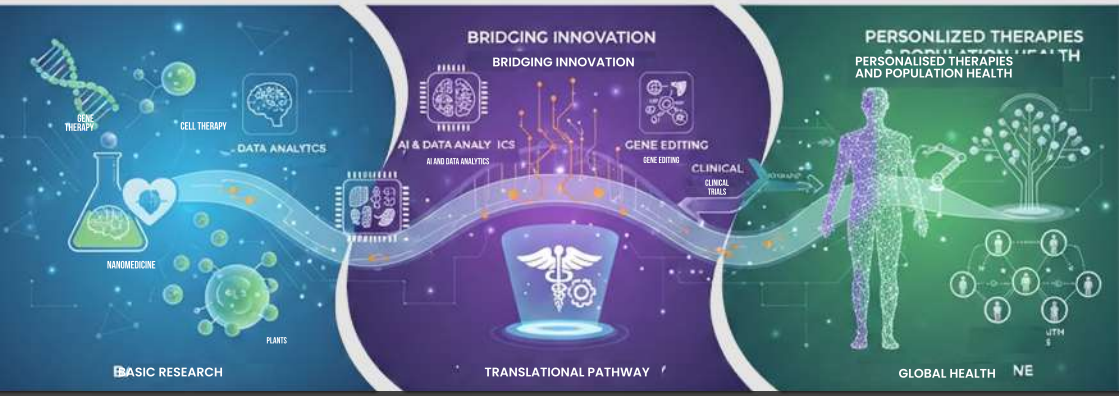
SNU-BIOTALK 2026

3RD INTERNATIONAL CONFERENCE



EVOLVING LANDSCAPE OF TRANSLATIONAL MEDICINE: A FUTURE PERSPECTIVE

19th & 20th FEBRUARY 2026

JOINTLY ORGANISED BY
THE DEPARTMENT OF MICROBIOLOGY AND THE DEPARTMENT OF BIOTECHNOLOGY,
SISTER NIVEDITA UNIVERSITY, KOLKATA, WEST BENGAL, INDIA

SNU-BIOTALK 2026

3rd International Conference
on
Evolving Landscape of Translational Medicine: A Future Perspective

19-20 February 2026

Jointly organised by
Department of Microbiology
&
Department of Biotechnology

Partially supported by

मानव संसाधन विकास समूह
Human Resource Development Group
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Council of Scientific & Industrial Research

Venue:
Sister Nivedita University, Kolkata, India
DG 1/2, Action Area I, Newtown, West Bengal 700156

Organizing Committee

Patron: Shri Satyam Roychowdhury, *Chancellor, SNU*

President: Prof. (Dr.) Sanku Bose, *Vice Chancellor, SNU*

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Prof. (Dr.) Dhrubajyoti Chattopadhyay, *Pro-Chancellor, SNU*

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Program Coordinator:

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Joint Co-Convenors:

Dr. Mahua Ghara & Dr. Shayani Dasgupta

Coordination Committee:

Dr. Fatema Calcuttawala, *HoD, Department of Microbiology*

Dr. Sudipta Saha, *HoD, Department of Biotechnology*

Message from the Chancellors' Desk

Satyam Roychowdhury

Chancellor, Sister Nivedita University

I take immense joy in welcoming you all to **SNU-BIOTALK 2026** which is centred on the fascinating theme 'Evolving Landscape of Translational Medicine: A Future Perspective.' SNU-BIOTALK is a platform to bridge ideas with impact, bringing together scientists, clinicians, industry leaders, and young researchers. Translational medicine stands at the most stimulating crossroads of science and society, where laboratory discoveries transform into real-world healing. At Sister Nivedita University, we believe the future of healthcare lies not only in innovation, but in the seamless integration of research, technology, and compassionate application.

I extend my heartfelt appreciation to the Departments of Biotechnology and Microbiology for jointly organising the 3rd International Conference, and to all the esteemed scientists, researchers and academicians from prestigious institutions across India and abroad. May this conference spark transformative discoveries, ignite innovation, and foster lasting connections that redefine the future of translational medicine.

I wish you an intellectually invigorating and enriching experience. Together, let us synergize our knowledge and efforts to drive scientific innovation for the greater good of humanity.

Satyam Roychowdhury
Chancellor,
Sister Nivedita University

Message from the Pro-Chancellors' Desk

Professor (Dr.) Dhrubojyoti Chattopadhyay

Pro-Chancellor
Techno India Group of Universities

Biotechnology has become one of the most prominent domain in the world. It encompasses almost all disciplines in the world and fosters collaborative research across the world. Recent developments include synthetic biology which involves creating predictable function based biological systems which include synthetic genomes, programmable cells and bio-based machines. Right from targeted therapies to smart immune cells Biotech works wonders in today's world and is converting Science fiction into reality. Concepts like CRSPR-Cas9 and Bio fabrications are being used to create, tailor and implement things which go beyond time and reality.

Bioscience research is evolving at an extraordinary pace, propelled by technological breakthroughs, computational advances and pressing global needs. Genomics, AI, synthetic biology, single-cell and spatial technologies are reshaping how we investigate life's complexity, while ethical frameworks and public engagement help ensure that scientific progress aligns with societal values. Environmental bioscience on the other hand contributes to sustainability and resilience.

This conference is undoubtedly an event which would attract a lot many scholars, speakers and extra ordinary talent holders. I am sure this conference would capture some of the pressing issues of Biotechnology and would be a forum for discussing various emerging technologies in the field of Biotechnology.

I want to wish all the participants, including the organizers of the conference a grand success. I feel this conference would be instrumental in developing various key metrics which will go a long way to solve some of the most challenging problems in the field of Biotechnology. I am confident that students will learn a lot from this conference and would also get a feel of how things are analyzed and processed at a critical level and can have an opportunity to have a face-to-face discussion with some of the notable talents in the field of biotechnology. This conference would also showcase some research papers of the students and would be an added credit for this conference.

Professor Dhrubojyoti Chattopadhyay
Pro-Chancellor
Techno India Group of Universities

Message from the Vice-Chancellors' Desk

Prof. (Dr.) Sanku Bose

Vice Chancellor,
Sister Nivedita University

It is my pleasure to extend warm greetings to all participants of the **3rd International Conference SNU-BIOTALK 2026**. This conference provides an important platform for researchers, scientists, and students to engage in dialogue in the areas of **biotechnology, biomedical science, and translational research**.

We are now witnessing a powerful convergence of **biosciences and artificial intelligence** — from AI-driven drug discovery and genomic analysis to precision medicine and bioinformatics. **AI is rapidly transforming biosciences from observation-based research to prediction-driven science**, accelerating innovation in healthcare and life-science research.

This transformation aligns strongly with the vision of the **India AI Summit 2026**, which emphasizes the role of AI in advancing scientific research and building a knowledge-driven innovation ecosystem for the nation.

At Sister Nivedita University, we are committed to nurturing a **research-centric academic culture aligned with NEP-2020**, encouraging interdisciplinary collaboration between **life sciences, data science, and engineering** to address real-world challenges.

I congratulate the organizing committee for hosting this important conference and wish all participants a productive and enriching academic experience.

Prof. (Dr.) Sanku Bose

Vice-Chancellor
Sister Nivedita University

Message from the Registrars' Desk

Sumanta Basu

Registrar,
Sister Nivedita University

I am delighted to present this Abstract Book, a snapshot of the vibrant research culture within the Department of Biotechnology.
This compilation reflects the core ethos of Sister Nivedita University: the relentless pursuit of knowledge to serve humanity. Each abstract represents countless hours of dedication, critical thinking, and scientific rigor. It is a testament to the innovative spirit of our students and the unwavering guidance of our faculty.

Biotechnology holds the power to shape our future. The ideas contained in these pages are the first steps toward that transformation.

My best wishes to all contributors for their present and future endeavors.

Sumanta Basu

Registrar
Sister Nivedita University

Message from the Deans' Desk

Prof. Amit Sarkar

Dean, School of Life, Agriculture & Biotechnological Sciences
Sister Nivedita University, Kolkata

It is with immense pride and deep academic significance that I present **SNU-BioTalk 2026** – the 3rd International Conference on "Evolving Landscape of Translational Medicine: A Future Perspective," jointly organized by the Departments of Microbiology and Biotechnology, Sister Nivedita University, Kolkata, India, to be held on 19–20 February 2026.

Translational medicine stands at the forefront of contemporary biomedical progress, seamlessly converting foundational scientific discoveries into precise diagnostics, innovative therapeutics, and equitable, sustainable healthcare solutions. In an era marked by complex global health challenges that necessitate integrative, technology-driven, and collaborative strategies, this conference embodies our unwavering commitment to bridging the divide between laboratory research and tangible clinical and societal impact.

The diverse scientific thrust areas—encompassing nanomedicine, cell and gene therapies, immunotherapies, microbiome research, plant-based innovations, and precision medicine—reflect the dynamic, interdisciplinary paradigm shaping the future of life sciences.

By convening distinguished scientists, clinicians, industry leaders, and promising young researchers from India and around the world, SNU-BioTalk 2026 aims to foster enriching dialogue, meaningful collaborations, and lasting advancements in translational excellence. I am confident that the

deliberations and exchanges at this gathering will not only elevate scientific discourse but also ignite forward-thinking research aligned with national priorities and global health imperatives.

I extend my heartfelt gratitude to the organizing committee for their tireless efforts and dedication. My warmest wishes for a highly successful, intellectually stimulating, and profoundly impactful conference.

Prof. Amit Sarkar, Ph.D.
Dean, School of Life, Agriculture & Biotechnological Sciences
Sister Nivedita University, Kolkata

Message from Programme Coordinators' Desk

Dr. Rajat Pal

Associate Professor,
Department of Microbiology
Assistant Dean, Student Affairs
Sister Nivedita University

It gives me immense pleasure to extend my heartfelt greetings and best wishes to the Department of Microbiology and the Department of Biotechnology, Sister Nivedita University, on the occasion of *BioTalk 2026*. This event stands as a wonderful platform for bringing together academicians, researchers, and students to exchange ideas, share knowledge, and explore emerging trends in the life sciences.

The presence of distinguished national and international speakers will undoubtedly enrich the academic value of *BioTalk 2026* and provide participants with valuable insights into cutting-edge research and global perspectives in the field. I am confident that this interaction will inspire meaningful discussions, foster scientific curiosity, and encourage collaborative thinking among all attendees.

I sincerely congratulate the organizing team for their dedicated efforts and wish the event every success. May *BioTalk 2026* be a rewarding and intellectually stimulating experience for everyone involved.

Dr. Rajat Pal
Program Coordinator SNU-BioTalk 2026
Associate Professor, Department of Microbiology
Assistant Dean, Student Affairs
Sister Nivedita University

Message from Head's Desk

Dr. Sudipta Saha

Head,
Department of Biotechnology
Sister Nivedita University
Kolkata

It gives me great pleasure to welcome all delegates, researchers, faculty members, students, and participants to SNU-BioTalk 2026, the 3rd International Conference jointly organized by the Departments of Microbiology and Biotechnology, Sister Nivedita University. The theme of this conference, "Evolving Landscape of Translational Medicine: A Future Perspective," reflects the growing importance of translating fundamental scientific discoveries into effective diagnostics, therapeutics, and preventive healthcare solutions. The carefully identified thrust areas—nanomedicine, cell and gene therapies, plant-based therapeutics, immunotherapies and vaccines, and microbiome-based therapies—highlight the interdisciplinary and forward-looking vision of this scientific gathering. SNU-BioTalk 2026 aims to provide a vibrant platform for meaningful scientific exchange, critical discussion, and collaborative networking among national and international experts, young researchers, and students. Such interactions are essential for nurturing innovation and addressing complex biomedical challenges through translational research.

I express my sincere gratitude to the entire SNU leadership and management for their continued guidance, encouragement, and unwavering support in making this conference possible. I also acknowledge the dedicated efforts of the conveners, co-conveners, and the entire organizing team. I wish SNU-BioTalk 2026 a grand success and hope it contributes significantly to advancing the future of translational medicine.

Sudipta Saha

Dr. Sudipta Saha
Head, Department of Biotechnology
Sister Nivedita University Kolkata

Message from Head's Desk

Dr. Fatema Calcuttawala

Head,
Department of Microbiology,
Sister Nivedita University
Kolkata

It gives me immense pleasure to welcome you to SNU Biotalk 2026, centered on the theme, "Evolving Landscape of Translational Medicine: A Future Perspective." Translational medicine serves as a vital bridge between laboratory discoveries and clinical applications, and in the rapidly advancing field of microbiology, this connection has become more important than ever. From understanding microbial pathogenesis to developing innovative diagnostics, vaccines, and precision therapeutics, today's research is directly shaping tomorrow's healthcare solutions.

The integration of genomics, bioinformatics, artificial intelligence, and advanced molecular technologies continues to transform how we prevent, diagnose, and treat diseases. Moving forward, translational medicine demands strong interdisciplinary collaboration, ethical responsibility, and a shared commitment to innovation that is both sustainable and accessible.

SNU Biotalk 2026 provides a dynamic platform for exchanging ideas, showcasing pioneering research, and inspiring young scientific minds. I extend my sincere appreciation to the organizing committee, invited speakers, faculty members, research scholars, and student volunteers for their dedicated efforts in making this event possible.

I wish all participants a productive and enriching experience and the grand success of SNU Biotalk 2026.

Dr. Fatema Calcuttawala
Head, Department of Microbiology
Sister Nivedita University Kolkata

Message from Convenor's Desk

It is my great privilege to welcome you to the 3rd International Conference on "Evolving Landscape of Translational Medicine: A Future Perspective" organized by the Department of Microbiology and Department of Biotechnology, Sister Nivedita University.

Translational medicine transforms laboratory discoveries into meaningful healthcare solutions. In a time of rapid advances in diagnostics, therapeutics, and interdisciplinary research, this conference aims to connect ideas with impact. We are honoured to host distinguished speakers from across India and the United States, along with enthusiastic participation from undergraduate, postgraduate, and research scholars from diverse institutions.

I hope these two days of scientific exchange inspire collaboration, innovation, and a shared commitment toward improving global health.

I extend my sincere gratitude to all speakers, participants, and organizers for making this gathering possible, and wish everyone a productive and enriching conference.

Wishing you a truly engaging experience.

Conveners,
SNU BioTalk 2026

Programme Schedule

SNU-BIOTALK 2026

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PROGRAMME SCHEDULE 19TH FEBRUARY 2026

08:30–09:30	**Registration**
09:30–09:45	**Inauguration**
	Session Chair: Prof. Dhrubajyoti Chattopadhyay
09:45–10:30	Keynote
	Prof. Kaustuv Sanyal
	Director, Bose Institute, Kolkata, India
10:30–11:00	High Tea
	Scientific Session I: Cell and Gene Therapy
	Session Chair: Prof. Susanta Roychoudhury
11:00–11:45	Plenary Talk
	Dr. Souvik Maiti
	Director, CSIR-Institute of Genomics and Integrative Biology (IGIB), Delhi, India
11:45–12:15	Invited Talk 1
	Prof. Tapas Kumar Kundu
	Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India
12:15–12:45	Invited Talk 2
	Dr. Nishant Chakravorty
	School of Medical Science and Technology (SMST), IIT Kharagpur, India
12:45–14:00	Lunch
	Scientific Session II: Immunotherapies and Vaccines
	Session Chair: Dr. Thandavarayan Ramamurthy
14:00–14:45	Invited Talk 1
	Dr. Tanmay Majumdar
	National Institute of Immunology (NII), Delhi India
14:45–15:15	Invited Talk 2
	Dr. Srinivasa Reddy Bonam
	CSIR-Indian Institute of Chemical Technology, Hyderabad, India
15:15–17:00	Poster session and Tea Break
17:00–17:30	Invited Talk 3
	Dr. Upasana Ray (Online)
	The University of Texas, MD Anderson Cancer Center, USA
18:00–19:00	Cultural Programme
19:00	Invited Dinner

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EVOLVING LANDSCAPE OF TRANSLATIONAL MEDICINE: A FUTURE PERSPECTIVE

PROGRAMME SCHEDULE 20TH FEBRUARY 2026

	Session Chair: Prof. Ashoke Ranjan Thakur
10:00–11:00	Plenary Talk
	Prof. Fabian Kießling
	RWTH Aachen University, Germany
11:00–11:30	Tea
	Scientific Session III: Nanomedicine
	Session Chair: Prof. Nahid Ali
11:30–12:00	Invited Talk 1
	Dr. Jaydeep Bhattacharya
	School of Biotechnology, Jawaharlal Nehru University, Delhi India
12:00–12:30	Invited Talk 2
	Dr. Prosenjit Mondal
	Department of Biological Sciences, IISER Berhampore, India
12:30–13:00	Invited Talk 3
	Dr. Shubhasis Haldar
	Department of Chemical and Biological Sciences, S.N. Bose National Centre for Basic Sciences, Kolkata India
13:00–14:00	Lunch
	Scientific Session IV: Plant based therapies
	Session Chair: Prof. Arunendra Nath Lahiri Majumder
14:00–14:30	Invited Talk 1
	Prof. Krishnendu Acharya
	Department of Botany, University of Calcutta, Kolkata, India
	Scientific Session V: Microbiome based therapies
14:30–15:00	Session Chair: Prof. Sujoy Dasgupta
	Invited Talk 1
	Dr. Anil Kumar
	National Institute of Immunology (NII), Delhi India
15:00–15:30	Invited Talk 2
	Dr. Somaditya Dey
	A. P. C. Roy Government College, Siliguri, India
15:30–16:00	Invited Talk 3
	Dr. Vipaporn Phuntumart (*Online*)
	Biological Sciences, Bowling Green State University, Ohio, USA
16:00–17:00	*Student Speed Talks and Tea Break*
17:00–18:00	Distinguished Lecture (An Open Session)
	Prof. Amrban Maitra (*Online*)
	Perlmutter Cancer Center, NYU Langone Health, USA
18:00–18:30	Valedictory session

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SISTER NIVEDITA UNIVERSITY, KOLKATA, WEST BENGAL, INDIA

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Scientific Session I: Cell and Gene Therapy

Speaker: Prof. Kaustuv Sanyal, Director, Bose Institute

The fungus and us

Kaustuv Sanyal[1]

[1]*Bose Institute, Kolkata*

Fungi kill thousands of people worldwide each year – most of them are immune-compromised. A growing threat in the healthcare sector is the unprecedented rise in antifungal resistance in clinics. Recently, the WHO declared a list of fungal priority pathogens. Our group has been working on some of these fungal pathogens for the last two decades. Since fungi are also eukaryotes and share a similar cell division strategy, identifying cellular factors that are critical for a fungal cell division and not that of ours is the major challenge. I will discuss our efforts in identifying key differences in the process of chromosome segregation and fungal-specific targets which will help researchers design safer and more potent antifungal drugs.

Speaker: Dr. Souvik Maiti, Director, CSIR-IGIB

Indigenous CRISPR-Cas9 Tools: Advancing Gene Therapy Through Precision

Souvik Maiti[1]

[1]*CSIR-Institute of Genomics and Integrative Biology, New Delhi.*

The advent of CRISPR-Cas9 has revolutionized the field of gene therapy, offering unprecedented precision in genome editing. While significant progress has been made globally, the development of indigenous CRISPR tools tailored to address region-specific challenges holds immense potential for advancing therapeutic applications. This talk will delve into the journey of developing an indigenous CRISPR-Cas9 platform optimized for treating genetic disorders prevalent in India, such as sickle cell disease and beta-thalassemia.

Key highlights will include the engineering of the CRISPR-Cas9 system to enhance target specificity and reduce off-target effects, ensuring safety and efficacy in clinical settings. Additionally, I will discuss the biophysical insights gained during this development, particularly in understanding the interaction of CRISPR components.

The talk will also provide an overview of ongoing academic clinical trials utilizing this indigenous tool, addressing challenges such as scalability, regulatory pathways, and ethical considerations. By integrating cutting-edge science with regionally relevant solutions, this initiative exemplifies how homegrown innovations can transform healthcare and make gene therapy accessible on a global scale.

Speaker: Prof. Tapas Kumar Kundu, JNCASR, Bangalore

Epigenetics and Chronic Diseases: Translational Insights for Pharmacological Intervention

Tapas K. Kundu[1]

[1]*Transcription and Disease Laboratory, Molecular Biology and Genetics Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Jakkur, Bengaluru – 560064, India.*

Epigenetics is gene function beyond the DNA sequence, operated by DNA modifications, DNA-associated protein modifications, and noncoding RNA. It is reversible and metabolically regulated, thus directly related to habit and lifestyle. Reversible histone modifications are among the most widely investigated epigenetic modifications and are implicated in diverse physiological and pathological processes. Several studies by us and others have demonstrated that the master Lysine acetyltransferases CBP/p300 catalytic activity could be critical for long-term memory formation. We have discovered a small-molecule activator of CBP/p300 (TTK21) that, upon conjugation to glucose-derived carbon nanospheres (CSP), crosses the blood-brain barrier and reaches various brain regions without apparent toxicity. It induces adult neurogenesis and long-term memory. By administering this activator to the Alzheimer's Disease (AD) model, we could significantly reverse the memory loss in young and older mice. Recently, we have found that in Syngap1+/-, a mouse model of intellectual disability (ID) and autism spectrum disorder (ASD), the p300 KAT activity is dramatically reduced. Our results demonstrate that oral administration of CSP-TTK21 in adult Syngap1+/- mice rescued physiological and cognitive/emotional functions, presumably by restoring p300/CBP-mediated histone acetylation and adult neurogenesis. p300 plays an important role in regulating the expression of genes involved in lipid homeostasis. Our studies revealed that p300-mediated butyrylation is involved in adipogenesis, and selectively inhibiting it with a semisynthetic compound LTK-14A can effectively curb Obesity in multiple mouse models. It was found that histones are hyperacetylated and arginine methylated in oral cancer patient samples, indicating the possible epigenetic language of tobacco habit-related cancer. Inhibition of the acetylation substantially reduces the tumor burden.

Speaker: Dr. Nishant Chakravorty, IIT Kharagpur

Non-coding RNA-Mediated ceRNA Networks: Emerging Therapeutic Targets for HbF Induction in Beta Thalassemia

Nishant Chakravorty[1]

[1]*School of Medical Science and Technology, IIT Kharagpur*

Beta thalassemia is a common form of genetic hematological disorder encountered in India. Over ten percent of the world's children born with beta-thalassemia each year are born in India. The lack of curative strategies makes blood transfusion and chelation therapy the prime therapeutic choices for management of the disease. Prior studies have shown that elevated fetal hemoglobin (HbF) levels can ameliorate the disease symptoms. As the search for methods to elevate HbF levels to treat β-hemoglobin disorders like beta-thalassemia, growing evidence suggests a major role of non-coding RNA-mediated ceRNA network, as a modifier of fetal hemoglobin expression. This talk will highlight some of our recent findings on ceRNA-mediated regulation of fetal hemoglobin and discuss their potential therapeutic implications in beta thalassemia.

Scientific Session II: Immunotherapies and Vaccines

Speaker: Dr. Tanmay Majumdar, National Institute of Immunology

β-catenin driven inflammasome activation shapes T-cells metabolic reprogramming

Tanmay Majumdar[1]

[1]*National Institute of Immunology, New Delhi, India.*

Toxoplasma gondii activates innate immunity via TLR11/12 in mice, yet the absence of functional human counterparts limits understanding of parasite sensing in humans. We identify a host- intrinsic innate recognition mechanism in which β-catenin signaling mediates immune detection while being hijacked through the PI3K-β-catenin axis to promote macrophage infection. Genetic or pharmacological β-catenin inhibition restricts parasite replication. β-catenin-TCF4 induces IRF4-CYBB signaling, elevating mitochondrial ROS, mitophagy, AIM2-NLRP3 inflammasome activation, and gasdermin-D dependent pyroptosis in an ASP5-dependent manner. ROS-driven HIF-1α stabilization promotes HKII-LDHA-mediated glycolysis, histone lactylation, and pro- inflammatory M1 polarization, whereas β-catenin ablation preserves mitochondrial fitness, shifts metabolism toward oxidative phosphorylation, and favors anti-inflammatory differentiation. Metabolic pathway enrichment further reveals that macrophage-intrinsic β-catenin governs immunometabolic programming of CD4+ and CD8+ T-cells. Infected β-catenin^{flox} CD4+ T cells display enhanced glycolysis, disrupted TCA cycling, and pentose phosphate activation, while β- catenin deficiency redirects metabolism toward oxidative phosphorylation and immune restraint. CD8+ T-cell remodeling and macrophage metabolic rewiring similarly depend on β-catenin status. Collectively, macrophage intrinsic β-catenin emerges as a central regulator of immune metabolism, host defense, and therapeutic vulnerability during toxoplasmosis.

Speaker: Dr. Srinivasa Reddy Bonam, CSIR-IICT

Future of Vaccines: From Mechanistic Adjuvant Science to mRNA-LNP Therapeutics

Srinivasa Reddy Bonam[1]

[1]*Department of Applied Biology, Vaccine Immunology Laboratory, CSIR-Indian Institute of Chemical Technology*

Most of us have witnessed the recent COVID-19 pandemic and the continued emergence of infectious pathogens such as monkeypox, Nipah virus, and others. Despite advances in preventive strategies, effective antiviral therapies remain limited. In this era of emerging and re-emerging pathogens, vaccination has become an indispensable tool for global health preparedness.

My research focuses on the development of next-generation vaccines, including rationally designed adjuvanted vaccine platforms. One such platform is the LITEVAX® Adjuvant (LVA), a proprietary oil-in-water (O/W) emulsion developed by LiteVax B.V., The Netherlands. LVA contains CMS (Maltose 4'-monosulphate 1,2,3,6,2',3',6'-heptadecanoic acid ester) as its active component. This adjuvant has demonstrated efficacy in multiple preclinical models, including influenza (inactivated whole-virion H7N9 in ferrets) and malaria (R0.10C; Plasmodium falciparum gametocyte extract). We have recently dissected the mechanism of action of LVA using in vitro human immune systems, including monocyte-derived dendritic cells and T cells. Our findings demonstrate that CMS is indispensable for optimal vaccine immunogenicity and drives key innate and adaptive immune responses required for vaccine effectiveness.

In addition, this talk will highlight our work on mRNA–lipid nanoparticle (mRNA-LNP) vaccine and therapeutic platforms. I will discuss how we have developed and optimized mRNA-LNP strategies to combat SARS-CoV-2 variants through rational antigen selection and advanced LNP formulation approaches. Finally, I will present how this versatile mRNA platform is being expanded in our laboratory toward broader immunotherapeutic applications.

Speaker: Dr. Upasana Ray, The University of Texas

Targeted Therapeutic Strategies in Cancer Biology: Present and Future Directions

Upasana Ray[1]

[1]*The University of Texas, MD Anderson Cancer Center, USA*

Significant progress has been made in cancer therapy through precision medicine tailored to patients' personal profiles, which also helps decrease toxic side effects. Our data indicate that targeting the transmembrane protein LRRC15 (Leucine-rich repeat-containing protein 15) could be a promising approach for preventing and treating ovarian cancer (OC). Metastatic spread to the bowel and omentum, leading to bowel obstructions, is the primary cause of morbidity in OC patients. Our prior analysis reported LRRC15 as one of the most significantly upregulated genes in the bowel mets compared to their autologous primary tumors in OC patients. We found that stable LRRC15 knockdown in OC cells reduced their ability to adhere and invade the mesothelium in a 3D omentum model and vice versa. Mechanistically, LRRC15 binds fibronectin, associates with integrin beta1, and activates focal adhesion kinase signaling to facilitate migration and invasion. Our data showed that treatment with ABBV-085, an antibody-drug conjugate (*AbbVie, US; ClinicalTrials.gov Identifier: NCT02565758*) that specifically targeted LRRC15, prevented metastasis and reduced tumor burden in both early- and late-stage *in vivo* metastatic OC xenograft models. Moreover, treatment of LRRC15-expressing patient-derived xenograft (PDX) models also showed similar attenuation in peritoneal adhesion and reduced metastatic tumor growth. Treatment of 3D spheroids derived from the ascites cells of OC patients expressing LRRC15 with ABBV-085 showed reduced cell viability. Our data reveal LRRC15 as a key regulator of OC metastasis, making it a promising target for future OC treatment. Transitioning from solid tumor cancer biology to hematologic malignancies, our ongoing research emphasizes the development of innovative immunotherapeutic approaches, including selective monoclonal antibodies, antibody-drug conjugates, and T-cell engagers that specifically target cell- surface proteins expressed on malignant cells, with the aim of minimizing toxic adverse effects.

Scientific Session III: Nanomedicine

Speaker: Prof. Fabian Kießling, RWTH Aachen University, Germany

Strategies to Overcome Barriers in Tumor Targeted Drug Delivery

Fabian Kiessling[1]

[1]*RWTH Aachen University, Germany*

Immature and hyperpermeable vessels and active transport through endothelial cells, combined with impaired lymphatic clearance and uptake by tumor-associated macrophages, contribute to accumulation of nanomedicines in tumors. However, due to the high degree of heterogeneity in each of these processes, the accumulation and, consequently, the response of tumors to nanomedicines is difficult to predict and control. In this talk, I will discuss strategies to diagnostically assess these mechanisms for therapy personalization as well as therapeutic approaches to improve drug accumulation and delivery. Possibilities to stratify patients more effectively for therapy include the development of histological and omics biomarkers, as well as companion diagnostics and theranostics. Therapeutically, active targeting of nanomedicines can improve retention and internalization by tumor cells but does not compensate for EPR heterogeneity. Complementary strategies focus on pharmacological priming of the vasculature and of the adjacent stroma, as well as image-guided physical priming of the tumor microenvironment. I will give examples of pharmacological priming with erythropoietin to increase the functional vessel fraction and corticosteroids to untighten the extracellular matrix (ECM). Physical priming is often used in combination with microbubbles that oscillate or burst upon stimulation, mechanically permeabilizing vessel walls and the surrounding ECM. This method can also be employed to trigger drug release from macrophages using phase-converting nanodroplets as intracellular acoustic resonators. Thus, patient pre-selection strategies and complementary interventions targeting biological barriers between the injection site and the target may greatly improve nanomedicine delivery to tumors and improve the performance of these treatments over larger patient populations.

Speaker: Dr. Jaydeep Bhattacharya, JNU

Various applications of Nanotechnology in biological Sciences

Jaydeep Bhattacharya[1]

[1]*School of Biotechnology, Jawaharlal Nehru University, New Delhi*

The modern drug delivery system (DDS) has been evolved in recent times which is capable of protecting the drug from degradation and can deliver specifically to the targeted site. The stability and solubility of hydrophobic drugs is always a concern. Liposomes, the vesicles are prepared from different types of lipids and have been used as delivery vehicles for hydrophobic drugs. However, the stability of the liposome and its blood circulatory time is very less. Polymers being one of the most versatile material have recently gained interest in its use in DDS applications. In our work we have taken a rather different approach to use the polymer as well as nano sized planner lipid structure Nanodisc as a hydrophobic drug carrier, Membrane The

The recent addition is using the Biomimetic nanoparticles and whole cells for antibiotic and anti cancer drug delivery. The protein Hemoglobin has been loaded in polymer and RBC nanoparticles to deliver the oxygen at the hypoxic core of the tumor to increase the efficacy of the anti cancer drug treatment.

In other works metal nanostructures have been used for surface enhanced Raman scattering and development of opto-electronic biosensors with increased sensitivity and specificity. On the other hand, metal oxide nanomaterials are well known for their vast applications. The highly active ternary complex of zinc oxide, reduced graphene oxide and gold has been synthesized and used for the degradation of contaminants and killing of bacteria. Highly biocompatible mesoporous silica nanoparticles have been used for the removal of urea and creatinine from spiked body fluid simulated solutions to prove its potential as nano dialysis beads, a better alternative to standard dialysis system for kidney failure patients.

Speaker: Dr. Prosenjit Mondal, IISER Berhampore

Exploring Liver-to-Pancreatic Islet Communication to Uncover Mechanisms that Propel β-cell Dysfunction in MAFLD

Prosenjit Mondal[1]

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The link between MAFLD and Type 2 diabetes (T2DM) is more complex than previously thought, and the relationship seems bidirectional. Evidence indicates that MAFLD might precede and promote the development of T2DM and that the risk of developing T2DM parallels the severity of MAFLD. In addition, the improvement or resolution of MAFLD is associated with a reduction of T2DM risk, adding weight to causality and suggesting that liver-focused treatments might reduce the risk of developing T2DM. We have recently elucidated the molecular mechanism(s) underlying ß- cell dysfunction and demise, which are mediated by a thus far unrecognized hormone (S100A6) released by the liver. Our findings indicate hepatokine S100A6 is a messenger protein mediating an unknown inter-organ communication between the liver and pancreas upon intrahepatic lipid stress. Our study also supports that neutralizing circulating S100A6 could be a novel therapeutic in restoring β-cells function in MAFLD, offering hope for future treatments.

Speaker: Dr. Shubhasis Haldar, SNBNCBS

Covalent Magnetic Tweezers: A Novel Single-Molecule Platform for Translational Research

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Mechanotransduction—the process by which cells convert mechanical stimuli into biochemical signals—plays a critical role in the pathogenesis of cardiovascular diseases, cancer metastasis, and neurodegeneration. However, developing therapeutics that target these mechanosensitive pathways is often hindered by the limitations of conventional biophysical tools, which lack the stability for long-term pharmacological observation.

Here, we present Covalent Magnetic Tweezers (CMT), a next-generation single-molecule platform engineered for the translational landscape. By utilizing covalent tethering, CMT overcomes the "stability barrier" of traditional assays, enabling continuous, high-resolution interrogation of individual protein targets over several weeks. This unprecedented stability allows for the observation of rare kinetic transitions and slow-binding drug interactions that are often missed in high-throughput ensemble screens.

The CMT platform integrates real-time microfluidics, facilitating the direct observation of how lead compounds and mechanical loads synergistically modulate protein conformation and stability. We demonstrate its utility by quantifying the mechanical remodeling of protein-protein interactions essential to cellular signaling. Our results establish CMT as a robust, scalable framework for force-dependent drug screening and the identification of mechanosensitive biomarkers. By bridging the gap between fundamental protein mechanics and clinical pharmacology, CMT offers a transformative approach to designing precision therapeutics for diseases driven by mechanical dysfunction.

Scientific Session IV: Plant based therapies

Speaker: Prof. Krishnendu Acharya, University of Calcutta

Mushrooms: From forest to pharmacy

Krishnendu Acharya[1]

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Speaker: Somaditya Dey, APC Roy Government College

Inflammasome-Dependent IL-1β Induction in C57BL/6 Mice Following Transmission by *Leishmania mexicana*-Infected *Lutzomyia longipalpis*

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Introduction: Cutaneous leishmaniasis manifests in different forms, ranging from uncomplicated self-healing skin lesions (*Leishmania major*) to chronic diffuse lesions (*L. mexicana*). Here, we compare the early immune response to bites of *L. mexicana*-infected ($LmxSF_i$) and *L. major*-infected ($LmjSF_i$) *Lutzomyia longipalpis* (*LuLo*) sand fly bites in mice.

Methods: *LuLo* sand flies have been infected with either of the parasites by artificial blood feeding, and the parasites are transmitted to C57bl6 mice by the bites of infected SFs. After 6 hr, the ear cells and Whole cell lysate were collected for flow and Western Blot analyses respectively.

Results: We demonstrate, $LmxSF_i$ and $LmjSF_i$ produced an acute inflammatory response with a higher recruitment of $Cd11b^+$ cells (6 hrs.), compared to steady state earskin. SFi produced a comparable influx of both neutrophils (median [M] of 33400, 34750), and inflammatory monocytes (iMOs; M of 11750, 10000), respectively, compared to steady state for neutrophils (M= 925) and iMOs (M=1250). A significant production of IL-1□ was observed, albeit at a lower magnitude in iMOs for both $LmxSF_i$ and $LmjSF_i$ (M= 2600, 3450) compared to neutrophils (M = 24280, 28400), respectively. WBs of cell lysate from both *Leishmania spp*. show production of NLRP3 and cleavage of pro-IL-1□ into its active form, indicative of pore formation and canonical inflammasome activation.

Conclusion: Collectively, we show that a robust recruitment of innate immune cells and upregulation of inflammasome-derived IL-1□, reinforces the signature early host immune response to SFi bite that regulates skin inflammation and modulates disease outcome.

Scientific Session V: Microbiome based therapies

Speaker: Dr. Anil Kumar, National Institute of Immunology

Towards investigating the anticancer role of gut microbiota-derived metabolites

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As per recent research reports, gut microbiota-derived metabolites such as indoxyl sulfate, inosine etc. possess selective anticancer effect on cancer cells. But the majority of gut microbial metabolites have not been screened for their anti-tumor activities nor underlying mechanism have been deciphered for developing therapeutic intervention for cancer management. In the present study, we investigated anti-tumor activity of three gut microbiota-derived metabolites, 4-ethylphenyl sulfate (4EPS), indoxyl sulfate (IndS) and p-Cresyl Sulfate (pCS) on colon cancer cells. Using HCT-116 colon cancer cells, in- vitro cell-based assays were done that demonstrated 4EPS, IndS and pCS can reduce cell proliferation, cell viability and ATP content in dose and time dependent manner. Cell morphology was found to be distorted at concentrations, 2.5 mM, 5 mM and 10mM. HCT-116 cells also showed a decrease in colony formation when exposed to 2.5 mM, 5 mM and 10mM of 4EPS, IndS and pCS. These metabolites enhanced the apoptosis and ROS production as compared to control cells. Cell cycle assay showed the arrest at G2/M phase for 4EPS, IndS and pCS. An animal study was also conducted using balb/c mice to demonstrate the selective deleterious effect of indoxyl sulfate on cancer cells while sparing normal colonic cells. IndS did not cause any harm or inflammation in normal colonic cells of balb/c mice, hence, it can be considered safe for use as an anticancer agent and may have implications in future applications for colon cancer treatment. This warrants further mechanistic investigations in this direction.

Speaker: Dr. Vipaporn Phuntumart, Bowling Green State University, USA

Gut Microbiome Remodeling After Fecal Transplant in Selectively Bred Alcohol-Preferring Rat Models

Vipaporn Phuntumart[1] *& Howard Casey Cromwell*[1]

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Alcohol Use Disorders (AUDs) are a global health challenge with limited effective treatments. Growing evidence suggests that gut microbiome alterations contribute to substance use disorders, and fecal microbial transfer (FMT) is emerging as a strategy to modulate the brain–gut–microbiome axis. Using the well-characterized Alcohol Preferring (P) and Non-Preferring (NP) rat models, this study examined ethanol consumption, preference, and gut microbiome composition before and after FMT. Ethanol exposure in P rats induced dysbiosis, including increased *Akkermansia muciniphila* and reduced *Bacteroidetes* and *Lactobacillus*. FMT from NP donors to P rats partially restored microbial balance, reduced alcohol-metabolizing pathway gene abundance, and decreased alcohol consumption behavior. These findings highlight distinct microbial shifts between P and NP rats and support FMT as a potential therapeutic approach for microbiome-associated AUD.

Speaker: Prof. Anirban Maitra, NYU Langone Health

Poster Session: Immunotherapies and vaccine

Poster 01: Polley et al, Presidency University

Bioinformatic screening of Epicatechin -3- gallete against PD1/PD-L-1 Breast Cancer Immunothreapy

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Breast Cancer is the most concerning cancer disease after lung cancer. Its causes for the interruption of the PD-1/PD-L-1 immune checkpoint pathway prevent the immune system from monitoring. Natural molecules like Epicatechin-3-gallete, a major bioactive compound of green tea, have anti-cancer and immunoregulatory effects, but it has the potential to target PD-1/PD-L-1. The study of molecular docking helps to analyze how well the Epicatechin – 3-gallete molecules bind with PD-1/ PD-L-1 and the probable binding position on the structure of PD-1/PD-L-1. It helps to find the hotspot for the interacting amino acid residues. ADMET analysis of this molecule indicates this is the good physicochemical compatibility, acceptable oral-drug likeness, and non-toxic characteristics. All over this in-silico analysis suggests the Epicatechin-3-gallete has a promising effect on modulating PD-1/PD-L-1 immune checkpoint activity in Breast Cancer. In the future, there will be a need to be more intense to prove this molecule as an agent of amelioration of Breast Cancer.

Keywords: Breast Cancer, Epicatechin-3-gallate, PD-1/PD-L1, Molecular Docking, Immunotherapy, ADMET

Poster 02: Sarkar et al, Presidency University

Investigation of Tumor Necrosis Factor Related Apoptosis Inducing Ligand (TRAIL) Induced RNA Splicing of FANCM in Breast Cancer Cells

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TRAIL (currently in phase-II clinical trial) is a cytokine expressed by the immune cells which can activate apoptosis in cancer cells, sparing the normal cells. To explore the impact of TRAIL beyond apoptosis, we analysed publicly available microarray (GSE82047) and RNA-seq (GSE186609) datasets of cancer cells treated with recombinant TRAIL. DAVID analysis highlighted RNA-processing and RNA-splicing as highly enriched pathways, suggesting that TRAIL may influence alternative splicing in cancer cells. Based on this observation, we performed RNA sequencing of MDA-MB-231 breast cancer cells treated with rhTRAIL. Differential splicing analysis of control and treated cells using rMATS identified 167 genes showing 212 skipped exon events. Network analysis by Cytoscape CytoHubba software identified FANCM as the Hub gene. Sashimi-plot analysis revealed TRAIL induces exon-3 skipping in FANCM, generating a shorter isoform FANCM-S(NM_001308133.2) lacking a 78bp that encodes part of the ATP binding domain of FANCM protein. However, control cells retain exon-3 generating FANCM-L,(long isoform; NM_020937.4). FANCM plays a key role in the Fanconi anemia DNA repair pathway. Next, we performed molecular docking and molecular dynamics simulations to compare ATP binding in the FANCM-L and FANCM-S isoforms. Although docking suggested stronger binding of ATP to FANCM-S, dynamic simulations revealed increased ATP instability, fewer hydrogen bonds, and weaker electrostatic interactions in FANCM-S. These findings suggest that 3rd exon skipping reduces the stability of ATP binding which may impair DNA repair activity of FANCM. Overall, our study proposes that TRAIL induces alternative splicing of FANCM, potentially weakening DNA repair and contributing to its anti-cancer effects.

Poster Session: Microbiome-Based Therapies

Poster 03: Narmada S et al, Gulbarga University

Plantaricin VN-25 from Probiotic Neera Isolate *Lactiplantibacillus plantarum* 1625: A Multifunctional Bacteriocin with Antimicrobial, Wound-Healing, and Anticancer Potential

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The emergence of multidrug-resistant (MDR) pathogens and drug-resistant cancers has intensified the search for safe, naturally derived bioactive molecules with broad therapeutic applications. This study reports the isolation, purification, and multifunctional evaluation of *Plantaricin VN-25*, a potent bacteriocin produced by lactic acid *bacteria* isolated from the traditional probiotic drink *Neera.* Plantaricin VN-25 a novel bacteriocin was produced by *Lactiplantibacillus plantarum strain 1625* were purified and characterized. Multi-stage purification method was used, salt precipitation, organic solvent precipitation and purity was checked by Reversed Phase High Performance Liquid Chromatography (RP-HPLC) with retention time of 3min indicating the homogeneity of bacteriocin and was characterized by Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS) with a molecular mass of 663 Da belongs to class II bacteriocins and amino acid sequence was determined by LC-MS and analyzed using ProtParam, yielding a composition of C-86, H-147, N-23, O-22, and S-2. Peptide's nominal mass and isoelectric point confirmed its cationic nature. Leucine was the most abundant residue, followed by Glycine, Alanine, and Methionine. Primary structure analysis using Pep Draw revealed hydrophobicity contributing +9.13 kcal/mol. Secondary structure prediction using I-TASSER and Alpha Fold v2 indicated alpha-helical content with high confidence. Tertiary structure modeling via TrRosetta revealed triple-stranded beta-sheets and a disulfide bridge, with a TM-score of 0. 412. Parallel screening of fish and waste samples from retail markets in Navi Mumbai revealed the prevalence of ESBL-producing *E. coli* harboring ^{bla}*TEM*, ^{bla}*SHV*, and ^{bla}*CTX-M* genes, displaying extensive resistance to β-lactams and other antibiotic classes. Plantaricin VN-25 demonstrated remarkable pH and thermal stability, potent activity against ESBL *E. coli*, and enhanced fibroblast cell migration in vitro, comparable to ascorbic acid. These findings establish Plantaricin VN-25 as a promising biocontrol and wound-healing agent for combating antimicrobial resistance and promoting tissue regeneration PlantaricinVN-25 displayed dose-dependent cytotoxicity against HCT116 cancer cells, HCT116 cell lines, with an IC_{50} = 65.10 µg/ml approaching the effectiveness of standard chemotherapeutics. These results demonstrate that Plantaricin VN-25 are a promising dual-function therapeutic platform with antibacterial and anticancer potential.

Keywords: Bacteriocin, *Lactiplantibacillus plantarum*-1625, ESBL *E. coli*, Antimicrobial resistance, Wound healing, Anticancer.

Poster 04: Roy et al., SNU Kolkata

Isolation and characterization of pigment from fluorescent Bacterium

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Soil bacteria play a vital role in the terrestrial ecosystem, contributing to the biodiversity within the soil. Among these bacteria, fluorescent species stand out due to their intriguing ability to emit visible light through bioluminescence. In addition to their bioluminescent properties, certain strains of fluorescent bacteria produce pigments with unique spectral characteristics. This study aimed to isolate and characterize the pigment derived from a fluorescent bacterium, focusing on its chemical composition, fluorescence properties, and potential applications. The isolation and characterization of the pigment from the fluorescent bacterium provide valuable insights into its chemical composition, fluorescence properties, and stability. The pigment's distinct spectral characteristics and stability make it a promising candidate for various applications, such as fluorescent labelling, biosensing, and bioimaging. Future studies could explore the pigment's biological functions, optimize its extraction process, and further investigate its potential applications in diverse fields.

Poster 05: Roy et al., SNU Kolkata

Investigation of Antibacterial Rhizospheric Microbes from Soil: A Step Toward Novel Therapeutic Bioactive Compounds

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Antimicrobial Resistance (AMR) is a global threat that is rising rapidly over the past few decades with billions of lives being affective annually mainly due to the declining efficacy of both traditional and conventional antibiotics. This escalating therapeutic crisis demands the discovery of novel bioactive compounds. Soil, in particular, the rhizosphere, harbours a wide variety of microorganisms that have been known to produce bioactive secondary metabolites as part of their survival mechanism in harsh conditions. These metabolites are highly effective against harmful microorganisms. This study highlights rhizospheric soil as a valuable habitat for isolating microorganisms capable of producing new bioactive agents with potential therapeutic applications. For this study, soil samples were collected from rhizospheric regions of Mangifera indica in two ecologically distinct environments – Nagerbazar(urban) and Kalyani(semi-urban). Multiple bacterial isolates were obtained, from the soil sample and the antagonistic activity of these isolates was evaluated against four bacterial strains – *Escherichia coli, Pseudomonas sp., Staphylococcus gallinarum and Klebsiella sp.*, using further screening procedures. The results showed that multiple isolates of both the soil samples are capable of producing potential novel bioactive agents. This study also opens avenues for future research aimed at identification of the novel bioactive compounds, their mechanism of action and comparison of their efficacy with existing bioactive compounds in regards to therapeutic treatments.

Poster Session: Nanomedicine

Poster 06: Das et al., NSHM Knowledge Campus Kolkata

Solid lipid nanoparticles (slns): A latest approach in drug delivery

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Drug delivery vehicles known as solid lipid nanoparticles (SLNs) are composed of naturally occurring lipids that have been stabilised by surfactants. Typically, their particle sizes fall between 50 and 1000 nm. Improved solubility and bioavailability for poorly water-soluble chemicals, regulated and prolonged release, and protection of active medications from degradation are just a few advantages they offer. In contrast to conventional carriers, SLNs benefit from polymeric nanoparticles and liposomes while avoiding issues like drug leakage and hazardous breakdown products. SLNs may be produced in huge quantities at a reasonable cost, are safe for the body, and decompose spontaneously. Cosmetics, nutraceuticals, and medications all employ them. In the medical field, SLNs are being researched for gene therapy, vaccine creation, targeted medication delivery in the treatment of cancer, brain targeting (passing the blood-brain barrier), and infection prevention. Additionally, by lowering the frequency of dosages and minimising side effects, they have the potential to increase patient compliance. Solid Lipid Nanoparticles are emerging as a versatile, secure, and efficient choice for upcoming medication delivery and therapeutic advancements as formulation techniques advance.

Keywords: Solid lipid nanoparticles, Liposomes, Nutraceuticals, Bioavailability, Surfactants

Poster 07: Saha et al., University of Calcutta

Synthesis and pharmacodynamic study of 2D Black Phosphorus as a novel drug carrier for Inflammatory Bowel Disease

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Introduction: Inflammatory Bowel Disease (IBD) is a chronic inflammatory condition of the colon that demands prolonged treatment. Mesalamine (MES) remains the first-line therapy; however, its oral formulation suffers from low bioavailability, limited retention at inflamed site, and high dosing needs that can cause serious side effects with long-term administration. Two-dimensional Black Phosphorus (BP) nanosheets offer advantages as drug carriers due to their large surface area and biodegradability. Since inflamed colonic tissues overexpress CD44 receptors, functionalizing BP with CD44-targeting Hyaluronic Acid (HA) could enable selective MES delivery. This integrated system may enhance therapeutic efficiency.

Methods: BP was synthesized, functionalized with HA via carbodiimide-coupling reaction, and loaded with MES. Characterization was done using Raman spectroscopy, DLS, zeta potential, FTIR, and TEM. *In-vitro* drug release was evaluated under different gastrointestinal pH via dialysis-bag method. Biocompatibility (MTT assay) and anti-inflammatory effects (ROS, NO levels) were evaluated in RAW 264.7 cells, followed by pharmacodynamic assessment in DSS-induced colitis mice using MPO assay and RT-PCR cytokine profiling.

Results: Raman Spectroscopy, FTIR spectroscopy, DLS and Zeta potential confirmed successful synthesis of the nanoconjugate. BP-HA-MES demonstrated sustained drug release alongside good biocompatibility and significant anti-inflammatory effects in RAW 264.7 cells. It also reduced the expression of inflammatory mediators *in-vivo*.

Conclusion: This study aimed to develop an oral, targeted nano-delivery system to improve mesalamine bioavailability and therapeutic efficiency. The HA-BP-MES nanoconjugate is expected to offer controlled MES release, CD44-specific targeting, and improved therapeutic response compared to free drug, representing a potential advancement in precision treatment strategies for IBD.

Poster 08: Shivaraju et al., Gulbarga University

Biosynthesis of Copper Nanoparticles Using *Vitex negundo* Leaf Extract: A Promising Antibiofilm Strategy Against Pathogenic Bacteria

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The rise of microbial resistance and persistent biofilm-associated infections has intensified the demand for eco-friendly antimicrobial alternatives. In this study, copper nanoparticles (CuNps) were green synthesized sustainable method using the aqueous leaf extract of *Vitex negundo* a medicinal plant renowned for its antimicrobial and antioxidant properties. Phytochemicals such as flavonoids, alkaloids, and phenolics in the extract acted as natural reducing and stabilizing agents, facilitating nanoparticle formation, which was visually indicated by a color change and confirmed by UV-Vis spectroscopy. Comprehensive characterization using FTIR, XRD, SEM, and TEM revealed that the CuNps were crystalline, predominantly spherical, and ranged in size from 20–50 nm. Antibacterial testing demonstrated effective activity against both Gram-positive and Gram-negative bacteria. Notably, the CuNps exhibited potent antibiofilm activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*, as assessed via crystal violet staining. The antibiofilm effect was dose-dependent and significantly stronger than that of the plant extract alone, suggesting a synergistic interaction between copper ions and plant-derived phytochemicals. This green synthesis approach not only aligns with environmental sustainability but also offers enhanced antimicrobial and antibiofilm efficacy. The biosynthesized CuNps show strong potential for application in medical and industrial settings particularly in preventing biofilm formation on biomedical devices and contact surfaces. Future directions will focus on elucidating the underlying mechanisms and developing CuNps-based antimicrobial coatings.

Keywords: Copper nanoparticles, Green synthesis, *Vitex negundo,* Antimicrobial activity.

Poster 09: Chakraborty et al., Adamas University

Biosurfactant-Stabilised Nanoparticles: A Novel Platform for Synergistic Anti-Microbial and Anticancer Activity.

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Introduction: Biosurfactants are microbially derived amphiphilic molecules that offer low toxicity and biodegradable alternatives to traditional surfactants with notable bioactivities against microbes and cancer cells. Reviews of surfactin, a model biosurfactant, highlight its cytotoxicity across multiple cancer types and the benefits of nano-formulations in optimizing drug delivery. Recent research shows that biosurfactant-stabilized silver nanoparticles maintain long-term stability and exhibit strong antimicrobial efficacy. This project aims to develop a unified platform where a selected biosurfactant would stabilize metallic or polymeric nanoparticles to achieve synergistic antimicrobial and anticancer effects.

Methodology: Biosurfactants will be produced and purified from a characterized microbial strain. It will serve both as a reducing/capping agent and a structural stabilizer for nanoparticles, such as silver or biodegradable polymer cores. Physicochemical as well as biophysical characterizations may include size, morphology, surface charge, storage stability, Critical Micelle Concentration (CMC), Surface tension measurement, Emulsification index, FTIR, GC-MS etc. Antimicrobial efficacy will be tested against a panel of Gram-positive, Gram-negative, and fungal strains. *In vitro* anticancer potential will be evaluated on cancer cell lines, monitoring viability, apoptosis markers, and cell cycle effects compared to controls. Combination indices will assess synergy between biosurfactant and nanoparticle effects**.**

Result: The biosurfactant-stabilized nanoparticles are expected to exhibit enhanced colloidal stability, longer shelf life, and significantly reduced microbial growth compared to biosurfactant or nanoparticles alone. In cancer assays, improved cellular uptake and targeted membrane interactions are likely to result in stronger growth inhibition and apoptosis induction than either component individually, indicating synergistic cytotoxicity.

Conclusion: A biosurfactant-stabilized nanoparticle platform could merge green synthesis, robust antimicrobial action, and potent anticancer effects into a versatile, sustainable nanomedicine strategy.

Poster 10: Naskar et al., Jadavpur University

A rapid HPLC-UV technique for quantification of chlorocresol, clobetasol propionate and miconazole nitrate in cream

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Introduction: Cream containing clobetasol propionate, chlorocresol and miconazole nitrate is a popular pharmaceutical formulation which is widely used to treat various skin diseases such as eczema, psoriasis etc. Proper quality control of the formulation is necessary to ensure the effectiveness and to avoid adverse effects. In this study, a rapid and accurate high performance liquid chromatography with UV detector (HPLC-UV) technique has been developed successfully for simultaneous quantification of clobetasol propionate, chlorocresol and miconazole nitrate in cream which has been validated according to International Conference on Harmonization (ICH) guidelines.

Method: The method was achieved by using HPLC-UV system with C8 (150 mm length × 4.6 mm ID, 5 µm particle size) column. The mobile phase consisted of buffer (0.05 M KH2PO4 solution at pH 3.5) and Methanol in the ratio (32:68, v/v) at 1.0 ml/min flow rate. The effluent was monitored using a UV detector at 223nm, which provided the best chromatographic condition for the quantification of among analytes.

Result: Validation of the method was done according to ICH Q2 (R1) guidelines for accuracy, precision, specificity, system suitability and robustness which were found satisfactory. Linearity was observed for clobetasol propionate, chlorocresol and miconazole nitrate with correlation coefficients (R^2), >0.999. The recovery studies yielded results between 98% and 102%, indicating high accuracy. The relative standard deviation (%RSD) was found less than 2 for precision.

Conclusion: The developed HPLC-UV technique is simple, reliable, economic and suitable for routine analysis of cream containing clobetasol propionate, chlorocresol and miconazole nitrate.

Poster 11: Choudhury et al., SNU Kolkata

Exploring the Bioactivity of *Justicia adhatoda* Essential Oil: Implications for Nano-Enabled Therapeutic Applications

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Essential oils derived from medicinal plants have gained significant attention due to their diverse biological activities and potential role in combating multidrug-resistant microorganisms. The present study focuses on the extraction, chemical characterization, and biological evaluation of essential oils obtained from the medicinal plant *Justicia adhatoda* (Basak). Essential oils were extracted from plant leaves using the hydro-distillation method, followed by solvent removal using a rotary evaporator. The biological potential of the essential oils was assessed through antioxidant, oxidative stress, and antimicrobial studies, with oxidative stress assays conducted on bacterial cells. Antimicrobial efficacy was evaluated against clinically relevant strains of *Escherichia coli* using minimum inhibitory concentration (MIC) assays and through comparative analysis with standard antibiotic such as tetracycline. The results were used to assess the relative antibacterial effectiveness of the essential oil. Further studies are planned to investigate combination therapy and determine the fractional inhibitory concentration index (FICI) to evaluate possible synergistic interactions. In addition, future work includes the development of nano-emulsions from the extracted essential oils, followed by structural characterization and evaluation of their antibacterial and wound-healing activities, with the expectation that nano-formulation may enhance bioavailability and therapeutic efficacy.

Poster Session: Plant-Based Therapies

Poster 12: Mandal et al., Presidency University

Cardiac immunotoxicity-induced heart muscle calcification in adult comorbid rats and its amelioration with fisetin, a natural plant derived bioactive compound

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Introduction: The confluence of obesity and diabetes significantly increases cardiovascular risk, primarily by driving pathological cardiac calcification via immunotoxicity. Calcific deposition causes myocardial stiffness, impaired contractile function, and heart failure. While the mechanisms remain elusive, we identified that dysregulated lipid metabolism and chronic inflammation trigger osteogenic differentiation, activating pro-calcific signaling pathways such as RUNX2. Fisetin, a flavonoid with potent anti-inflammatory and senolytic properties, was hypothesized to counteract this immunotoxicity.

Methods: We investigated the therapeutic potential of fisetin in attenuating cardiac calcification using high-fat diet- and streptozotocin-induced obese diabetic rat models. The study assessed cardiac function using echocardiography, calcific burden using CT scan and histology, and molecular markers of cardiac injury (cTnT), infiltrated immune cells, and osteogenesis using histological staining, IHC, and WB to evaluate the efficacy of fisetin in modulating inflammation-driven mineralization.

Results: Fisetin administration significantly reduced myocardial mineralization and suppressed the RUNX2-mediated osteogenic shift in comorbid rats by reducing inflammation levels. Furthermore, treatment ameliorated cardiac functional defects and reduced cardiac injury markers (cTnT) compared with untreated comorbid groups. Histological assessment confirmed a marked reduction in the calcific burden, suggesting a reversal of pathological remodeling.

Conclusion: These findings highlight fisetin as a promising intervention for mitigating diabetic cardiovascular complications by targeting the immunotoxic pathways of heart muscle calcification. Given the limited therapies for cardiac calcification, this study warrants clinical exploration of fisetin as a specific therapeutic strategy for preserving cardiac health in patients with metabolic disorders.

Poster 13: Bala et al., Subhami Biopharma

Genistein: A Natural Compound with Therapeutic Promise

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Introduction: Genistein, a naturally occurring isoflavone predominantly derived from soy and other legumes, has emerged as a phytochemical with multifaceted therapeutic potential. Structurally similar to mammalian estrogen, genistein exerts phytoestrogenic effects by binding to estrogen receptors, thereby modulating hormonal activity while supporting cardiovascular, bone, and cognitive health. Beyond hormonal interactions, genistein demonstrates broad bioactivity, including anti-inflammatory, antioxidant, anti-apoptotic, and antiproliferative properties.

Methods: Mechanistically, genistein modulates key signaling pathways such as NF-κB, Nrf2, PI3K/Akt, MAPK, and AMPK, regulating reactive oxygen species (ROS) levels and mitigating oxidative stress—a recognized contributor to chronic diseases including Parkinson's disease, Alzheimer's disease, diabetes mellitus, cardiovascular disorders, and various cancers. Nano-encapsulation strategies have been explored to improve genistein's solubility, stability, and bioavailability, thereby enhancing its therapeutic efficacy.

Results: Preclinical studies in both in vitro and in vivo models have underscored the neuroprotective, cardioprotective, and anticancer efficacy of genistein. For instance, genistein attenuates neuronal apoptosis and oxidative damage in ischemic stroke models by activating Nrf2/HO-1 and suppressing NF-κB, while inhibiting tyrosine kinase-mediated proliferative signaling in cancer cells. Nano-encapsulated forms of genistein have demonstrated enhanced cellular uptake and stronger biological responses compared to conventional formulations.

Conclusion: Clinically, it has shown promise in alleviating postmenopausal osteoporosis, improving bone mineral density, reducing hot flashes, and enhancing cognitive function, with minimal adverse effects when administered within controlled dosages. Despite these benefits, genistein's clinical translation faces challenges due to limited water solubility and variable bioavailability.

Poster 14: Chakraborty et al., Heritage Institute of Technology

Role of 1,8-Cineole-rich Small Cardamom Extract as an Antimicrobial Agent -An approach to improve shelf life of Prawn

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1,8-Cineole serves as an important bioactive compound used mainly as an antioxidant. Apart from that it also have various properties like antimicrobial properties,Respiratory relief,delays aging processes and many more.. This report deals with examining the role of antimicrobial activity of the cineole-rich small cardamom seed extract on branded Indian Prawn by checking its microbial safety. Small Cardamom (*Elettaria cardamomum*) is one of the most widely consumed spices all over the world and is highly valued for its traditional use. From ancient times it was used for the treatment of various diseases. It also finds its use in the treatment of soared throat, coughing and digestive issues. Supercritical Fluid Extraction technology has been used to obtain the 1,8-cineole-rich extract from the small cardamom seeds using previously optimised parameters (pressure 200 bar, at 50 C for 90 min). The extract was applied to the surface of the prawn and kept in air tight containers for a series of days along with a control which was without extract. 1g of prawn from each container was taken out and weighed each day, and the microbial count was measured after 24 h of incubation in terms of Colony Forming Units (CFU)/g using the pour plate method. Results indicated a significant reduction in microbial growth, suggesting that the extract effectively delays spoilage and enhances the shelf life of the prawns. This study demonstrates the potential of natural plant-derived compounds like 1,8-Cineole as sustainable and effective alternatives to synthetic preservatives in seafood preservation. Further research may open up new avenues for their application in commercial food safety and packaging industries.

Keywords: 1,8-Cineole, Small Cardamom, Antimicrobial properties, Prawn preservation, shelf-life, Pour plate method

Poster 15: Dey et al., University of Calcutta

Comparative evaluation of aminoglycosides and phytoextracts individually and in combination against UTI pathogen as genotoxic as well as cytotoxic with emphasis on computational simulation

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Urinary Tract Infections (UTIs) are among the most common bacterial infections globally, commonly resulting from multidrug-resistant (MDR) uropathogens like *Escherichia coli* and *Klebsiella pneumoniae*. The onset of antibiotic resistance against traditional aminoglycosides has stimulated the investigation of new and additional therapeutic approaches. This research provides a comparative analysis of aminoglycosides like doxycycline and streptomycin and some phytoextracts (plumbagin and allicin)—singularly and synergistically—against UTI pathogens, with an integrated consideration of genotoxic and cytotoxic implications. The experimental part consists of antimicrobial susceptibility tests, minimum inhibitory concentration (MIC) determination, thin layer chromatography, gel electrophoresis, UV Spectroscopy, Cup- plate assay and Biofilm assay. Parallel computational simulations, such as molecular docking and molecular dynamics (MD) analysis, were used to explain the binding affinity and interaction stability of active phytocompounds with bacterial ribosomal RNA and membrane proteins, compared to reference aminoglycosides. The computational results were validated with in vitro data to forecast synergistic or antagonistic effects. Early results show that some phytoextracts augment aminoglycoside activity by enhancing membrane permeability and target affinity with reduced genotoxic and cytotoxic hazards compared to aminoglycosides in isolation. The study underscores the potential of **phyto-antibiotic combinations** as sustainable therapeutic options that minimize side effects and mitigate resistance development. In addition, computational simulations provide a predictive platform for fine-tuning such combinations prior to confirmation in vivo. This combined biochemistry and bioinformatics-based strategy offers a promising avenue for the creation of more effective, safer antimicrobial treatments for recurrent and drug-resistant UTIs.

Keywords: aminoglycosides, phytoextracts, minimum inhibitory concentration, cup- plate assay, molecular docking

Poster 16: Das et al., Swami Vivekananda University

In-silico **evaluation and structure-based screening of plant-derived anticancer peptides targeting NF-κB, COX-2, and EGFR**

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Bioactive peptides of plant origin have become therapeutic scaffolds with anticancer effects, but this potential has not been sufficiently exploited to determine their capacity to selectively regulate several oncogenic signaling proteins in combination. In the present study, fourteen peptides in plant extracts were screened in silico against three large cancer-related targets, which were NF-κB, COX-2, and EGFR. Peptides were tested in terms of physicochemical characteristics, ADMET activity, binding constant, and structural interactions. Docking with AutoDock Vina revealed that peptide 6 was the highest-binding multi-target, with docking energies of -6.1 kcal/mol (NF-κB), -10.0 kcal/mol (COX-2), and -7.8 kcal/mol (EGFR). Profiling of interactions revealed the presence of hydrogen bonding, hydrophobic contacts, as well as electrostatic interactions between peptide 6 and conserved active-site residues. The ADMET analysis predetermined acceptable solubility, low neurotoxicity, and positive indices of pharmacokinetics. To analyze stability, a 100 ns GROMACS simulation in CHARMM36 of the COX-2–peptide 6 complex was performed. It showed reduced RMSD sensitivity (0.22–0.30 nm), suppression of RMSF fluctuations in flexible loops, and a smaller Rg distribution, representative of a stabilized conformational ensemble. Additional analysis demonstrated suppression of large-scale domain motions during peptide binding through principal component and free-energy landscape analysis. Taken together, these findings predict that peptide 6 is a promising multi-target anticancer scaffold with the potential to stabilize and inhibit NF-κB, COX-2, and EGFR simultaneously, warranting experimental verification for translational cancer treatment.

Keywords: Molecular Docking, ADMET, Molecular Dynamics, Plant Biopeptides, NF-κB, COX-2, EGFR, and Peptide Therapies.

Poster 17: Sarkar et al., SNU Kolkata

Assessment of *Justicia adhatoda* Leaf Extract for Natural Food Preservation: Antimicrobial Activity Against Spoilage Microorganisms

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Food spoilage in citrus fruits such as orange mainly occurs due to the growth of bacteria and other microorganisms. The widespread use of chemical preservatives in the food industry has raised concerns regarding their potential health and environmental impacts, leading to increased interest in natural, plant-based alternatives. *Justicia adhatoda* (Basak) is a medicinal plant known for its antibacterial properties due to the presence of bioactive compounds such as alkaloids and flavonoids. Phytochemical analysis was performed to identify the major bioactive constituents present in the Basak leaf extract. In the present study, the extract was prepared using water as a solvent and evaluated for its antibacterial activity against bacteria isolated from spoiled orange samples using the agar well diffusion method. The results showed clear zones of inhibition against spoilage-associated microorganisms, indicating effective suppression of microbial growth. These findings suggest that Basak leaf extract possesses significant antibacterial potential and may serve as a natural preservative agent. Further studies are planned to evaluate its preservative activity on orange pulp and to assess its effectiveness in extending shelf life, and it is expected that these investigations will provide additional evidence supporting its application in natural food preservation.

Poster 18: Sengupta et al., SNU Kolkata

Exploring Agricultural and Biomedical Applications of a Soil Isolate

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Soil bacteria play a crucial role in maintaining terrestrial ecosystem balance and agricultural productivity. In this study, a soil bacterium that produces pigment was isolated and its multifunctional potential was biochemically characterized. The isolate showed a strong capacity to promote plant growth by synthesizing the phytohormone Indole-3-acetic acid (IAA). Additional characterization verified the production of siderophores on Chrome Azurol S (CAS) agar, ammonia generation, positive zinc solubilization activity, and phosphate solubilization on Pokrovsky's and NBRIP agar (clear halo formation). Together, these characteristics demonstrate its potential as a sustainable Plant Growth Promoting Rhizobacteria (PGPR), promoting nitrogen supply, nutrient availability, and phytopathogen biocontrol.

Apart from its capacity to stimulate plant growth, the isolated bacterium was investigated for its potential to produce bioelectricity in a pigment-assisted Microbial Fuel Cell (MFC). By acting as an electron shuttle, the bacterial pigment enhances electron transfer and generates stable bioelectricity. This energy is utilized to operate a wearable; self-powered patch designed for continuous immune monitoring.

The patch selectively detects different inflammatory cytokines by using graphene oxide microneedles to access interstitial fluid. Measurable voltage changes result from their interaction with graphene oxide, which modifies its electrical characteristics. Without the need for external power, these signals are recorded, processed, and wirelessly transmitted to allow for early, portable, and real-time immune status evaluation.

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