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IMPRINT

NIBMG in Bits & Bytes

NIBMG building , PC: Aditya Agarwal

DESIGN BY VINAY, JYOTISHMAN & DIVYANK

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FROM THE RESEARCH OFFICE

Dr. Alpana Dave

With the beginning of the financial year, we also welcomed new members to NIBMG family. Dr. Dilip Kumar joined NIBMG as an Assistant Professor while Dr. Soumitra Mohanty and Dr. Kaushik Das joined us as Ramalingaswamy fellows. Dr. Kumar's research interest lies in understanding the mechanism of drug resistance in acute myeloid leukemia and device therapeutic strategies to overcome the same. In the new projects initiated, Dr. Mohanty will work towards understanding phylonephritis in diabetes and potential ways of treatment while Dr. Das will be working to investigate the biology of endothelial extracellular vesicles secreted in response to different concentrations of thrombin. In addition, Prof. Sandeep Singh received a grant from Department of Biotechnology to further his work on JAK-STAT signalling in modulating plasticity in oral cancer. Dr. Raghavendra has also initiated a DBT funded project to unravel the ceramide mediated immune response thorough NLRP3, an important component of the innate immunity pathway. In another new DBT-funded project, under Dr. Samsiddhi Bhattacharjee, will use an integrative genomics approach to discover regulatory variants using datasets for type-2 diabetes and coronary artery disease. Prof. Analabha Basu, in another DBT-funded project, will be taking forward the genomic discoveries in Indian population by correlating them with potential functional implications to identify the expression Quantitative Trait Loci. We were also privileged to have Secretary DBT, Dr. Rajesh Gokhale visit us and inaugurate our BSL3 facility and laid the foundation stone of our animal holding facility.

In this issue of IMPRINT, we talk to Prof. Analabha Basu about his views on the research ecosystem in India and some of his personal experiences. We continue to highlight the ongoing research of our PhD students in the Research Spotlight section and our publications in the past few months are showcased in the In Public Eye segment. We are also thankful to Dr. Anup Mazumder for contributing a short piece on the recently inaugurated BSL3 facility. Taking into account feedback received from our readers, we have included a small segment on science fun facts; we hope you like it. And finally, be ready to be amazed by the creativity of our students and staff in the Creative Corner section.

Enjoy reading!

SCIENTIST TALKS

Cruising with Analabha

Q1 What motivated your shift from statistics to genetics, and what differences did you notice between US and Indian academia? Why did you decide to return to India and join NIBMG?

I don’t view my shift from statistics to genetics as a true transition, as both fields are deeply interconnected. Genetics, from its early days with Mendel's laws, has always been closely tied with statistics. Pioneers like Fisher, who is also a key figure in statistics, illustrate this connection. Genetics has always had a strong quantitative component, which has allowed us to make predictions and validate theories with precision.

My interest in population genetics was driven by a curiosity and a desire to integrate my interests in history, archaeology, and social science into my work. Population genetics provides a platform to combine these diverse interests, which I couldn’t explore traditionally.

Comparing academic environments, I noticed significant differences in resources and culture between India and the US. For example, access to advanced technology was far more prevalent in the US. Moreover, while administrative hurdles can be less in India, the US offers a more mature framework for research. The culture of extreme professionalism in US institutions, particularly in the recruitment process, was a noteworthy experience.

I didn’t return to India with a permanent position initially; instead, I took a fellowship opportunity, motivated by a deep sense of belonging and the belief that India is currently the best place for cutting-edge research in population genetics. Despite the fantastic experiences in the US, I felt a strong pull to contribute to the growth of science in India, driven by the country’s unique diversity and research opportunities.

Q2 Have you faced any bias or challenges in collaborating with researchers from different cultural or national backgrounds, especially when dealing with sensitive topics like population genetics?

Challenges are always present, especially when cultures differ. In the USA, scientists often naturally adopt a collaborative mindset, essential for large projects. This approach dates to significant initiatives like the Manhattan Project and the Human Genome Project, which involved numerous institutions globally. American scientists seem more comfortable and culturally inclined to engage in large-scale collaborations. In India, we face hurdles in recognizing individual contributions within large projects. Evaluating someone's role for promotions or acknowledging their work beyond just the first or corresponding author in a paper remains challenging.

This lack of clarity can discourage participation in big projects. Additionally, the US culture of professionalism, commitment, and accountability complements their collaborative efforts.


PC: Vinay More

While collaboration is not absent in India, it often relies on personal relationships. My experiences in India have been enriched by strong personal connections, but forming successful collaborations with strangers, as commonly seen in the US, seems rare here.

While collaborating on sensitive topics, I have not faced significant challenges. However, fears and differences of opinion do arise and need resolution. In population genetics, working with remote or less accessible populations requires permissions that can delay progress. Uncertainty about the information the population will provide and concerns about revealing sensitive data are common issues. Despite these challenges, we have managed to resolve differences in opinion successfully

Q3 Drawing a parallel to Svante Pääbo's groundbreaking work on ancient DNA and the interbreeding between Neanderthals, Denisovans, and modern humans, how do you see the integration of ancient DNA studies with contemporary genomic research enhancing our understanding of human evolution and health? What future directions do you envision for combining these fields to address complex genetic questions?

SCIENTIST TALKS

Cruising with Analabha

First of all, I think one should not draw a parallel. Svante's work was truly groundbreaking. His research on ancient DNA and the interbreeding between Neanderthals, Denisovans, and modern humans is absolutely fascinating. The major contribution of ancient DNA studies is that not only understand the biology of ancient humans but also the history, archaeology, and sociology at that time, even though the person is not present in flesh and blood. One downside being that the equatorial belt is considered to have lesser ancient DNA but this belt also has enormous amount of information which is not explored yet.

In terms of future directions, I believe there are many exciting possibilities. The hustle in science has shifted towards Biology mostly because of Genetics. From the Human Genome Project to Genome wide studies, we have come a long way. Looking ahead, combining historical population studies with contemporary genomic research can help us understand the natural history of diseases. We need to study human diseases more longitudinally and retrospectively.

Q4 Considering the potential and risks of emerging technologies, do you think some experiments should be off-limits, or is it unrealistic to impose moral limits on technological advancement?

See, I mean, this is extremely difficult to answer. You're asking me to make a prediction on something which I'm possibly not an expert in, and I don't think there is any existing expert in this world. However, there are certain experiments that people have put off. As we evolve in science and technology, our institutions also need to evolve. Institutions provide frameworks which may need updating as technology advances. What is crucial is understanding that while we live with our primordial emotions, institutions must evolve to keep pace with technological advancements. We need strong discussions and debates about where to set limits. These discussions must ensure that we do not encroach on areas detrimental to people while still benefiting from scientific progress. Unfortunately, history shows that there have been instances, such as during World War II, when institutions failed to provide necessary oversight, leading to unethical practices. Technology presents a challenging question, but it requires continuous dialogue between social scientists, humanities experts, and technology developers. There must be a unified approach to development, integrating technological and ethical considerations, rather than allowing profit motives alone to drive research.

Q5 Some critics argue that genomic research on populations can be misused to support pseudoscientific claims of racial superiority or inferiority. How do you address these ethical concerns in your work?

DD Kosambi once said that to infer history, one must do so without prejudice.

When discussing upper and lower castes or addressing population genetics involving African Americans and White Americans, racial identification becomes essential in the context of biomedical genomics.

Although ethnicity, rather than race, is often emphasized, genetics can still reflect social stratification. For example, in India, a child of an upper-caste father and lower-caste mother may be identified as upper-caste if acknowledged by the father; otherwise, the child is considered lower-caste. Here, genetics remain constant, but social identity changes based on practices that impact health data. Relating genetics to health and environment requires scientists to consider these factors without prejudice. It's crucial to honor individual sensibilities when working on such social platforms. Therefore, collaboration with social scientists and humanities experts is necessary to ensure respectful and effective handling of these sensitive issues. When addressing ethical concerns, it's crucial to ensure all data is deidentified. First, detach yourself from the individual, treating the data as a phenomenon. This approach requires dispassion, but if you discover something significant, there's an ethical duty to inform the individual. I usually de-identify reports and inform the population, advising them to consult a doctor if certain parameters are highlighted. Despite efforts to remain detached, full erasure from memory is challenging due to engagement in the work. Complexities must be handled case-by-case, considering the specific population. Balancing dispassion and sensitivity, and involving anthropologists or social scientists, is essential.

Q6 You have been involved in studies where you had to interact with the tribal populations of India. How was that experience? How are they different from us? Did you learn anything new from them?

It has been fascinating and the most humbling experience of my life. No matter how much homework you do, visiting these communities will always be completely different from what you expect. So, I went to this village for work and I posed this hypothetical question to the village head, "Suppose I stay back and don't go back anymore, what would you do?" I said the utmost I could do was to teach in a school but for that I would need a land where I could live. I expected him to be perplexed or to say that it wouldn't be possible. Instead, he took none of the options and said that they would first debate among themselves and might welcome me if they found me suitable to live with them. They would then assign me a piece of land where I could set up a house and cultivate it. This democratic process of accepting someone into their community was completely unexpected. This was a very heartwarming and enlightening experience. It's fascinating to learn how such communities accommodate individuals through a democratic and collective decision-making process.

SCIENTIST TALKS

Cruising with Analabha

Q7 From your perspective as an expert in evolutionary biology and genomics, how do you perceive the relationship between religious beliefs and scientific explanations of human origins, and can science and religion coexist harmoniously?
Evolutionary biology is a broad field, but from a genetics perspective, it provides the strongest physical evidence of evolution. Genetics allows us to trace material inheritance through generations, species, and even to the origin of life. This molecular basis of inheritance helps us understand evolution without relying on supernatural explanations. However, the evolution of thought processes and consciousness extends beyond molecular studies. Human imagination and cognitive development are key to understanding our existence and consciousness. Imagination plays a crucial role in science, as it helps us conceptualize phenomena that are not immediately visible, like molecular physics or astrophysics. It's essential to respect diverse perspectives and recognize that while science questions and explores, imagination and interpretative aspects of human experience also contribute to our understanding.

Q8 With the increasing influence of pharmaceutical companies in biotech and precision medicine, how can research institutes attract and manage private funding in early public-private partnerships? Will these collaborations benefit academic research or risk being driven by profit motives? How can we balance innovation with integrity?
I may not be fully qualified to answer this, but science can be compared to a knife, a tool that can be used for good or ill. Power is similar; it's like a double-edged sword that must be handled with care. How we manage this power, whether we create a symbiotic environment or allow misuse, is something only the future will reveal. In our current scenario, industry will inevitably be profit-driven, which comes with its own costs and values. Profit can act as an incentive and a driving force, but maintaining integrity is crucial. We must have good rational selves and strategies in place. These discussions must lead to the development of robust institutions. Balancing profit and ethical considerations is essential for future progress.

Q9 As a fellow of prestigious academies like the Indian Academy of Sciences and the West Bengal Academy of Science and Technology, how do these organizations contribute to the scientific community and influence policy-making in India?
Honestly, the contribution is very limited. I myself spend very little fraction of my academic time as a member of these academies and it should not be like that. Ideally, I should be more engaged and assigned more responsibilities within these organizations but unfortunately, the activities and potential of these academies are not being fully realized. These academies are really important for the scientific community and I wish that the members are more active so that the opinions and contributions of these academies are more widely recognized and considered.

Q10 How do systemic issues in education, like exam integrity and recruitment processes, affect the long-term progress of scientific research and societal well-being?
The issue will significantly impact us, as it's been a long-standing problem with substantial evidence. It’s crucial to address this and work towards a solution, even if we can't completely eradicate it. From my experience, I've seen a decrease in student diversity and access over time, which reflects broader societal inequalities. Many students from diverse backgrounds face substantial challenges, and opportunities have become increasingly limited to a privileged few. We need to make efforts to provide more equitable access and opportunities from an early stage to address these disparities.

Q11 Could you share some insights into the strategies and approaches you use to attract and secure large research grants? What advice would you give to young researchers to improve their chances of success in grant applications?
I don't have specific strategies. I have always tackled big problems and secured big grants naturally. My approach has always been to think big within my field. Contrary to what you might think, most of my career has been without grants, by design. I enjoy analyzing vast amounts of data that others have generated to solve their problems and making that information public. There’s a wealth of untapped data out there. That was my plan, but I ended up writing a big grant, which isn't typically my style. I think about big things and big things cannot be achieved with small minds; it’s simple: just think big. I’m not judging big problems versus deep problems—both are significant. However, big problems require substantial grants, and in reality, you often come up short.

Q12 We know you have a passion for travel and trying out different cuisines and sweets. Could you share some of your favorite places you have visited and memorable dishes you have had both in India and around the world? What joy does exploring new places and flavors bring you, and how do these experiences influence your perspective on life and work?
Talking about cuisines, I have a favorite story. So me and my wife were travelling to Machu Picchu and we landed in Peru. We arrived in Lima very late at night, hungry and excited to try the local food. It was past midnight and yet the place was very lively. My wife ordered a soup and I ordered a local delicacy called “Ceviche” which is basically a marinated raw fish. The soup was fantastic, and when my wife tried my dish, she loved it so much that we ended up exchanging our meals, and I never got it back! Another interesting experience was in Thailand, where I tried eating fried insects. Despite cultural preconceptions, I found them surprisingly good.

RAPID FIRE

Cruising with Analabha

In India, during my stay in the tribal regions of West Bengal, I tried this traditional dish where they cook the eggs of ants which was extremely hot and terribly sour and you eat it with lots of rice. It was just fantastic! The wonderful thing about this is how people in remote areas can actually make the most out of minimal resources.

The joy of exploring new places, meeting new people, and trying new flavors is enormous. Travelling is an integral part of my life and I am fortunate that is an integral part of my work as well. The only challenge is managing commitments before starting my travels, especially when visiting remote areas with limited connectivity. Overall, travel provides endless joy and learning opportunities to me.

Rapid Fire:

Q1: If you weren't a geneticist, what career would you have pursued?
I would have loved to be an artist or a footballer, but I realized I don't have the talent for either. I still have various interests, but I consider myself a scientist using genetics, statistics, history, linguistics, and social science as needed.

Q2: What's your favorite pastime or hobby when you're not immersed in research?
I used to enjoy painting, but now I mostly read books, travel, and indulge in procrastination, sometimes reminiscing about things which were a part of our discussion as well.

Q3: If you could have dinner with any three scientists, dead or alive, who would they be?
Charles Darwin, Richard Feynman and Albert Einstein.

Q4: If you could time travel, which era or time period would you visit first?
If I could time travel, I would go back to the 1960s. I want to be a youth in the 60s and 70s.

Q5: What's the best piece of advice you've ever received?
Best piece of advice I have ever received has never been in sentences. It has always been through words and deeds of people. It is to stay humble and work hard.

Q6: What's your favorite childhood memory?
There are many memories, but one stands out. I unfairly hit a friend during an argument, and he got hurt. As kids, my cousin and I panicked, thinking he might have died. When we returned home, we saw my friend with his father. My friend and I hugged and made up, and I was relieved he was okay. My father and uncle handled the situation, and it ended on a lighter note. It was a funny situation in retrospect, and I learned an important lesson from it.

Q7: What's the last book you read?
Nowadays, I often forget book titles. Currently, I'm reading a book on cells by Siddhartha Mukherjee. The last one I read was "The Theory of Everything." It's a beautiful book.

Q8: If the multiverse theory is true, what version of yourself in an alternate universe would you be most curious to meet and why?
This is a situation I never imagined myself in. I sometimes wonder if there's a multiverse where parallel universes evolve. Even if they don't evolve simultaneously, they might have similar outcomes. In one of these universes, I could still be sitting here, being interviewed by three people. If there's only one Big Bang, I might still end up in a similar scenario. It could be kind of boring. However, if given a chance, a parallel universe might not have a version of me at all.

Q9: What's the most bizarre thing you've ever eaten and regretted?
Puchkas in Delhi might be the one that I had consciously eaten and regretted it.

Q10: What's your approach to maintaining a healthy lifestyle?
I do not maintain a healthy lifestyle but I do like swimming. I think my way of keeping myself healthy is to keep myself happy and not deprive myself of too many things.

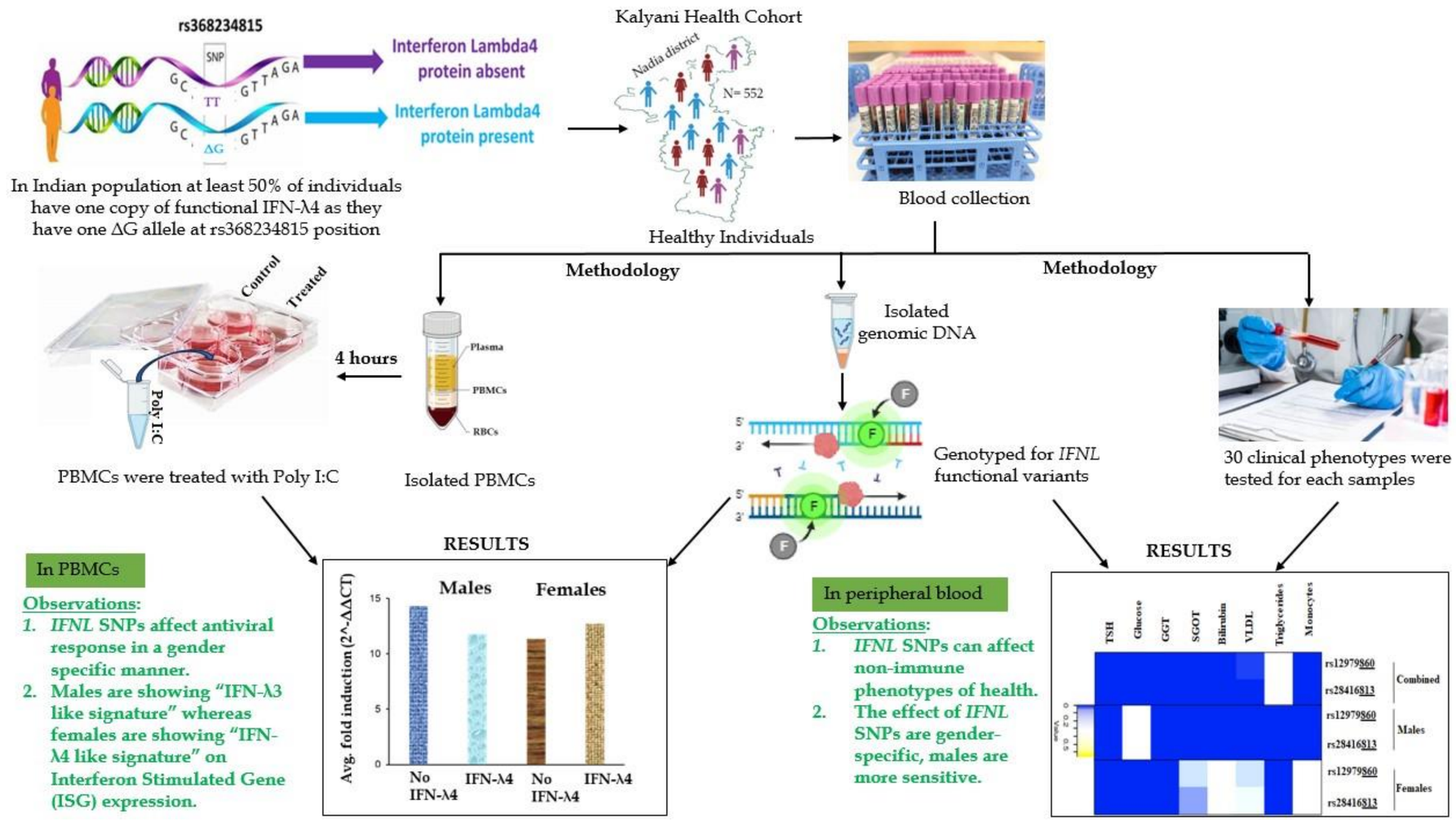
Q11: Which sport do you enjoy the most, and if you can share a funny incident from your experience playing it?
Was answered previously. As a child I liked playing chess too.

PC: Vinay More

RESEARCH SPOTLIGHT

Interferon Lambda 4: Protection or Risk for Indian Population?

Debarati Guha Roy, PI: Dr. Sreedhar Chinnaswamy



In viral infection the antiviral response in majority of the cells is generated by interferons (IFNs) mainly Type I and Type III IFNs and this antiviral response varies between individuals. For example, an RNA virus infection like HCV infection, 80% of acute infection cases develop into chronic cases. Genome wide association studies (GWAS) showed that polymorphisms on type III *IFN* or interferon lambda (*IFNL*) locus in the host genome is associated with the response to clear HCV infection either spontaneously or by treatment. In 2013, the discovery of IFN-λ4, a new member of type III IFN family, happened as a follow-up to the GWAS studies on HCV. The ΔG allele of a novel dinucleotide polymorphism rs368234815 (TT>ΔG) in the distal promoter of the *IFNL3* gene gives rise to the functional full-length IFN-λ4 protein consisting of 179 amino acids. The TT allele at rs368234815 terminates the ORF for IFN-λ4 expression. IFN-λ4 is a paradoxical cytokine as the ΔG allele of IFN-λ4 generating SNP rs368234815 was found to be associated with poor clearance of HCV infection, although it has in vitro antiviral activity like other type III interferons. Not only HCV, the SNP was found to be associated with multiple diseases like HIV infection, bronchiolitis, SARs-CoV2, fibrosis, cancer etc. but the molecular basis of the associations is yet to be explored. It is obvious from the above background that the locus, particularly the variants are influencing a lot of diseases but the *in vivo* role of the SNPs as well as IFN-λ4 is not clear.

In India around 50% of the population has at least one copy of IFN-λ4 but nothing is known about the effect of the SNP in the population. Hence, we conducted a population-based study to investigate the role of rs368234815 that generates IFN-λ4, in shaping immune and nonimmune responses in healthy individuals. Upon stimulating the PBMCs of healthy donors with ds-RNA virus mimic poly I:C, we found that antiviral responses are going in opposite directions for male and females. Whenever at least one copy of IFN-λ4 is present in females it is generating higher antiviral response compared to the females without IFN-λ4, and the trend is exactly opposite in males. This finding is very novel in the field. We also discovered that the secreted level of IFN-λ3 is significantly more in males compared to females; this could be a compensatory mechanism for generating antiviral response in males. Hence, we demonstrated that IFN-λ4 could be providing protection to females more than to males upon viral infections. Not only immune response, in non-immune peripheral blood phenotypes like level of monocytes, SGOT, Triglycerides, Uric acid etc. we found distinct pattern of association with rs368234815 in males and females. However, these findings need further functional investigation to know how the genetic variant is affecting males and females differently and whether it is interacting with sex hormones or regulating epigenetic modifications.

RESEARCH SPOTLIGHT

Decoding the Mysteries of Liver Health: Insights from Ongoing Research

Deboprioyo Ganguly, PI: Dr. Priyadarshi Basu

In the world of medical science, understanding the liver's health is critical due to its essential role in detoxifying our bodies and aiding in digestion. We delve into a specific liver condition called hepatocyte ballooning, a hallmark of severe liver diseases like NASH (Non-Alcoholic Steatohepatitis) and NAFLD (Non-Alcoholic Fatty Liver Disease).

What is Hepatocyte Ballooning?

Imagine your liver cells (hepatocytes) swelling up like balloons. This abnormal enlargement indicates severe liver damage and is a critical factor in diagnosing and predicting the progression of liver diseases. Our research focuses on identifying specific genes that can predict this swelling, helping doctors diagnose and treat liver diseases more effectively.

The Key Players: Genes and Their Expressions

We have zeroed in on eight critical genes: CXCL10, KRT8, JUN, SPP1, FABP4, H2AFY2, HSPC157, and MFSD2. These genes show significant changes in their activity levels in patients with hepatocyte ballooning. By analyzing these changes, we can predict who is at higher risk of developing severe liver conditions.

Techniques and Findings

To analyze the data, we used Lasso regression, a statistical method that helps identify the most important predictors among a large set of variables. This technique allowed us to pinpoint the eight key genes associated with hepatocyte ballooning.

We then built predictive models using these genes and tested their accuracy in predicting hepatocyte ballooning. The models were compared against traditional markers like blood lipids and liver damage indicators to evaluate their performance.

Validation

Our findings were validated in laboratory settings using liver cell lines, specifically Huh7.5 cells treated with fatty acids. This step ensured that the gene expressions we observed were consistent and reliable.

Pathway to Better Diagnosis and Treatment

By understanding which genes are involved in liver damage, doctors can diagnose liver diseases earlier and more accurately. This research also opens the door to developing new drugs that target these specific genes, potentially stopping the disease in its tracks.

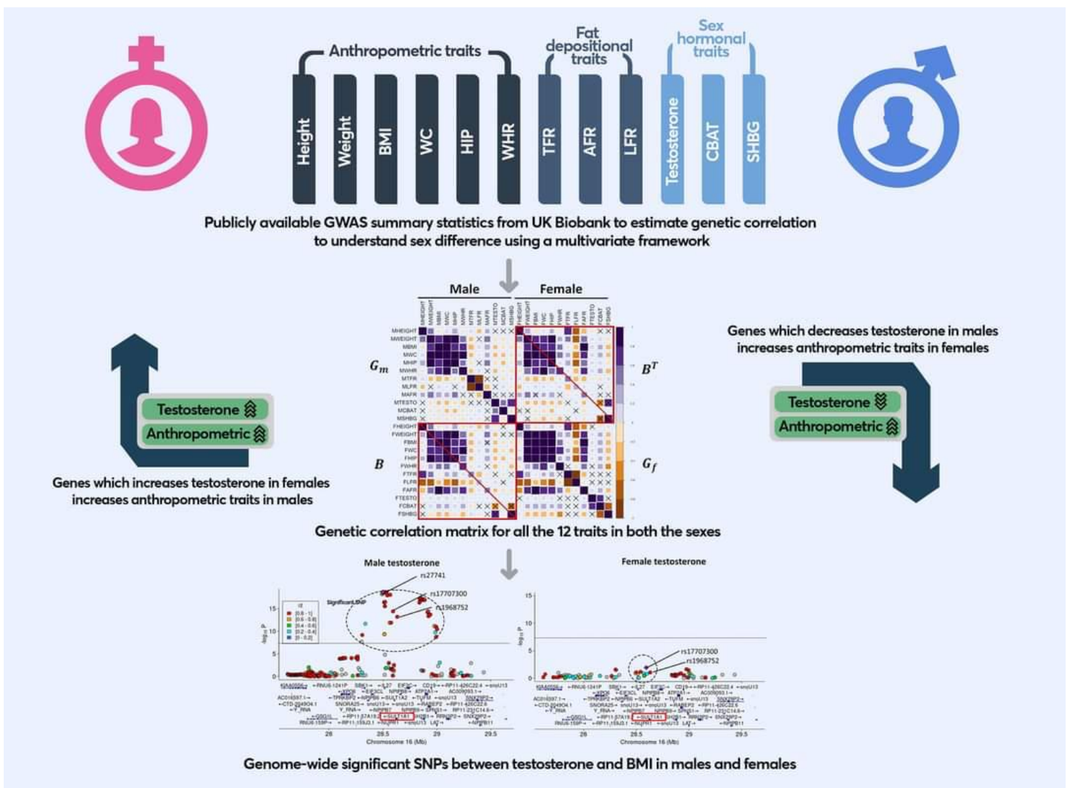
Moving Forward

Our work aims to enhance the understanding of liver diseases at a molecular level. In essence, this research is about peering into the microscopic world of genes to find clues that can lead to better health outcomes for people worldwide. It’s a fascinating journey into the heart of our biology, with promising prospects for the future of liver research.

IN PUBLIC EYE

Multivariate genetic architecture reveals testosterone-driven sexual antagonism in contemporary humans

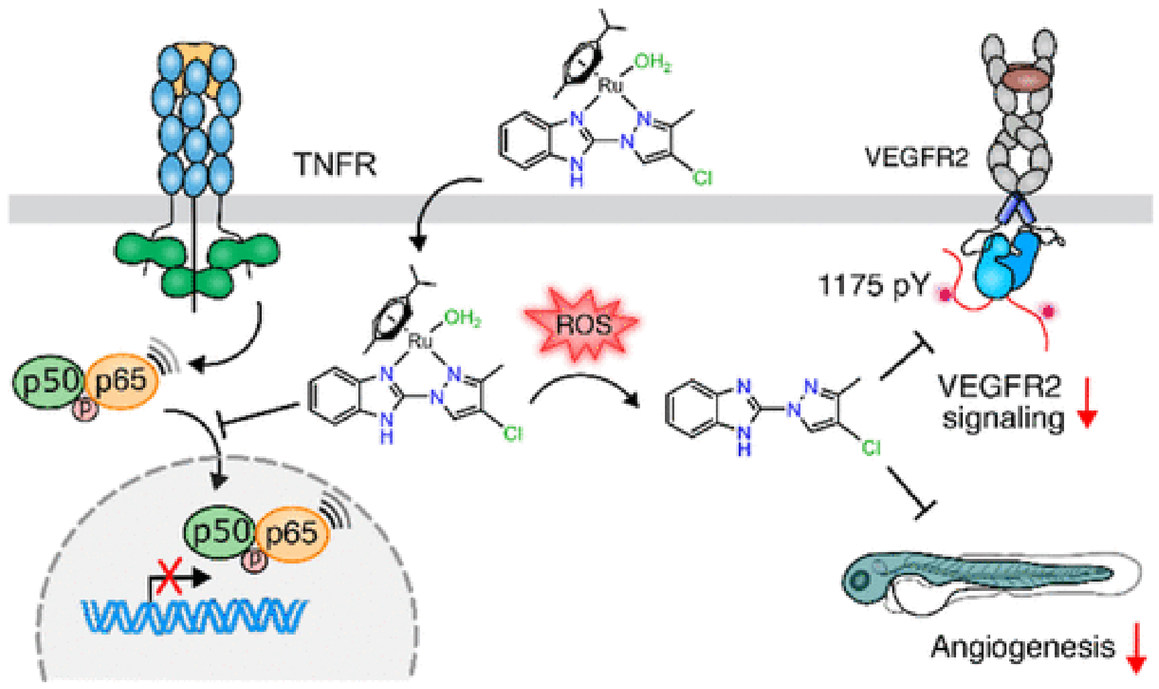
Chakrabarty A et al., Proc Natl Acad Sci USA. doi: 10.1073/pnas.2404364121



Males and females are known to share the same genetic architecture. However, sex difference (SD) is common in humans. In a recent work published by Dr. Anasuya Chakrabarty and Prof. Analabha Basu, SD was studied in the genetic architecture of 12 anthropometric, fat depositional, and sex-hormonal phenotypes. It was found that same set of alleles act in opposite directions in males and females. The effect was seen mostly with testosterone, that influences sexual antagonism in the anthropometric traits, at the genetic and phenotypic levels. Overall, the study explains the multivariate gene architecture in humans and explores sexual antagonism which contributes to the observed asymmetry in the shared genetic architecture between sexes.

Inhibition of NF-κB-Mediated proinflammatory transcription by Ru(II) Complexes of Anti-Angiogenic Ligands in Triple-Negative Breast Cancer

Chakraborty A et al., J Med Chem., doi: 10.1021/acs.jmedchem.4c00169

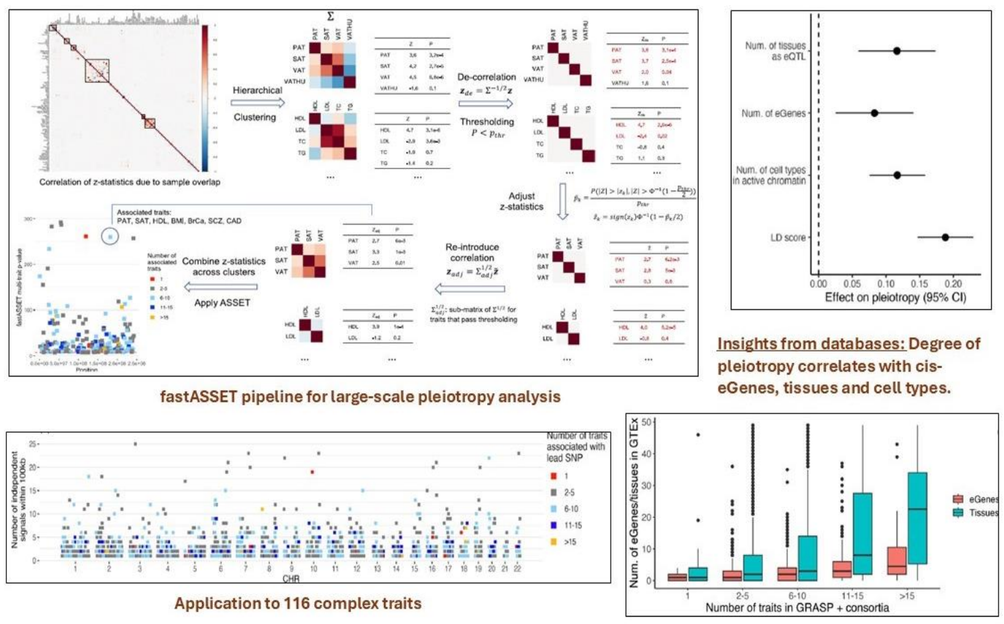


Nuclear factor kappa beta (NF-κB) is known to assist inflammation, proliferation, epithelial–mesenchymal transition, metastasis, and drug resistance in breast cancer. It upregulates the expression of vascular endothelial growth factor (VEGF) leading to angiogenesis. Dr. Moulinath Acharya in collaboration with IISER Kolkata, identified the role of Ru(II) complexes of methyl- and dimethylpyrazolyl-benzimidazole N, N donors in inhibiting phosphorylation of ser536 in p65 and translocation of the NF-κB heterodimer to the nucleus. The methyl- and dimethylpyrazolyl-benzimidazole were found to inhibit VEGFR2 phosphorylation at Y1175, disrupting downstream signalling through PLC-γ and ERK1/2. The anti-angiogenic ligand demonstrated strong effects at 3 μM during embryonic growth in zebrafish model but no visible effect was seen in the adult phase.

IN PUBLIC EYE

Genome-wide large-scale multi-trait analysis characterizes global patterns of pleiotropy and unique trait-specific variants

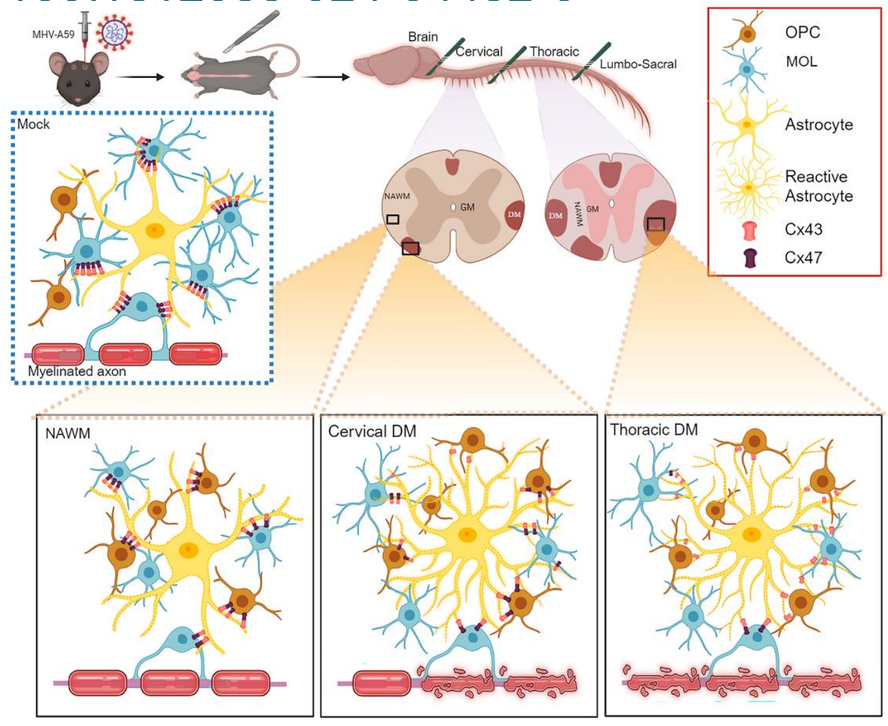
Guanghao Qi et al., Nat Commun 2024
DOI: 10.1038/s41467-024-51075-5



Dr. Samsiddhi Bhattacharjee and his group have developed fastASSET, an innovative method for mapping genetic pleiotropy—cases where single genes impact multiple traits. Using fastASSET, the researchers uncovered genetic patterns that explain why certain diseases often occur together, as they share underlying genetic factors. At the same time, they identify specific variants linked to individual traits, highlighting the complexity of genetic influences on health. The discussion emphasizes that these findings have real implications for personalized medicine, as understanding both shared and unique genetic factors could help tailor treatments more effectively. This approach shows how genes act in both broad, cross-trait ways and in precise, trait-specific roles, shedding light on how complex human traits and diseases develop. This work opens up new possibilities for therapies that address several conditions through their shared genetic pathways.

Neurotropic Murine β-Coronavirus Infection Causes Differential Expression of Connexin 47 in Oligodendrocyte Subpopulations Associated with Demyelination

Soubhik Das et al., Mol Neurobiol. 2024
DOI: 10.1007/s12035-024-04482-0

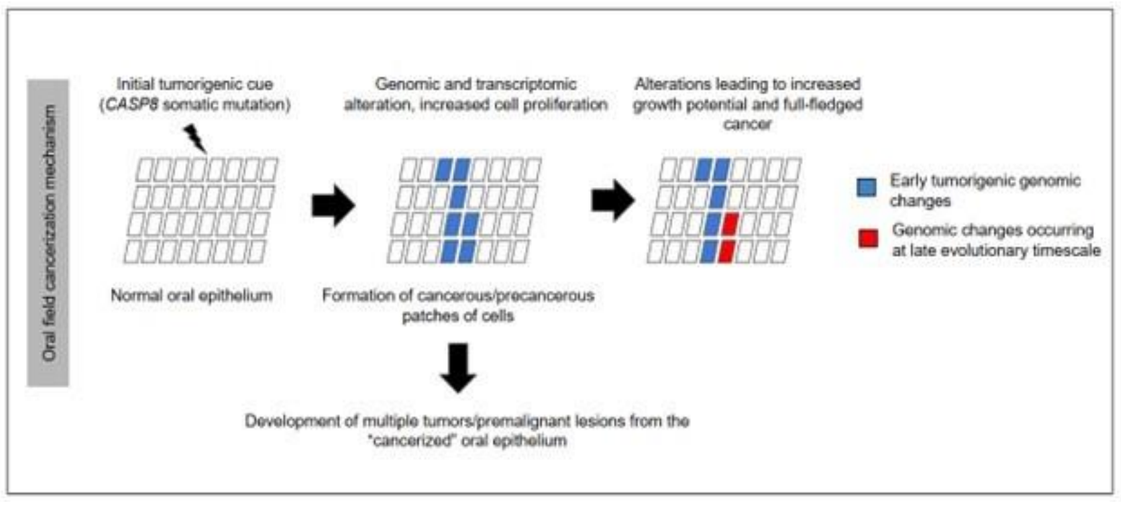


Gap junctions (GJs), intercellular channels made up of connexin proteins, help in the maintenance of oligodendrocytes and the myelination of CNS. Dr. Mahua Maulik and her team studied the spatiotemporal changes in connexin 47 (Cx47) along with its astroglial partner Cx43 to understand their relationship with the demyelination caused by mouse hepatitis virus (MHV). MHV is a beta-coronavirus and induces a multiple sclerosis-like disease. They found out that after the loss of Cx43 during infection, Cx47 are also degraded in mature oligodendrocytes in demyelinating lesions and surrounding “apparently normal" white and gray matter. Post-infection reemergence of Cx43 GJs is not accompanied by reestablishment of GJs with astrocytes as Cx47 GJs fail to form. The study further describes that the regional differences in demyelination in spinal cord correlate with the levels of Cx47 expression, which proves that there exists a mechanism of progressive demyelination even after viral clearance.

IN PUBLIC EYE

Multi-regional genomic and transcriptomic characterization of a melanoma-associated oral cavity cancer provide evidence for CASP8 alteration-mediated field cancerization

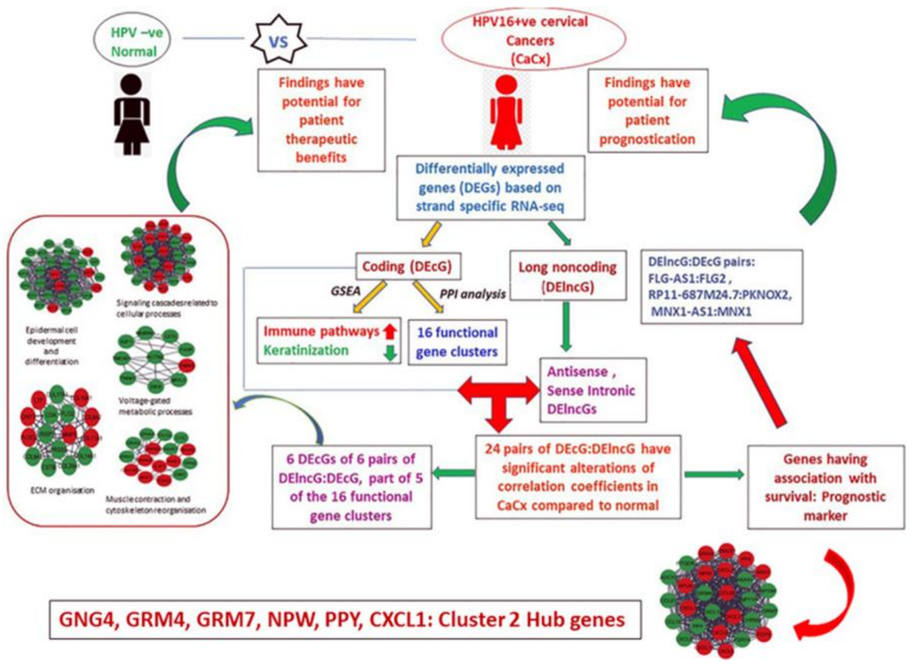
Shouvik Chakravarty et al., Hum Genomics 2024
DOI: 10.1186/s40246-024-00668-8



Oral Squamous Cell Carcinoma (OSCC) is a leading cause of mortality among the Indian population. Carcinogenic stimulants, such as smokeless tobacco gives rise to pro-tumorigenic alterations, leading to localized cancerous “patch” in the normal oral epithelia, a phenomenon known as field cancerization. Over time, these patches or fields can accumulate genomic alterations and transcriptomic dysregulation. Dr. Nidhan K Biswas and his team at NIBMG have tried to understand the evolution of field cancerization in OSCC. They performed whole exome sequencing (WES), genome-wide copy-number profiling and transcriptome sequencing from an Indian OSCC patient displaying multiple oral tumours and dysplastic lesions, followed by in-vitro validation in OSCC cell line. Their study revealed early CASP8 somatic alteration as a key event in the initiation of field carcinogenesis.

Biological and clinical relevance of correlated expression levels of coding and long noncoding RNAs in HPV16 positive cervical cancers

Abhisikta Ghosh et al., Hum Genomics. 2024
doi: 10.1186/s40246-024-00660-2



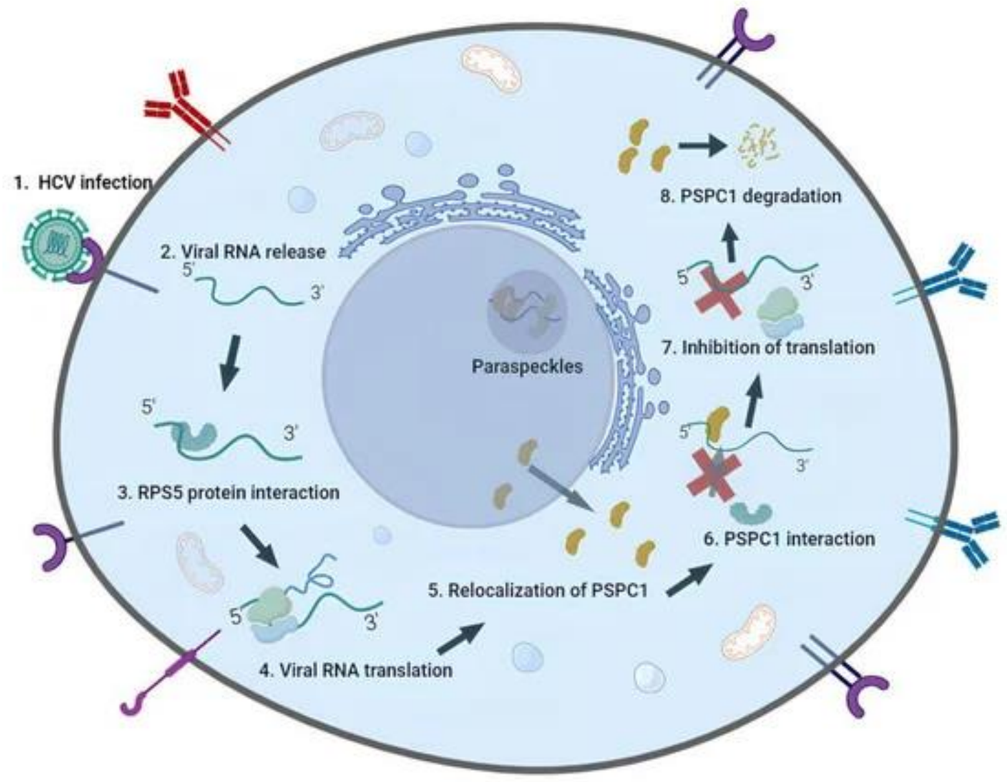
Cervical cancer is strongly linked to persistent infection with high-risk human papillomaviruses (HPVs), particularly HPV16. Prof. Sharmila Sengupta and her group investigated the intricate interactions between protein-coding genes that are differentially expressed (DEcGs) and differentially expressed long noncoding RNA Genes (DElncGs) in HPV16 positive cervical cancers.

They also identified several lncRNAs co-expressed with genes critical for cell cycle regulation, immune evasion, and tumour progression. These DEcGs and DElncGs co-expression appears to play key roles in cancer development, potentially influencing how the virus hijacks host cellular mechanisms. The study highlights that targeting these DEcGs and lncRNAs could serve as biomarkers for early diagnosis or targets for precision therapies.

IN PUBLIC EYE

PSPC1 Binds to HCV IRES and Prevents Ribosomal Protein S5 Binding, Inhibiting Viral RNA Translation

Tripathi SK et al., Viruses.,
doi: 10.3390/v16050738



The RNA virus, Hepatitis C infects the liver and is the causal organism for Hepatocellular Carcinoma. Ribonucleoprotein bodies, such as paraspeckles found in the mammalian cell nuclei are reported to regulate viral life cycles. Study from Prof. Saumitra Das's lab reported the role of Paraspeckle Component 1 (PSPC1) during HCV infection. His research demonstrates that upon HCV infection, PSPC1 is relocalized to the cytoplasm and regulates the function of HCV IRES to prevent viral RNA translation. They showed that partial silencing of PSPC1 protein led to increased viral translation and consequently, HCV replication. Overall, the study explains the complex interplay between the host and the virus and exhibits the possible anti-viral effect of PSPC1 during HCV life cycle.

Reviews:

Coagulation Protease-Driven Cancer Immune Evasion: Potential Targets for Cancer Immunotherapy

Paul S et al., Cancers (Basel),
doi: 10.3390/cancers16081568

The review by Dr. Kaushik Das summarizes how coagulation protease-driven protease-activated receptors (PAR) signalling plays a key role in both innate and adaptive immunity. It further discusses how coagulation protease-induced signalling can help in cancer immune evasion and tumour progression.

MicroRNAs in extracellular vesicles: A potential role in cancer progression

Parashar D et al., Cell Signal.,
doi: 10.1016/j.cellsig.2024.111263.

The review by Dr. Kaushik Das focuses on EV miRNAs that are crucial in cancer pathogenesis, influencing growth, proliferation, metastasis, angiogenesis, apoptosis, stemness, immune evasion, and therapy resistance.The review contains details of clinical trials that are ongoing to explore their therapeutic potential in cancer treatment.

IN PUBLIC EYE

Circulating Extracellular Vesicles: An Effective Biomarker for Cancer Progression

Chatterjee et al., Front. Biosci.
https://doi.org/10.31083/j.fbl2911375

Extracellular vesicles (EVs) are membrane-bound, small heterogenous bodies that carry with them genetic materials in the form of DNA, RNA, small non-coding RNA, proteins, etc. and can prove to be important cancer biomarkers in liquid biopsies. Dr. Kaushik Das and team are working on learning how these bioactive molecules can be utilized for fine-tuning therapies for cancer.

The role of extracellular vesicles in the pathogenesis of gynecological cancer

Chatterjee et al.,Frontiers in oncology,
https://doi.org/10.3389/fonc.2024.1477610

Prof. Arindam Maitra and Dr. Kaushik Das in the review article discuss about the role of Extracellular Vesicles (EVs) during the progression of gynecological cancers. EVs are lipid enclosed particles, that transfer different types of biomolecules between cells. In the recipient cells, these cargo molecules can alter the phenotypic response, thus contributing to disease progression.

Collaborative studies:

- **Development of an effective single-chain variable fragment recognizing a novel epitope in the hepatitis C virus E2 protein that restricts virus entry into hepatocytes.**

  Das S et al, Arch Virol.
  doi: 10.1007/s00705-024-06024-4

Prof. Saumitra Das in a collaborative study, reported the nucleotide sequence of a neutralizing monoclonal antibody A8A11, raised against a conserved epitope within the HCV E2 protein. The also found a single-chain variable fragment (scFv) protein that mimics A8A11 antibody and reduces viral replication. Thus, scFv-based drugs may prove to be a promising therapeutic approach against HCV infection.

- **Uracil as a biomarker for spatial pyrimidine metabolism in the development of gingivobuccal oral squamous cell carcinoma**

  Shaikh S et al, Sci Rep,
  doi: 10.1038/s41598-024-62434-z

Dr. Nidhan K. Biswas and Prof. Arindam Maitra in a collaboration with Tata Medical Center tried to identify metabolic biomarkers of gingivobuccal oral squamous cell carcinoma (GB-OSCC) using NMR spectroscopy. The study suggested the presence of uracil and/or intermediate molecules in purine and pyrimidine pathways to be potential biomarkers for the diagnosis and prognosis of oral cancer.

EVENTS, AWARDS & OUTREACH

Events

NIBMG-IGIB Conclave

Scientists from NIBMG and IGIB came together for the NIBMG-IGIB Conclave, where inspiring talks sparked engaging discussions, paving the way for future collaborations.

10th International Yoga Day

The 10th International Yoga Day was celebrated with great enthusiasm, as faculty, staff, and students came together to participate. Embracing the spirit of yoga, the event underscored the profound wisdom: "**You cannot always control what goes on outside, but you can always control what goes on inside.**"

Scientific Advisory Committee 2024

We express our heartfelt gratitude to the esteemed members of Scientific Advisory Committee for their active involvement during the fruitful two-day meeting. We deeply appreciate their participation, stimulating discussions, and wise counsel.

78th Independence Day

On the occasion of the 78th Independence Day, we celebrated with pride and patriotism as Director of NIBMG, hoisted the National Flag, reaffirming our commitment to contributing to the nation's progress. The celebrations continued with a vibrant cultural program and a tree plantation drive led by our dedicated staff and students, symbolizing our pledge to nurture both the nation and the environment.

EVENTS, AWARDS & OUTREACH

Events

1st NIBMG Cancer Research Symposium

We extend our heartfelt gratitude to the distinguished speakers - Dr. Avinash Bajaj (RCB), Dr. Dimple Notani (NCBS), Dr. Mohit K. Jolly (IISc), Prof. Chandrima Das (SINP), and Prof. Sandeep Singh (NIBMG)- for sharing their groundbreaking research with us. Their active participation in discussions with our faculty and students made the event intellectually enriching and truly memorable.

Hindi Diwas 2024

We celebrated the Hindi Diwas program on September 19, 2024, with great enthusiasm. On this occasion, we were guided by our esteemed guests: **Mr. Om Prakash Prasad,** Research Officer, Regional Implementation Office (East), Kolkata, and **Mrs. Sunita Ram**, Research Officer, Regional Implementation Office (North), New Delhi, from the Ministry of Home Affairs, Department of Official Language, along with **Mr. Sarachchandra Jha**, retired Assistant Director, Hindi Teaching Scheme, Kolkata. The event featured activities such as the use of the **Kanthasth software**, discussions on scientific writing in Hindi, and various cultural programs in which the institute's members participated with great zeal, making the event a resounding success.

BioE3 Symposium

"Changing the way we perceive our research will pave the way for the growth of our bioeconomy."

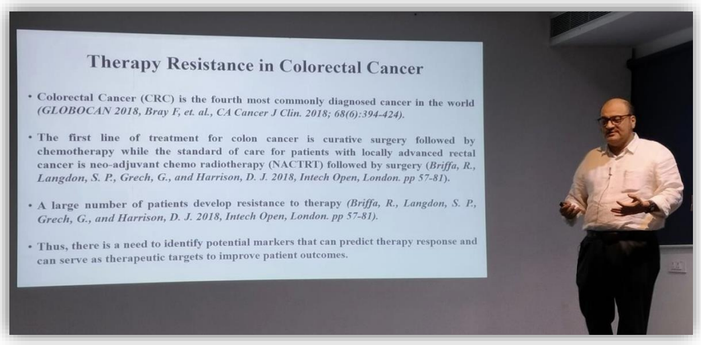
We successfully concluded the mini symposium on BioE3 Policy, marked by enthusiastic participation from our Kalyani Innovation Network partner institutes.

Seminar

We were thrilled to welcome Dr. Rajesh Gokhale, Secretary of DBT, whose inspiring talk encouraged us to step out of our comfort zones and contribute to India's burgeoning bioeconomy and the revolution in biology-driven technology.

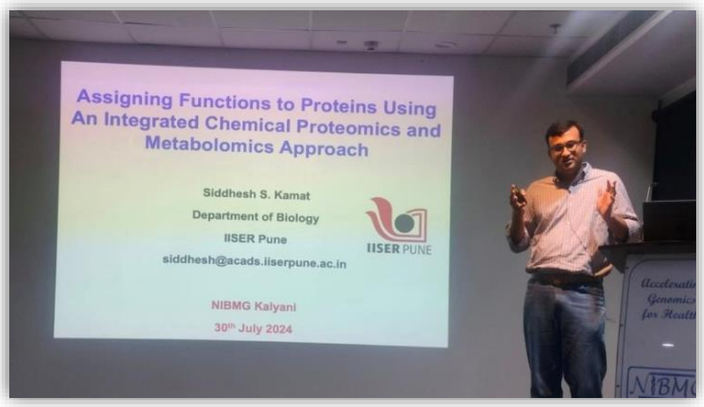
EVENTS, AWARDS & OUTREACH

Seminar



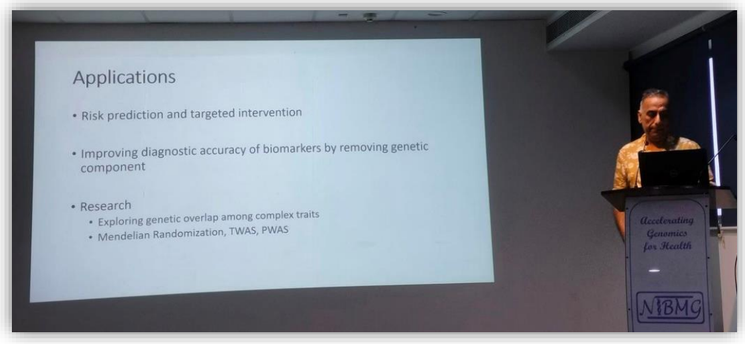
As part of our ongoing colloquium series, we were delighted to host a talk by Dr. Sorab N. Dalal from ACTREC, who shared his groundbreaking research on lipocalin-2 and 14-3-3 proteins in colorectal cancer.

We were privileged to host **Prof. Satyajit Rath** from the Indian Institute of Science Education and Research (IISER), Pune, for an inspiring colloquium talk. He shared valuable insights with young researchers on framing compelling scientific questions that fuel impactful research, leaving the audience enriched and motivated.



We were honored to host a stellar colloquium talk by **Dr. Siddhesh Kamat** from the Indian Institute of Science Education and Research, Pune, and **Dr. Arnab Mukhopadhyay**, BRIC-National Institute of Immunology . They inspired the faculty and students with their insightful research work.

We were thrilled to host **Prof. Nilanjan Chatterjee** from Johns Hopkins Medicine and the Johns Hopkins Bloomberg School of Public Health, who delivered a stellar talk on the role of advanced algorithms in enhancing disease prediction through polygenic risk scores and their clinical applications.



We were delighted to welcome **Dr. Tessy Thomas Maliekal** from the DBT-Rajiv Gandhi Centre for Biotechnology to NIBMG. She delivered an engaging and insightful talk on her groundbreaking research exploring the role of TIF1 gamma in oral cancer, sparking thought-provoking discussions among attendees.

EVENTS, AWARDS & OUTREACH

Outreach

SERB - High-End Workshop Karyashala

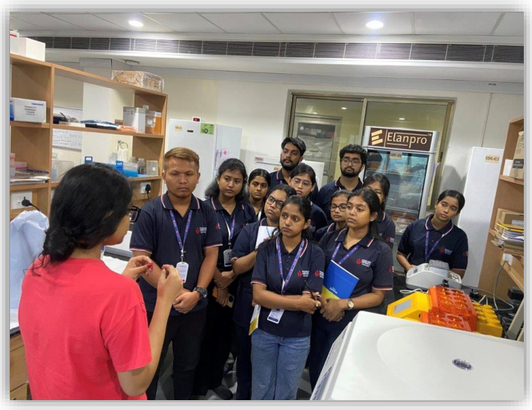
We proudly inaugurated the Science and Engineering Research Board (SERB) High-End Workshop *Karyashala* on **Human Metagenomic Sequencing Data Analysis: Emphasis on Health and Diseases.**





"Successful and impactful science needs to be shaped and disseminated through the people we are doing it for"

We are dedicated to nurturing young minds by introducing them to the captivating realm of biomedical research. In line with our commitment to outreach, we hosted Biotechnology students from Techno India University, Tripura (A Sister Institution of Sister Nivedita University), Durgapur Government College, Department of Physiology, Raja Peary Mohan College, Uttarpara, Hooghly, and Jawahar Navodaya Vidyalaya from Bihar, Jharkhand and West Bengal to NIBMG .







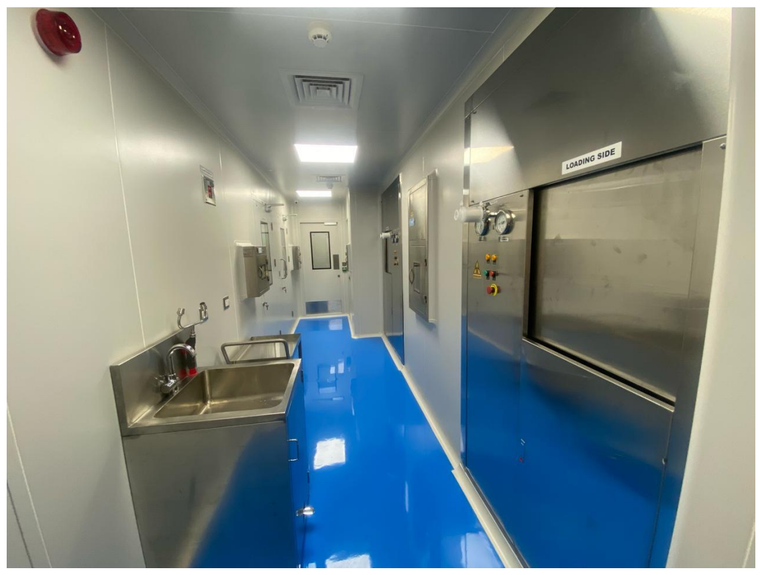




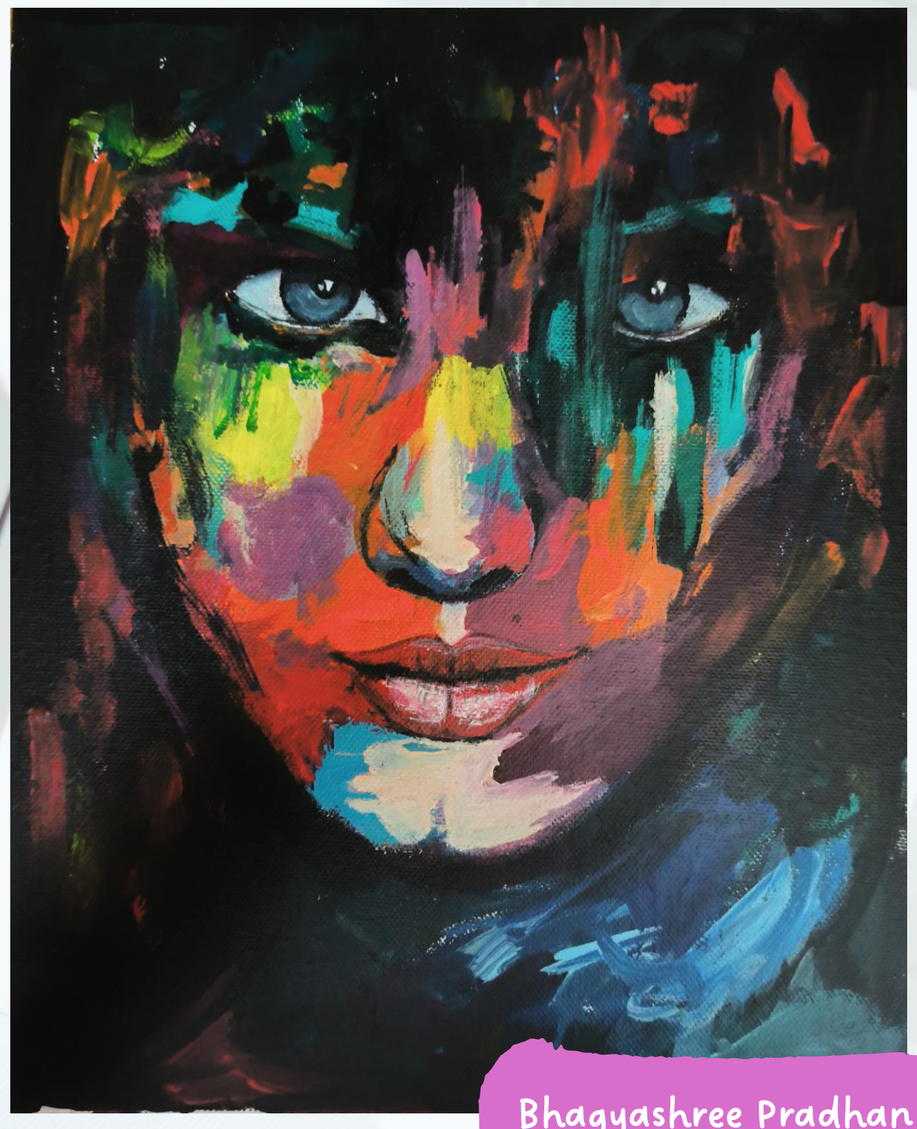
NIBMG *in focus*

Biosafety level 3 facility

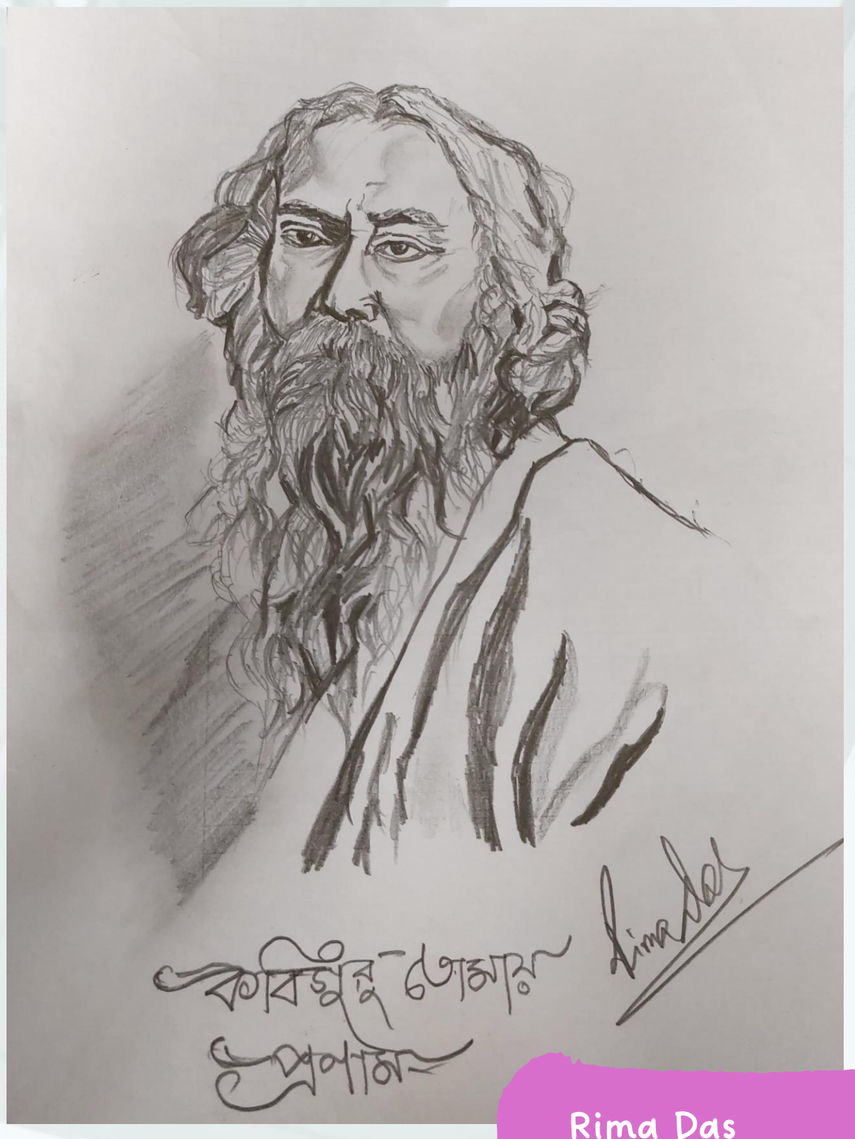
The BSL-3 facility at BRIC-NIBMG has been recently established under the Department of Biotechnology (DBT) and was inaugurated by Secretary DBT, Dr. Rajesh Gokhale. This facility is a prefabricated modular structure built over 2000 sq. ft. area, just outside the NIBMG research building. It has one Virus lab, one Bacteria lab and one Animal BSL-3 (ABSL-3) room along with a control panel room, ETP treatment plant and autoclave room. The BSL-3 facility has been specifically made to work with pathogenic viruses like SARS-CoV-2 and pathogenic bacteria like *Mycobacterium tuberculosis*. Since these are highly contagious and can spread through aerosol, utmost care must be taken during the growth and maintenance of these pathogens. This includes measures such as use of gradient negative pressure in different rooms, HEPA filter, virus burn-out unit and chemical treatment plant. We have recently obtained the regulatory approval to use our BSL-3 facility and will soon be initiating our research on pathogens. Our work will lead to new knowledge about the host-pathogen interaction and eventually to identification of novel therapeutic targets to combat the diseases.



CREATIVE CORNER



Bhagyashree Pradhan



Rima Das

Kaulick Mitra

IDENTITY

You shine within the sparks of thunder.
You flow through the crystals of glacier.
Your whims shape the temper of wind to occur.
Your sweat imparts to the redolence of petrichor.

Your hues fill in the selfhood of million life forms.
You glow on the shores and abyss of tartarean enorms.
You grieve as the blood of prey whisper the wraths of barbary.
You keep the memory of the bygones within the sheets of your earthy diaries.

For eons now, have you been awake.
Witnessing countless whip hand make and break.
They feel you within the urge of desperate procreation.
You choose them for the offerings of desolation.

You've bestowed all of it - altruism and vengeance.
You see them play the hunger battle in each hour of impedance.
While they plot their weapons of tactics, you smirk
Knowing they'll be paralyzed by their primal behaviours that you kept lurk.

You play with them, you keep them changing.
The price of change? Oh now some sing.
"It is the Supreme power that led to Creation"
says one group.
The other mutters, " It's stochastic Evolution "

They quarrel and shed blood.
They drift apart with eyes rud.
I wonder what good will do your name!
My question lies in the "how" of your game.

Shreyashi Ghosh

MEET THE TEAM

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