nanoparticles from *Hibiscus Rosa-Sinensis* and Evaluation of Their Anticancer and Dye Degrading Activities

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Abstract: The objective of the present study was to synthesize and characterize Iron oxide nanoparticles (IONPs) using the aqueous extract of Hibiscus rosa-sinensis leaf. IONPs synthesis was performed by calcination. X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), Scanning Electron Microscopy (SEM) and particle size analysis were used to characterize the IONPs. XRD and FTIR data confirmed that the IONPs were hematite α-Fe2O3 nanoparticles and crystalline in nature. SEM and particle size analysis showed that the IONPs were spherical in shape, having the size range from 15 to 25 nm. The in vitro anticancer property of the IONPs was determined by MTT, LDH and oxidative stress marker assays using human cancer cells. The results suggested the inhibition of cancer cell growth in a dose-dependent manner via oxidative stress-induced apoptosis. In addition, dye degrading capability of IONPs was demonstrated in Orange G dye. Our results demonstrate that Hibiscus rosa-sinensis leaf extract could be a potential candidate for the green synthesis of IONPs.

Nano Al_2O_3 Incorporated Chitosan Scaffold for Hard Tissue Engineering Applications

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Abstract: The thought of composites synthesis of using polymer and ceramic nanoparticles can consider as a solution for tissue engineering. In this paper, we are addressing the development of biodegradable and biocompatible composites with enhanced mechanical properties. The aluminum oxide (Al_2O_3) nanoparticles were incorporated chitosan based scaffold was fabricated by using freeze-drying method. The biocompatibility and the cationic nature of chitosan make it effective as bone grafting material. XRD, SEM, TEM, and Fluorescence Microscope studied various properties of composites, such as microstructure, particle size, surface topography etc. The scaffold has given improved density, porosity, mechanical properties, and biodegradability. These composites can prompt to the advancement of artificial creation of hard tissue alternates.

Wheelchair Control Using Brain Computer Interface

Veeramma Yatnalli, B G Shivaleelavthi, Saroja S Bhusare,
JSS Academy of Technical Education, Karnataka, India.

Abstract: The objective of this paper is to aid the patients to achieve a command based movement of wheelchair using Electroencephalogram (EEG) signals. A wheelchair is developed with a BCI system to help the below neck paralyzed patients. In such patients, brain fails to interact with the external environment. A Brain Controlled Wheelchair provides mobility to locked-in patients with the help of BCI in a safe and efficient way. In this proposed work, EEG signals are detected from the brain through the connected headset. The patient makes the decision for movement and blinks his/her eyes accordingly. Once the decision is made for the movement, the eye blinks are detected and a signal corresponding to that particular direction is sent to the controller via bluetooth. The received signals are analyzed and move the wheelchair accordingly. Wheelchair prototype is constructed using DC motors fitted onto a platform using L brackets, screws and nuts. The microcontroller, bluetooth module and ultrasonic sensors are mounted on this platform. In this prototype, patient's eyeblinks are translated into control commands to guide the wheelchair's movements.

Lung Cancer and Its Association with Chronic Obstructive Pulmonary Disease (COPD): Role of Inflammatory Genes.

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Abstract: The incidence of lung cancer and chronic obstructive pulmonary disease is one of the major medical challenges and the current research aims to understand the pathogenesis and therapeutic approaches of these disorders. 50–70% of patients diagnosed with lung cancer suffer from COPD. COPD is shown to increase the susceptibility for lung tumorigenesis up to 4 to 5 fold. Cigarette smoke-mediated oxidative stress, cellular aging, senescence, Genetic predisposition, and altered epigenetic regulation of gene expression are some of the shared mechanisms which are driving both diseases. Chronic inflammation is the key feature of COPD and could be a potential driver of lung cancer development. Studies have shown that there is a strong relationship between lung cancer risk factors and alteration in inflammatory cytokine levels. To elucidate the role of inflammatory genes that links COPD and lung cancer, RT2 Profiler PCR Arrays were conducted in the CD4+ T helper cells isolated from the peripheral blood mononuclear cells (PBMCs) of COPD patients, lung cancer patients and normal subjects. RT2 Profiler PCR Arrays showed that a set of genes (e,g., BMP2, CCL2, CCR4, CSF2, CX3CR1, IL17A, IL5, VEGFA, etc.) are over-expressed in both COPD and lung cancer patients in comparison to normal subjects. Interestingly we also observed another set of genes (e.g., AIMP1, CD40LG, IFNG, LTA, LTB, TNF, etc.) are under-expressed in both COPD and lung cancer patients in comparison to normal subjects. Thus targeting the potential inflammatory genes will help us to develop efficient therapeutic strategies against both diseases.

Chemical Hydrolysis of Potato Peel Waste for Sugars and Value-Added Metabolites Production

Sonika Kag, Neha Kukreti, Rashmi Kataria,
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Abstract: Potatoes are the most important carbohydrate rich crop and extensively used in food industries. Every year, approximately 20-30% of potato waste is generated and traditionally this potato peel waste is used for producing low value animal feed, fertilizer or being raw material of biogas. This potato waste mainly composed of residual starch with peels. Hence, this waste can be converted to high value chemicals. Monomer sugars especially glucose is an important component for microbial fermentation for production of valuable products and this waste stream can be utilized as renewable source of sugar. In present study potato peel waste, obtained from Delhi Technology university canteen waste was used for extraction of glucose. The composition analysis of potato waste was also done. An optimization study for chemical hydrolysis was performed at different hydrochloric acid concentration (0.25, 0.5, 1 and 1.25%) and temperatures (50, 100 and 121^{o}C). The resulted hydrolysate was analyzed for reducing sugars. The maximum sugars obtained will be further used for microbial fermentation for metabolites production. Chemical composition of potato peel waste is composed of sugars, total solids, proteins, ash, moisture and lipid content. Hence, potato peel waste can serve as a cheap and easily available substrate to produce some valuable products like bio ethanol, biobutanol, enzymes etc.

In Silico Identification of Micrornas and Their Target Genes in Wheat *(Triticum Aestivum L.)* Responsive to Leaf Rust Infection

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Abstract: Puccinia triticina Eriks. (basidiomycetes fungus) forms infectious urediniospores that cause leaf rust disease in wheat *(Triticum aestivum L.).* Wheat is among the primary hosts of Puccinia (telial/uredinial) which encounters an annual yield loss of up to 15%. MicroRNAs are small non-coding RNAs that play significant role in defense against pathogens and other aspects of gene regulation. Not much information on wheat microRNAs is available in the miRBase database, limiting the understanding of their role in defense response against biotic stresses. In this study, small RNA library sequences of susceptible and resistant wheat near-isogenic lines under mock and pathogen infected condition were sorted out to obtain microRNAs with probable role during infection. We identified 135 conserved and 64 novel microRNAs from the next-generation sequence data. Degradome analysis revealed 36 microRNA target genes under different categories of signals of cleavage. Gene ontology analysis showed 15 target genes to be functionally categorized under biological process, molecular function, and cellular component, which could throw some light in defense mechanism of wheat. Furthermore, two of the target genes were involved in various metabolic pathways as analyzed through the KEGG database. This study provides insight into wheat microRNAs with probable roles in leaf rust pathogenesis and their target genes in wheat which may establish our understanding on the disease infestation and would be of great significance for discovering remedial approaches.

A Thermochemical Pre-Treatment Study of Stubble Waste for Value-Added Product

Neha Kukreti, Sonika Kag, Rashmi Kataria,
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Abstract: The burning of stubble is associated with major risks related to human health and the environment. The paddy straw, corn straw, wheat straw etc are the lignocellulosic biomasses which are known as stubble waste. It releases harmful gases in the atmosphere such as carbon-monoxide, sulphur-dioxide, methane, nitrogen oxides together with particulate matter and kills useful microorganisms in the soil as well as causes soil erosion. The two states - Punjab and Haryana produces 35 million tons of paddy straw every year. So, the proper utilization of stubble waste to make some value-added and environmentally friendly product is of utmost importance to transform these wastes to valuables. In present work to enhance the sugar yield from rice and corn straw, thermochemical pre-treatments were studied using chemicals (NaOH and H_2SO_4) at different concentrations (0.6%, 0.8%, 1.0% and 1.2%). The yield of fermentable sugars in lignocellulosic biomass is increased using thermo-chemical pre-treatment. The removal of lignin from lignocellulosic biomass after pre-treatment is the indication of availability of fermentable sugars. The composition analysis for both type of lignocellulosic waste was done for total carbohydrate, cellulose, hemicellulose, lignin, moisture, ash, nitrogen. Hence, Stubble waste can serve as an economical and easily available substrate for its conversion into value added chemicals including bio-ethanol, bio-butanol, various enzymes etc.

In-Vivo Investigation of Superparamagnetic Iron Oxide Nanoparticles (SPIONs) as a Theranostics Agent for Magnetomotive Optical Coherence Tomography (MMOCT)

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Abstract: In recent years, nanoparticles are widely used in biomedicine due to their unique properties. We showcase the engineered polyethylene glycol coated (PEG) functionalized superparamagnetic iron oxide nanoparticles (SPIONs) as theranostics for magnetomotive optical coherence tomography (MMOCT). It is a non-invasive, non-contact, bio-imaging technique based on Michelson interferometry. It performs high resolution and provides cross-sectional 2D and 3D tomographic imaging of the internal microstructures at the micron level. PEG functionalization of iron oxide nanoparticles increases its chemical stability, biocompatibility and biodegradability etc., and acts as a potential contrast agent because it provides high scattering media in tissue imaging. In the MMOCT system, SPIONs act as a targeted molecular imaging agent due to their paramagnetic property. A strong magnetic field provides magnetic motion to the SPIONs which causes the enhancement of localized temperature near SPIONs particles. The magnetic motion is detected by a digital-lock-in detection algorithm and the whole system act as a targeted diagnosis tool. Cancerous cells die at high temperatures (43-48℃) whereas healthy cells survive. In this study, we show the efficiency of engineered SPIONs as theranostics for MMOCT and enable a wide range of research and clinical applications.

In Silico Analysis of Papillary Thyroid Cancer Patient Samples for HIF1α Responsive Genes as a Prognostic Marker

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Cochin University of Science and Technology, Cochin, India.

Abstract: Hypoxia is a significant hallmark in cancers and is known to contribute towards the radioactive treatment resistance in tumors, especially across Thyroid cancers. But the molecular mechanisms behind this is still unclear. The master regulator of hypoxia, Hypoxia inducible transcription factor (HIF1α) is known to have an increased expression in Papillary Thyroid Carcinoma (PTC). Methods: In the present study we analyzed the data of Thyroid Cancer patient samples from TCGA (The Cancer Global Atlas) database. The Over Representation Enrichment Analysis was performed via Linked Omics. The top 25 genes that are positively correlated with HIF1α in Thyroid cancer and the major pathways that are differentially regulated with this association were determined by the KEGG pathway analysis. The Overall survival and Disease free survival analysis in Thyroid cancer patient sample data from TCGA were also compared. Results: HIF1α was seen to be positively correlated with many pathways including Thyroid hormone signaling pathway and major pathways in cancer. The altered expression of the selected genes that were positively correlated with HIF1a showed a reverse correlation with the Overall survival as well as Disease free survival in Papillary Thyroid cancer patients. ABI1 a major player in melanoma and breast cancer showed strong correlation with HIF1a expression indicating its possible role in PTC progression.

Preparation and Evaluation of OKM-G-PAM Graft Copolymer for the Biomedical Applications and as a Biodegradable Food Packaging Material

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Abstract: In this study, thermal and mechanical properties of okra fruit mucilage (OFM) were improved using graft copolymerization of acrylamide (AM). The graft copolymerization was achieved via microwave-assisted free radical formation using Ammonium per sulfate (APS) as initiator. The graft copolymer was precipitated and the homopolymers were removed with the excess of acetone. Graft copolymer was optimized through percentage grafting efficiency (% GE). The structure of graft copolymer was confirmed with the help of Fourier transform infrared spectroscopy (FTIR). The thermal properties of optimized grade of graft copolymer were investigated through Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA), Nature of the polymer was predicted by X-Ray Diffraction (XRD) and Scanning Electron Microscope (SEM) was used for determining the surface morphology of the graft copolymer. Biodegradability study, biocompatible study, toxicity studies, and hemocompatibility studies were also performed in order to prepare a supporting framework for delivering the drug onto the targeted site and for using that graft copolymer for tissue regeneration. From above studies it was concluded that the prepared graft copolymer can be used for delivering the drug in humans.

Nanoparticle-Based Intracellular Delivery of Microtubule Stabilizers Overcome Microtubule Disassembly in Corneal Endothelium under Hypothermia and Cytokine Stress

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Abstract: The standard care for treating corneal disorders is corneal transplantation. The barrier function of corneal endothelium (CE) maintains corneal transparency. During storage, donor CE is inevitably exposed to hypothermia and challenged by cytokines after transplantation. They both induce microtubule disassembly and subvert barrier function of CE. Therefore, the objective of this project is to develop a nanoparticle-based strategy for delivering microtubule stabilizing drugs (Paclitaxel and Epothilone-B) sustainably to donor CE during storage and after transplantation to enhance the success of corneal transplantation. In this direction, CE cells were isolated from fresh porcine cornea and grown using a defined medium until confluence and hexagonal mosaic was observed. Paclitaxel or Epothilone-B were mixed with biodegradable poly-L-lactic-co-glycolic acid polymer and nanoparticles (NPs) were prepared using nanoprecipitation technique. NPs were spherical and homogeneously sized with an average size of 95 ± 10 nm. Drug entrapment efficiency of NPs was about 91% and drug release sustained up to 4 weeks and followed zero order kinetics at 4 °C and first order kinetics at 37 °C. The surface charge of NPs was increased to +25 ± 4 mV by coating poly-L-lysine, which resulted in a better uptake of NPs by CE cells, confirmed by confocal fluorescence imaging. CE exposed to hypothermia and cytokine (TNF-alpha) stress demonstrated significant microtubule disassembly. On the other hand, sustained intracellular drug release resulted in the stabilization of microtubules in NP-internalized CE cells under stress. We are currently investigating the effects of stresses on tight junctional proteins or barrier integrity of CE.

Microtubule Disassembly in Corneal Endothelium Subjected to Oxidative Stress, a Hallmark of Fuch's Dystrophy

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Abstract: FECD is a slow progressing, genetic corneal dystrophy that usually affects both the eyes and leads to blindness. It is characterized by the change in cell morphology caused by accelerated loss of endothelial cells, thickening of Descemet's membrane and corneal edema. The corneal transparency is maintained by barrier function of corneal endothelium (CE). In FECD, the barrier function is opposed by an oxidant-antioxidant imbalance known as oxidative stress, one of the hallmarks of this disease. Oxidative stress induces microtubule disassembly causing disruption of cellular cytoskeleton that maintains the barrier integrity of CE. Thus, we hypothesize that identification of oxidative stress related signaling pathways and a clear understanding of the same on cytoskeletal breakdown in CE is necessary to identify molecular targets to treat FECD. In this direction, CE cells were isolated from fresh porcine cornea and grown using a defined medium until confluence was reached and hexagonal mosaic shape was observed. The cultured PCECs showed expression of tight junctional proteins (ZO-1 and F-actin) as observed with normal human CE. Normal PCECs demonstrated α-tubulin structure in a polymerized state, as expected. PCECs treated with 50 µM H_2O_2 (oxidative stress) for 1 h showed decreased microtubule polymerization and disruption in the membrane structure. Restoration in the structure of the microtubule was observed upon treatment with an antioxidant (5 mM n-acetylcysteine (NAC)) for 1 h in PCECs treated with H_2O_2. NAC scavenges superoxide and counterbalances the effect of H_2O_2 on the microtubules.

Biomechanical Stress Analysis of 3D Printed Polymer Human Femur Implant Using PLA and PEEK: A Comparative Study

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Biomechanical polymer implants are now trending in medical field because of its good strength and light weight, also they more adaptive and take less rehabilitation time for performing the task after surgery. The objective of this investigation is to compare the 3D printed biocompatible polymer implant of femur bone using different polymer materials under different loading conditions. A 3D model of femur bone is constructed by utilizing computed tomography scan images in DICOM file format and processing all those in materialize mimics and 3-matic software. Raw geometry is separated by ranging specific Hounsfield units (HU) for bone. Due to variation in size and shape of bone structure in an individual, additive manufacturing technique favors development of patient specific implant which is widely used for the cases with accidental history. The finite element model of femur is used in ANSYS software for performing analysis at different static load conditions. Simulation is performed for standing, walking and jumping load. The material which are considered for this study are poly lactic acid and poly aryl ether ketone and to compare their load bearing capacity under static structural analysis for better selection implant material for biomechanical component.

POSTER PRESENTATION

Sustainable Solid Waste Management in Rural and Semi-Rural Areas of Ladakh: A Critical Review of Project Tsangda

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Abstract: Ladakh which was recently declared as the new Union Territory of India has seen an abrupt change in the recent years. Being one of the major tourist destinations in the trans-Himalayan region opened to tourist since 1974 and along with rapid urbanization, the lifestyle of people has changed and along with the huge influx of tourist it has led to an increase in the non-biodegradable waste with no proper management system. The region was getting crushed under these non-biodegradable waste until two years ago Project Tsangda was started to tackle this problem, before that not a single proper solid waste management was practiced in the whole region except burning it all at some periphery of the city. This project is the first solid waste management project of Ladakh working in the harsh climate towards saving the fragile ecosystem of the region. The main objective of this paper is to give a critical review of this project.

Pretreatment Processes for Production of Bioethanol by Lignocellulosic Biomass

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Abstract: Lignocellulosic biomass is one of the most abundant feed stocks in nature for bioethanol production and includes agricultural and forestry residues, municipal wastes and energy crops from woody and non woody plants. In recent years, it has drawn much attention for bioethanol production because of its low cost, renewable nature, the key to reduce negative environmental impacts of fossil fuel. Among all bioprocessing steps used for bioethanol production, pretreatment of lignocellulosic biomass is an important step due to recalcitration of hemicellulose and cellulose with lignin which makes hydrolysis a critical step to obtained sugars for fermentation. Various physical, chemical, biological, and physicochemical methods have been used for the pre-treatment of lignocellulosic biomass to obtain fermentable sugars. This method includes steam explosion, ammonia, CO2 Explosion, Ozonolysis, acid and base pretreatment, wet oxidation technology and biological pretreatment. Biological pretreatment is a new promising emerging technology due to its less energy requirement and mild environmental conditions.

Vitamin D Supplementation and COVID-19 Severity – Regulation of Angiotensin-Converting Enzyme 2 (ACE2), Renin Angiotensin System (RAS), Kinin-Kallikrein System (KKS).

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Abstract: Covid-19 is the disease that lead to a pandemic and disrupted the world in 2020. Even though by the end of 2020, we seem to be approaching closer to a viable vaccine, it's going to take longer to overcome the logistical hurdles to create large scale supplies and end the pandemic. Meanwhile it is important to look at all possible solutions to treat and prevent the spread of the disease. An important practice to reduce fatalities is to ensure adequate amount of vitamin D in the body. It is known that of angiotensin-converting enzyme 2 (ACE2), renin angiotensin system (RAS), kinin-Kallikrein system (KKS) all work in close interplay to function and when ACE2 is disrupted, all of them are. Through this paper, we want to highlight how vitamin-D can help modulate and maintain all the three systems while the virus disrupts them. SARS CoV-2, the virus responsible for covid-19 infection targets ACE2 enzymes for cellular uptake in vivo. ACE2 receptors are present in lung alveolar, endothelial cells and in arterial cells and are critically involved in regulating the RAS. It has been found that interaction of the virus with ACE2 receptors causes degradation of ACE2-angiotensinogen interaction. The lack of these interactions leads to increased buildup of angiotensinogen II levels, which were found to induce cytokine expression, apoptosis, retention of Na+, amplification of lung injury and fibroproliferation by activating NF-kB and activating protein 1 (AP1). This usually results in lung inflammation and exacerbated pneumonia. However, in the case of depletion of the ACE2 receptors to regulate the RAS, we seek to discuss how we may try to regulate the RAS by using vitamin D. It has been found that Vitamin D acts as a negative endocrine regulator of RAS and hence can help reduce pulmonary hypertension. Hence, we want to discuss how it may be a crucial step in inhibiting the aggravation of pulmonary fibrosis and hypertension. Moreover, RAS functions in close interaction with the kinin-Kallikrein system. DABK (des-Arg-bradykinin) acts as an important substrate for ACE2. Investigation among COVID-19 patients has shown that reduced ACE2 leads to decrease in inactivation of DABK leading to enhanced signalling of bradykinin receptors which results in fluid extravasation and leukocyte recruitment to the lung. We shall discuss the investigations that show that Vitamin D3 may act as a suppressor of renin biosynthesis and hence playing an important role in regulating renin-angiotensin hence may help compensate the decrease in ACE2.

A Review on the Various Systems under Forensic DNA Phenotyping for the Prediction of Externally Visible Characteristics.

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Abstract: Forensic DNA Phenotyping (FDP) aids in the estimation of physical polygenic traits that are externally visible (EVCs: externally visible characteristics) from DNA samples that are obtained from various crime scenes. This tool can be utilized for the prediction of features such as eye colour, hair colour, skin colour and gender. The discovery of the melanin biosynthesis pathway helped in understanding the workings of pigmentation better. In this regard, IrisPlex was the first system that was developed for the prediction of eye colour, by taking into account the genes that code for eye colour. Similar systems for the simultaneous predictions of hair/eye colour and hair/eye/skin colour were developed, namely HIrisPlex and HIrisPlex-S respectively. Other models for estimation of height, baldness, facial features, hair morphology, etc. were also devised using similar approaches. This paper provides a review of the aforementioned systems and their applications in the prediction of various polygenic characteristics. Prediction of all the mentioned features have a similar method of estimation. The DNA was sequenced using MPS (massive parallel sequencing) or NGS (next generation sequencing) technologies. Using traditional capillary electrophoresis (CE), the results for the respective number of STRs (short tandem repeats) and SNPs (single nucleotide polymorphism) were obtained. The data obtained is fed into the tools that predict the respective traits discussed in the paper. These tools return the probability values of the expression of a particular trait. We envision that using similar principles, polygenic traits, other than the ones previously predicted, can also be predicted.

The Metabolic Interplay between Obesity and Breast Cancer

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Abstract: Obesity is defined as abnormal or excess fat accumulation which is a risk to health. A body mass index (BMI) of >= 30 kg/m^2 is considered obese. Obesity causes various fatal diseases and health conditions which include stroke, hypertension, dyslipidemia and a varying range of malignancies such as breast cancer. Breast cancer is the most prominent diagnosed cancer in women, seen across the globe. The interconnection between obesity and breast cancer is a complicated relationship in both premenopausal and postmenopausal women. In this paper an overview is provided on how obesity affects breast cancer differently in premenopausal women and postmenopausal women. This review focuses on the potential mechanism that explains the interplay between obesity and breast cancer like the differing levels of estrogen, altered signaling pathways of insulin/ IGF1, regulation of inflammatory factors, influence of gut microbiota and the act of adipokines (leptin, adiponectin, serum amyloid A) as a bridgeway between obesity and breast cancer. In many epidemiological studies it has been found that weight change influences cancer risks especially an increased risk is seen in cases of weight gain. We discuss the importance of total energy intake, dietary composition and physical exercise which need to be maintained to lower the risk of breast cancer. Better understanding of the mechanism linking obesity and breast cancer will lead to the development of biomarkers and improve therapy targeted intervention to undermine cancer risk in the future.

Multiple Sclerosis and Antigen Specific Therapy

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Abstract: Multiple Sclerosis (MS) is a long-term autoimmune disease, which is characterised by the demyelination of the white fibres of the Central Nervous System (CNS). Many therapies and treatments have been designed to suppress the adverse effects caused by Multiple Sclerosis. In recent years there has been a considerable development and enhancement in the different therapies involved in treating MS. The main objective of the antigen specific therapy for Multiple sclerosis is to suppress the undesired immune responses that target the myelin sheath and underlying axon. Antigen specific therapy is capable of suppressing the targeted autoimmunity, without affecting the rest of the immune system. Of the several models that exist to understand the onset of the disease, its pathogenesis and to develop a therapeutic model, the most understood and commonly used animal model is the Experimental Autoimmune Encephalomyelitis (EAE) model. Many of the immunomodulatory drugs that were developed using this model are approved by the US Food and Drug Administration (FDA) and have been so far found to be effective. Here we will report the recent developments in this area with emphasis on antigen specific therapy using EAE models.

Applications of Internet of Things (IoT) In Healthcare

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Abstract: The Internet of Things (IoT) is an extensive network connecting the many intricacies of the public sphere to the digital domain. It can be defined as a structure of objects containing specific attributes that can communicate with each other with the help of the internet or any digital device. It has steadily been gaining traction across various fields in tandem with the growth of the technological era. One such field in which IoT has become a force to reckon with is that of healthcare. Due to a surmounting occurrence in the growth of the population around the globe, innovations in healthcare are the need of the hour. With the rise in problems such as demographic-specific health concerns, epidemics like COVID-19 and superbugs, cutting-edge technologies that can aid the human brain in diagnosis are extremely favorable for the wellbeing of mankind. Due to the capacity of the IoT to independently communicate with its objects and provide an intelligent analysis of the same, it assumes a position of paramount importance in the healthcare sector. The novel methodologies detailed in this article include healthcare systems to monitor ICU patients at risk, IoT based approach for specially-abled persons, IoT in palliative care, Clinical Decision Support System (CDSS), Electronic Health Record (EHR), mobile applications and remote medical assistance. Our aim through this article is to shine a light on the high efficiency of these technologies and to delineate how they are revolutionizing global healthcare, especially in challenging scenarios like the ongoing coronavirus pandemic.

Biodiesel Production from Dairy Wastewater Using from Microalgae (*Chlorella Pyrenoidosa)*

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Abstract: Biodiesel production has been gained much attention as an alternative to petro-diesel because of worries about the scarcity of fossil fuel supplies and the environmental issues created by fossil fuels. So, biodiesel is produced by using vegetable oil, animal fat, microalgae, and waste cooking oil. Microalgae are similar to the plant and use CO_2 from the atmosphere for photosynthesis and behave as carbon sequesters. These are a good source of fatty acids and help in wastewater treatment. Microalgae fatty acids are converted into fatty acid methyl ester (FAME) using the trans-esterification process, similar to the petro-biodiesel. Current research is focused on the production of biodiesel from the microalgae *Chlorella pyrenoidosa*. There are various methods for extracting fatty acid from microalgae such as chemical (Folch and Bligh & Dyer method.), mechanical (expeller press, ultrasonic treatment, microwave). Microalgae fatty acid is converted into Fatty acid methyl ester (biodiesel) in the presence of enzymes such as lipase by trans-esterification. Thus, using recombinant DNA technology (RDT), lipase production can be enhanced, and biodiesel production makes it commercially feasible.

Pharmacogenomics of Anticancer Drugs for Targeted Therapy

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Abstract: The field of Pharmacogenomics has made extraordinary steps in oncology over the last 20 years and to verify, countless pre-emptive hereditary tests are regularly attempted preceding anticancer medication organization. Drugs for focused treatments are fundamentally Small Molecules Inhibitors (SMIs), monoclonal antibodies (mAbs), meddling RNA atoms and microRNA. The utilization of these new specialists creates a multifaceted advancement in the pharmacokinetics (PK) of these medications. Individual PK changeability is regularly enormous, and capriciousness saw in the reaction to the pharmacogenetic profile of the patient (for example cytochrome P450 protein), quiet qualities, for example, adherence to treatment and ecological variables. Doing an overall study of all the factors, along with the somatic genome, helps determine anticancer drug response more accurately and safely. Observing individual pharmacogenomic profiles helps oncologists with new resources to formulate the best treatment for their patients by maximizing the efficiency and minimizing toxicity. OBJECTIVE: This review recapitulates the existing knowledge associated with Pharmacogenomics of anticancer drugs, classification of these drugs, comparative analysis between targeted therapy and other methods, and further discusses the greater opportunities for the advancement of these therapies and drugs for improving a cancer free world. FUTURE OUTLOOK: Until this point, remedial medication observing (TDM) of mAbs and SMIs isn't yet upheld by weighty logical proof. In light of this reason, the clinician ought to assess favorable circumstances and constraints, with respect to viability and relevance, of the most appropriate pharmacological way to deal with playing out a customized treatment.

Smart Health Care and Tracking System Based on Internet of Things

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Abstract: As per the medical statistics, the death rates are increasing due to High Blood Pressure and Heart Diseases. To save patient's life, preventive measures are to be taken against high risk diseases that need tracking of the patient's health parameters at an appropriate time. In remote places the doctor may not be reachable to the patients in person. In such situations, a remote monitoring health care system is needed. This paper proposes to develop a remote monitoring system to observe the patient's health conditions using technologies like IoT, GPS and GSM. To monitor the patient's health conditions, the proposed system captures heart rate, oxygen saturation level, body temperature and patient location. The sensors namely: Temperature Sensor, Pulse Oximeter (SPO2 Module), Heartbeat Sensor are used to capture the biomedical signals and are compared with a predefined threshold. When the readings in the module are outside the range of the defined values, then the patient is assumed to be abnormal. The acquired values and patient's location are sent to doctor's mobile through SMS in case of emergency. A well-functioning prototype is developed for supervision of medical entities using GSM, GPS and the Node MCU integrated together to perform as a smart health care and tracking system, and to provide immediate remedy to save patient's life with potentiality.