Central University of Kerala

EMSI-2024

46th Annual Meeting of Environmental Mutagen Society of India

INTERNATIONAL CONFERENCE ON

"Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World"

JANUARY 29–31, 2024

INTERNATIONAL PRE-CONFERENCE WORKSHOP ON

'Methods in Genotoxicology'

JANUARY 28, 2024

SOUVENIR & ABSTRACT BOOK

Organized by

DST-FIST Supported Department of Zoology,
School of Biological Sciences, Central University of Kerala
Tejaswini Hills, Periya, Kasaragod – 671 320, INDIA

Sponsored by

Department of Biotechnology
Government of India

KSCSTE

SERB INDIA

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केरल केन्द्रीय विश्वविद्यालय
(नैक 'ए' ग्रेड से प्रत्यायित)
CENTRAL UNIVERSITY OF KERALA
(Accredited with NAAC 'A' Grade)
(संसद के अधिनियम, वर्ष 2009 द्वारा स्थापित / Established under the Act of Parliament in 2009)

No. CUK/VCO/F-8/2023 Dated : 17th January 2024

MESSAGE

It is my pleasure to welcome all the delegates and participants of the 46th Annual Meeting of The Environmental Mutagen Society of India (EMSI) and International Conference on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World" from 29-31 January 2024; and associated pre-conference workshop on "Methods in Genotoxicology" on 28th January 2024 in the Department of Zoology, Central University of Kerala, Kasaragod.

Globally there is a great concern regarding the increasing number of chemicals coming in contact with humans and ultimately being released into the environment. This not only leads to mutations in the microbes but also has increased the risk in humans leading to an exponential increase in genetic disorders. Scientists are making attempts to predict mutagens and their mechanism of action using advanced technologies. This allows the scientific community and the regulators to make decisions before the chemicals/products are released into the market. This is gaining momentum over hazard identification for which artificial intelligence and machine learning tools are deployed. The EMSI 2024 conference organization is a great effort by the Department of Zoology, Central University of Kerala to bring together experts from India and abroad. There will be intense discussions on the new methodologies as well as guidelines on how to minimize the risk of chemicals and physical mutagens. The recommendations of the meeting shall provide a road map for the country to take futuristic measures in terms of risk assessment and mitigation.

I wish the conference a grand success.

Prof. K.C. Baiju
Vice-Chancellor I/c

तेजस्विनी हिल्स, पेरिया डाक, कासरगोड, केरल - 671 320 / TEJASWINI HILLS, PERIYE (P.O.), KASARAGOD, KERALA - 671 320
दूरभाष / Phone : 0467 - 2232400, 2232403.
वेबसाइट / Website : cukerala.ac.in, ई-मेल / E-mail : registrar@cukerala.ac.in

ENVIRONMENTAL MUTAGEN SOCIETY OF INDIA

(Affiliated to International Association of Environmental Mutagen Society & Asian Environmental Mutagen Society)

Regd. No.: Bom. 270/75 G.B.B. S.D. Dt. 25th Nov1975

Prof. K. B. Sainis, PhD, FNASc,
Distinguished Scientist & Director,
Bio-Medical Group(Retired),
Former DAE Raja Ramanna Fellow,
Bhabha Atomic Research Centre,
Mumbai, India 400085

President, EMSI

MESSAGE

I am very happy that the Department of Zoology, School of Biological Sciences, Central University of Kerala at Periya, Kasaragod is hosting the 46th Annual Meeting of the Environmental Mutagen Society of India (EMSI) and an International Conference on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World", from January 29 to 31, 2024. I am also glad to note that it will be preceded by a preconference workshop on "Methods in Genotoxicology". The toxicity of environmental mutagens is responsible for the biological as well as genetic changes in the living elements of the ecosystem. They will, no doubt, impact biodiversity and food chains and in turn, human health as well. Therefore, assessment of the environmental impact of any physical or biological agent that can modulate human and animal health-related processes is an issue of prime importance today. It will involve a multipronged approach including traceability. field surveys, chemical analyses, aquatic pathology, omics, epigenetics, population-level clinical and genetic analysis, and epidemiology. Today, very sensitive and high throughput methodologies are available which, in turn, will generate a huge body of data, worldwide. Computational and AI-based tools are being developed to analyze these data from different constituents of the human ecosystem. One would legitimately hope to develop measures to mitigate the adverse environmental impact of these mutagens.

I am glad that the participants from India and abroad, including some eminent senior scientists, will be discussing an impressive array of relevant topics during this conference. It will also be a suitable platform for young researchers to learn the ropes of tackling complex research problems.

While profusely thanking the Department of Zoology, Central University of Kerala, and Dr H. P. Gurushankara in particular for organizing this scientific event, I wish the conference a great success.

Wishing a Very Happy New Year to all delegates,

(K. B. Sainis, PhD)
President, EMSI

ENVIRONMENTAL MUTAGEN SOCIETY OF INDIA

(Affiliated to International Association of Environmental Mutagen and Genomic Society & Asian Environmental Mutagen Society)

Regd. No. : Bom. 270/75 G.B.B. S.D. Dt. 25th Nov1975

Dr. Mrs. Birajalaxmi Das, MPhil., PhD
Secretary, EMSI

MESSAGE

It gives me immense pleasure that the 46th Annual meeting of Environmental Mutagen Society of India (EMSI) and the international conference is being organized by the Department of Zoology, School of Biological Sciences, Central University, Kasaragod, Kerala with a theme on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in changing world."

Since 1975, EMSI has been involved in disseminating knowledge to the scientific community with frontier areas of research in the field of mutagenesis, carcinogenesis, toxicogenomics, etc. Also for the past few years, EMSI has been actively organizing conferences with the themes that have direct relevance to human health and environment.

I would like to congratulate the organizers of EMSI-2024 for conducting the conference with a subject that is so engaging and highlights the significant influence of environmental mutagenesis on human health in the changing world. The impact of environmental mutagenesis leads to alteration in biological responses that affect all forms of life. The advent of novel high throughput techniques and approaches such as genomics, proteomics, metabolomics etc. have strengthened the area of research. I hope the participants from the various universities and institutes attending this conference will have a great opportunity to interact with each other and exchange their knowledge towards building collaborations in their respective fields.

I extend a warm welcome to all the delegates from India and abroad and hope that they will have very fruitful conference and enjoyable stay.

Wishing the 46th Annual Conference of EMSI-2024 is a huge success.

(Birajalaxmi Das)
Secretary, EMSI

CENTRAL UNIVERSITY OF KERALA

(Established by the Parliament of India under the Central University Act, 2009)

Thejaswini Hills, Periye, Kasaragod District– 671 316. Kerala, India.

Prof. (Dr.) K. Arunkumar
Dean, School of Biological Sciences

Mobile:9865051016
Email:arunkumark@cukerala.ac.in

MESSAGE

Being a Dean of the School of Biological Sciences joining with the Department of Zoology, Central University of Kerala, delighted to host an International Conference on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World", from January 29 to 31, 2024 marking the 46th Annual Meeting of the Environmental Mutagen Society of India (EMSI).

Now the environment is adversely affected by pollutants of different origins that thread the existence of not only humans but also other animals and plants in the environment. These pollutant contributors are the ultimate sufferer-human; alter the genome of life through mutation. Such diverse mutagens accumulate in the air, water, and food day by day and cause mutations in plants, animals, and humans that ultimately alter the function of organisms resulting in unfit to exist. Even though we are advancing in biology with artificial intelligence and algorithms, still we are not unknotting the molecular biology of the cause of cancer which thread the human existence. Increasing toxic pollutants in the environment proportionately increases the mutation rate which will ultimately predispose the cancer incidence.

I congratulate the Department of Zoology in the School of Biological Sciences for selecting this most urgent topic "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World" as an International conference by inviting experts, academicians, and scholars across the world to the Central University of Kerala for having discussions and deliberations for 3 days on various aspects of environmental mutagenesis. At this juncture, I would like to express my deep sense of appreciation to Dr. H. P. Gurushankara, organizing secretary of this scientific event, Head of the Department of Zoology, Dr. Indrashis Bhattacharya and other faculty members of the Department of Zoology and School of Biological Sciences for the successful conduct of this international conference in the School of Biological Sciences, Central University of Kerala.

I welcome all the distinguished Delegates, President, Secretary, and members of EMSI to Thajeswini Hills, Saptha Pasha Shangamapoomi.

Sincerely,

(K. Arunkumar)

EMSI-2024

46th Annual Meeting of Environmental Mutagen Society of India

INTERNATIONAL CONFERENCE ON

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JANUARY 29-31, 2024

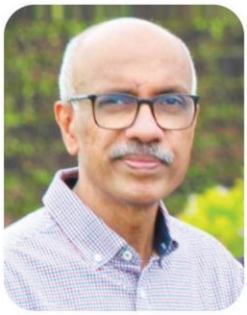
INTERNATIONAL PRE-CONFERENCE WORKSHOP ON

'Methods in Genotoxicology'

JANUARY 28, 2024

WELCOME

Chairman



Prof. K.V. Rajendran

Convener

Dr. Indrashis Bhattacharya

Organizing Secretary

Dr. H.P. Gurushankara

On behalf of the organizing committee, we are immensely pleased to invite you to 46th Annual Meeting of The Environmental Mutagen Society of India (EMSI) and International Conference on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World" from 29-31 January 2024; and associated pre-conference workshop on "Methods in Genotoxicology" on 28th January 2024 in the Department of Zoology, Central University of Kerala, Kasaragod.

Since the origin of life, all organisms have been advertently or inadvertently exposed to various environmental xenobiotics, adversely affecting the biota. The consequent damaging effects at the cellular and molecular levels caused by those factors are being counteracted by cellular defense mechanisms, especially those related to DNA. Failure to do so may lead to mutagenic, carcinogenic, and hereditary effects. In addition, the changes in the gene structure and epigenetic modifications in the germ line can invariably affect the offspring. This is where the "genes and environment" interaction plays a vital role at the population level, highlighting the importance of public genomics. The impact of environmental mutagenesis leads to altered biological responses affecting all forms of life particularly human health. Though global efforts to contain the harmful effects on the environment, ecosystem, and individual level have met with sporadic success, new challenges emerge continually. In this context, this International Conference will provide an excellent platform to discuss the prevention of mutations, protection, and preservation of biodiversity with an emphasis on the knowledge in the field of human health.

We thank the Environmental Mutagen Society of India, for providing us the opportunity to host their 46th Annual Meeting of The Environmental Mutagen Society of India at the Central University of Kerala, Kasaragod. We are grateful to the Central University of Kerala administration for their support in organizing this event. The financial support of various governmental and non-governmental sponsors is thankfully acknowledged.

We greatly appreciate your active participation and ensure that you return scientifically enriched with the recent advances in the area of environmental mutagenesis in human and environmental health.

We wish everyone a comfortable stay and enjoyment during these four days of scientific

Central University of Kerala

The Central University of Kerala, Kasaragod, came into being in 2009 under the Central Universities Act 2009 (Parliament Act No. 25 of 2009). The University is founded on the noble vision of a 'Caring Wisdom.' It is guided by the lofty ideals of academic and social commitment, moral steadfastness, and intellectual and spiritual enlightenment, as reflected in the vision statement. The University opened its academic portals in October 2009 at Nayanmarmoola (Vidyanagar) in Kasaragod town. From this humble beginning, the University has grown into an institution offering 27 postgraduate and 22 research programmes with a total enrolment of around 2500 students. The campus of the University, known as Thejaswini Hills, is located at Periya, Kasaragod, on 310 acres of land. In addition to headquarters located at Periya, the University has a Law department at Thiruvalla in Pathanamthitta, and a BA programme in International Relations is offered at Trivandrum. Prof. Jancy James was CUK's first Vice-Chancellor (2009-2014). She was followed by Prof. G. Gopakumar (2014-2020) and Prof. H. Venkateshwarlu (2020-2023), Prof. K.C. Baiju is the current Vice-Chancellor (i/c).

Department of Zoology

The Department of Zoology was established in 2010 at Riverside Transit Campus, Padannakkad. The department offers M.Sc. and Ph.D. in Zoology with a strong curriculum designed to provide the experience, skills, and exposure in areas that range from basic conceptual frameworks to the most advanced areas of biological sciences. Deep engagement in research by faculty in entomology, aquatic pathobiology, herpetology, toxicology, immunology, physiology, molecular biology, and endocrinology is a core strength of the department. Convergence of the expertise and research strengths of the faculty ensures that the academic programme provides the students and researchers with profound insights and adequate skills, besides inculcating a culture of innovation and inclusive development.

Environmental Mutagen Society of India (EMSI)

The Environmental Mutagen Society of India (EMSI), founded in 1975, promotes scientific education and research in mutagenesis. The Society is an affiliate of the International Association of Environmental Mutagen Society (IAEMS) and the Asian Environmental Mutagen Society (AEMS). Every year, the EMSI conference provides a scientific forum for exchanging ideas and information on mutagenesis at the experimental and clinical levels with an emphasis on human health and environmental safety.

Executive Committee of EMSI

President	:	Dr. KB Sainis, BARC, India.
Vice-Presidents	:	Prof. Nandjee Kumar, Magadh University, India.
		Dr. Radha Saraswathy, VIT, India.
Secretary	:	Dr. Birajalaxmi Das, BARC, India
Joint Secretary	:	Dr. Bani B. Ganguly, Genetics Center, India
Treasurer	:	Dr. Devashish Rath, BARC, India
		Dr. Sudin Bhattacharya, CNCI, India
Members	:	Dr. Satwinderjeet Kaur (Amritsar)
		Dr. Bhavani Shankar, BARC, Mumbai
		Dr. Prakash Hande (Singapore)
		Dr. Shouvic Mandal (Kolkata)
		Dr. Yasir Hassan Siddique, AMU, India
		Dr. DK Chowdhury (Lucknow)
		Dr. Vinay Jain (Mumbai)
Co-opted Member	:	Dr. Ravi Chandran
Permanent invitees	:	Dr. P S Chauhan, Former Scientist, BARC, Mumbai.
		Dr. R K Bhattacharya (Mumbai)

Scientific Advisory Board

Organizing Committee

Chief-Patron	: **Prof. K.C. Baiju,** Hon'ble Vice-Chancellor (i/c), Central University of Kerala, Tejaswini Hills, Kasaragod, Kerala
Patron	: **Prof. K. Arunkumar,** Dean, School of Biological Sciences, CU-Kerala
Chairman	: **Prof. K.V. Rajendran,** Depr. of Zoology, CU-Kerala
Convener	: **Dr. Indrashis Bhattacharya,** Head, Dept. of Zoology, CU-Kerala
Organizing Secretary	: **Dr. H.P. Gurushankara,** Dept. of Zoology, CU-Kerala
Members	: **Prof. Sudha K,** Dept. of Zoology, CU-Kerala.
	Dr. P.A. Sinu, Dept. of Zoology, CU-Kerala.
	Dr. Ramachandran K, Dept. of Zoology, CU-Kerala.
	Prof. Dennis Thomas T, Dept. of Plant Sciences, CU-Kerala.
	Dr. Pramod K Kandoth, Dept. of Plant Sciences, CU-Kerala.
	Dr. Jasmin M. Shah, Dept. of Plant Sciences, CU-Kerala.
	Dr. Ginny Antony, Dept. of Plant Sciences, CU-Kerala.
	Dr. Ajay Kumar, Dept. of Plant Sciences, CU-Kerala
	Dr. Chithra Manisseri, Dept. of Plant Sciences, CU-Kerala.
	Prof. Alagu Manickavelu, Dept. of Genomic Sciences, CU-Kerala
	Prof. V.B. Sameer Kumar, Dept. of Genomic Sciences, CU-Kerala
	Dr. Padmesh Pandaram Pillai, Dept. of Genomic Sciences, CU-Kerala.
	Dr. M. Nagarajan, Dept. of Genomic Sciences, CU-Kerala.
	Dr. Tony Grace, Dept. of Genomic Sciences, CU-Kerala.
	Prof. Govinda Rao Duddukuri, Dept. of Biochemistry and Mol. Biol. CU-Kerala.
	Prof. Rajendra Pilankatta, Dept. of Biochemistry and Mol. Biol. CU-Kerala.
	Prof. R. Aswati Nair, Dept. of Biochemistry and Mol. Biol. CU-Kerala.
	Dr. Thejaswini Venkatesh, Dept. of Biochemistry and Mol. Biol. CU-Kerala.
	Dr. S. Lokeswara Bala Krishna, Dept. of Biochemistry and Mol. Biol. CU-Kerala.
	Dr. Ashok Kumar Madikonda, Dept. of Biochemistry and Mol. Biol. CU-Kerala.

46th Annual Meeting of Environmental Mutagen Society of India (EMSI-2024)

International pre-conference workshop on "Methods in Genotoxicology"

(Jointly organized by Central University of Kerala & CSIR-Indian Institute of Toxicology, Research, Lucknow)

January 28, 2024, Sunday

Sabarmati Seminar Hall, CU-Kerala

PROGRAM SCHEDULE

Time	Event
9:00-9:30	Workshop Registration

9:30-10:00	**Workshop Inauguration**
9:30-9:35	University Anthem: **Students of Biological Sciences.**
9:35-9:40	Welcome Address: **Dr. Indrashis Bhattacharya**, Head, Dept. of Zoology, CU-Kerala.
9:40-9:45	Presidential Address: **Prof. K. Arunkumar**, Dean, School of Biological Sciences, CU-Kerala.
9:45-9:50	Inauguration: **Prof. V. Vasudev**, University of Mysore.
9:50-9:55	About the Workshop: **Dr. Alok Kumar Pandey,** CSIR-IITR, Lucknow.
9:55-9:58	Vote of Thanks: **Dr. H.P. Gurushankara**, Dept. of Zoology, CU-Kerala.
9:58-10:00	National Anthem
10:00-10:15	**Group Photograph**

Technical Session	
10:15-11:30	Basic genotoxicity tests: Chromosomal aberration. **Dr. Alok K. Pandey,** CSIR-IITR, Lucknow, India.
11:30-11:45	Coffee/Tea Break
11:45-13:00	Generation of Gal4-UAS transgenic flies and its application in biological research. **Dr. Shamprasad Varija Raghu**, Yenepoya University, Mangaluru, India.
13:00-14:15	**Lunch**
14:15-15:30	Application of the blood and buccal micronucleus assays in biomonitoring of children exposed to diagnostic radiation. **Dr. Goran Gajski,** Institute for Medical Research and Occupational Health, Zagreb, Croatia.
15:30-15:45	Coffee/Tea Break
15:45-17:00	Fundamental methods for assessing genotoxicity. **Dr. Anurag Sharma,** Nitte University, Mangaluru, India.
17:00-17:30	Feed back session
17:30-18:00	Closing Remarks on Pre-Conference Workshop

International Conference on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World"

January 29, 2024, Monday
Sabarmati Seminar Hall, CU-Kerala

Time	Event
8:00-9:30	Conference Registration

Conference Inauguration	
9:30-9:35	University Anthem: **Students of Biological Sciences**
9:35-9:40	Welcome Address: **Prof. K.V. Rajendran**, Dept. of Zoology, CU-Kerala
9:40-9:45	About the Conference: **Dr. H.P. Gurushankara**, Dept. of Zoology, CU-Kerala.
9:45-9:55	Presidential Address: **Prof. K.C. Baiju,** Vice-Chancellor (i/c), CU-Kerala.
9:55-10:05	Inauguration: **Padmashree Prof. R. C. Sobti,** Panjab University, Chandigarh, India.
9:05-10:07	Release of Souvenir and Abstract book: **Dignitaries**
10:07-10:15	Speech by Guest of Honour: **Prof. P.R. Sudhakaran,** University of Kerala, Trivandrum.
10:15-10:20	About the EMSI 2024: **Dr. KB Sainis,** President, EMSI. **Dr. Birajalaxmi Das,** Secretary, EMSI.
10:20-10:25	Felicitation: **Prof. K. Arunkumar**, Dean, School of Biological Sciences, CU- Kerala.
10:25-10:28	Vote of Thanks: **Dr. Indrashis Bhattacharya**, Head, Dept. of Zoology, CU-Kerala.
10:28-10:30	National Anthem

10:30-10:45	**Group Photo**

10:45-11:00	Coffee/Tea Break

Chair:	**Prof. V. Vasudev,** University of Mysore, India.
11:00-11:45	**Keynote speech:** Delineation of the impact of microenvironment on cancer. **Padmashree Prof. R C Sobti,** Panjab University, Chandigarh, India.

Session 1: Gene-Environment Interaction and Human Health

Chairpersons:	**Prof. G.M. Nair,** University of Kerala, Trivandrum, India. **Dr. Pramod K Kandoth,** CU-Kerala, India.
11:45-12:20	**Plenary Lecture-1:** Twin crises of air pollution and antimicrobial resistance: impact on human health. **Prof. Narinder K Mehra,** All India Institute of Medical Sciences, New Delhi, India.
12:20-12:40	**Invited Talk-1:** Organs-on-a-chip for safety evaluation and modelling of disease. **Dr. Mohanan PV,** Sree ChitraTirunal Institute for Medical Sciences and Technology, Trivandrum, India.
12:40-13:00	**Invited Talk-2:** Effects of environment, habit, and habitat on human health. **Dr. Bani Bandana Ganguly,** MGM Center for Genetic Research & Diagnosis, Mumbai, India.

13:00-14:00	Lunch and Poster Viewing
Poster Session Coordinators:	Dr. Chithra Manisseri, CU-Kerala. Dr. Ashok Kumar Madikonda, CU-Kerala. Dr. S. Lokeswara Bala Krishna, CU-Kerala.
PP-1	Monitoring susceptible/resistance status of Anopheline species in Mangaluru City Karnataka, India. **Pradeep D**, Mangalore University, Karnataka, India.
PP-2	Role of tumor heterogeneity in expression of epithelial-mesenchymal transition-associated genes and oral squamous cell carcinoma metastasis **Shubham Singh**, Annamalai University, Tamil Nadu, India
PP-3	Morphological alterations induced by lithium chloride (LiCl) on *Drosophila melanogaster*. **Vijaykumar R,** Karnatak University, Dharwad, India.
PP-4	Ionic liquid functionalized-silica coated magnetic iron oxide nanoparticles: Synthesis and optimization of anionic azo dye adsorption for quantitative analysis in complex food matrices. **Garima Sagar,** CSIR - Indian Institute of Toxicology Research, Lucknow, India.
PP-5	Assessing Chromosomal Abnormalities, DNA Damage, and Oxidative Stress in Patients with Rheumatoid Arthritis. **Sombodhi Bhattacharya,** Vellore Institute of Technology, India.
PP-6	Green synthesis and characterization of *Wrightia tinctoria* extract encapsulated Zein–Alginate nanoparticles for controlled drug release. **Dhanya AT,** University of Hyderabad, Telangana, India.
PP-7	Environmental monitoring and health effects assessment of people using suspected polluted water bodies.

	Shridhar J. Kondhalkar, ICMR-Regional Occupational Health Centre (Southern)-NIOH, Bangalore, Karnataka, India.
PP-8	Physio-Biochemical characterization of *Chlamydomonas reinhardtii* upon exposure to Bisphenol A **Sakshi Dubey,** University of Hyderabad, Telangana, India.
PP-9	Hormetic level cadmium-induced differentially expressed metabolites and transporters in Solanum lycopersicum **Manish Yadav,** University of Hyderabad, Telangana, India.
PP-10	Age and gender-wise analysis of nuclear anomalies using cytokinesis-block micronucleus cytome (CBMN) assay in asthma, obese, and obese individuals with asthma. **Sohini Dey,** Vellore Institute of Technology, Tamil Nadu, India.
PP-11	Latent prostate cancer in South India: Incidence, risk factors, and implications for diagnosis and treatment. **Ishvaria S,** Vellore Institute of Technology, Tamil Nadu, India.
PP-12	Anti-Yeast effects of Cu-Ag bimetallic nanoparticles (NPs) are exerted through the ROS-mediated damage of intracellular biomolecules. **Abhishek Sinha,** Atria University, Bangalore, India.
PP-13	Influence of KBrO3 and pomegranate juice (*Punica granatum*) on oxidative stress and neurodegeneration in the brain of *Drosophila melanogaster* **Jyoti Aiwale,** Karnatak University, Karnataka, India.
PP-14	Age and gender-based analysis of DNA damage using alkaline comet assay in asthma patients **Swathi R,** Vellore Institute of Technology, Tamil Nadu, India.
PP-15	Comparative analysis of antioxidant level among prediabetes and type 2 diabetes mellitus individuals – a proposed study **Aarthi. Y,** Vellore Institute of Technology, Tamil Nadu, India.
PP-16	Biodiversity at Risk: Probing molecular damage in *Collembola* exposed to heavy metals in agricultural environment. **Samar Mahmood,** Aligarh Muslim University, India.
PP-17	Maternal ancestry of Kalpeni, a southern island of the Lakshadweep archipelago **Shivanand S Shendre**, Mangalore University, Karnataka, India.
PP-18	Comparative analysis of antibiotic resistance and gut microbiome composition in broiler chickens versus indigenous chickens **Adon Babu,** Central University of Kerala, Kasaragod, India.
PP-19	WNT Signaling: Decisive bifurcation in human pluripotent stem cell differentiation towards amnion and placenta **Asha Shaji Antony**, Central University of Kerala, Kasaragod, India.

PP-20	Isolation of MRS agar-positive bacteria from commercial/homemade curd samples and commercial probiotics and their RAPD analysis: A brief preliminary work **Soorya PV,** Central University of Kerala, Kasaragod, India.

Session 2: Environmental mutagens and Health

Chairpersons:	**Prof. Govinda Rao Duddukuri,** CU-Kerala, India. **Sri. Kollegala Sharma**, CSIR-CFTRI, Mysore, India.
14:00 -14:30	**Plenary lecture-2**: Fukushima's recovery from 2011 nuclear meltdown: Fighting toxic rumours. **Prof. M. Prakash Hande,** National University of Singapore, Singapore.
14:30-14:50	**Invited Talk-3**: Biological mechanisms involved in radio-adaptation to chronic low-dose radiation in individuals from high-level natural radiation areas of Kerala coast. **Dr. Vinay Jain,** Bhabha Atomic Research Centre, Mumbai, India.
14:50-15:10	**Invited Talk-4:** Ultraviolet radiation: Skin photoaging, carcinogenesis and the role of phytochemicals for the treatment and prevention. **Dr. N. Rajendra Prasad**, Annamalai University, Chidambaram, India.
15:10-15:30	**Invited Talk-5:** Impact of environmental exposures on human health. **Prof. Radha Saraswathy,** Vellore Institute of Technology (VIT), India.
15:30-15:50	**Invited Talk-6:** Genetic alterations in tobacco and betel quid-associated esophageal squamous cell carcinoma of the high-risk region in India **Dr. Indranil Chattopadhyay,** Central University of Tamil Nadu, India.
15:50-16:10	**Invited Talk-7:** Low dose radiation and the immune system: Implications for human health. **Dr. K. B. Sainis,** Bhabha Atomic Research Centre, Mumbai, India.

16:10-16:20	Coffee/Tea Break

Session 3: Molecular signatures and/or effect of environmental chemicals

Chairpersons:	**Prof. P.R. Sudhakaran,** University of Kerala, Trivandrum, India. **Dr. Thejaswini Venkatesh**, CU-Kerala.
16:20-16:40	**Plenary Lecture - 3:** The role that the complement system at the placental level in both physiologic and pathologic pregnancy. **Prof. Roberta Bulla,** University of Trieste, Italy.
16:40-17:00	**Invited Talk-8:** Histocompatible HLA Haplo-banking: A step towards *'off the shelf'* regenerative medicine**.** **Dr. Gaurav Sharma,** Postgraduate Institute of Medical Education & Research, Chandigarh, India.

17:00-17:20	**Invited Talk-9:** Targeting DNMT1 mediated methylation in the mutation-prone zones in cancer genome for the treatment of breast cancer. **Prof. Chandi C. Mandal,** Central University of Rajasthan, India.
17:20-17:40	**Invited Talk-10:** The Spatial Biology Revolution in Life Sciences: multi-omic whole-transcriptome Digital Spatial Profiling Combined with single-cell and sub-cellular Spatial Molecular Imaging **Dr. Jay Manikandan,** Nanostring, Singapore/USA
17:40-17:50	**Platform talk-1:** Phytochemicals composition in sequential solvent extracts and its fractions and minerals analysis of *Michelia champaca* Linn flower as a potential source for wound healing and anticancer. **Dr. Sreenivasa Rao Amaraneni**, East Point College of Engineering & Technology, Bangalore, India.
17:50-18:00	**Platform talk-2:** AURKA, A Major miscreant: Imparting radioresistance in cervical cancer. **Dr. Sutapa Mukherjee**, Chittaranjan National Cancer Institute, Kolkata, India.
18:00-18:10	**Platform talk-3:** Influence of particulate matter 2.5 on pro-carcinogenic cue in exposed population of Kolkata and surrounding areas. **Dr. Dona Sinha**, Chittaranjan National Cancer Institute, Kolkata, India.
18:10-18:20	**Platform talk-4:** transgenerational impact of atrazine: impaired sexual maturation and subfertility in F1 male rats with congenital deformities in F2 progeny. **Neelam Pandey**, ICMR-National Institute of Research in Reproductive and Child Health, Mumbai, India.
18:20-18:30	**Platform talk-5:** Neurotoxic effect of electromagnetic radiation in SH-SY5Y cell line. **Dr. Sivasamy R**, Bharathiar University, Coimbatore, India.
18:30-18:40	**Technical talk-:** Recent advances in confocal microscopy. **Parthasarthy N,** Carl ZEISS India Bangalore Pvt Ltd.

17:20-19:00	EMSI Executive Committee Meeting

19:00-20:30	**Yakshagana Programme**: Mahishasura Vadhe by Siribagilu Venkappayya Samskrithika Prathishtana (R), Kasaragod, Kerala. (Payashwini Multi-purpose Hall)

20.30-21.30	Dinner

January 30, 2024, Tuesday

Session 4: Biodiversity and Conservation/Bioprospecting/bio-discovery and risk assessment

Chairpersons:	**Prof. Dennis Thomas T**. CU-Kerala, India. **Dr. Sudheesh Jogaiah, C**U-Kerala.
9:15-9:45	**Plenary Lecture 4:** Characterization and mechanistic aspect of the genotoxicity of some secondary plant metabolites present in foodstuff. **Prof. Hansruedi Glatt,** German Institute of Human Nutrition (DIfE), Germany.
9:45-10:05	**Invited Talk-11:** Investigating thiazolidine-2, 4-dione-based small molecule, O-prenylated benzylidene-thiazolidinedione, as chemoprotectant with simultaneous chemoenhancement of cisplatin efficacy against breast cancer cells. A pre-clinical *in vivo* study. **Prof. Sudin Bhattacharya,** Chittaranjan National Cancer Institute, India.
10:05-10:25	**Invited Talk-12:** A comparative study of the impact of plant extracts and synthetic antibiotics on the growth of some bacteria. **Prof. Nandjee Kumar,** Magadh University, India.
10:25-10:45	**Invited Talk-13:** Genomics of dermatological disorders. **Dr. Medha R,** Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India.
10:45-11:05	**Invited Talk-14:** Metagenomics and metabolomics tools for revealing the adverse impact of environmental toxicants and augmenting sustainable farming. **Dr. Ashwani Kumar,** University of Allahabad, India.
11:05-11:15	**Invited Talk-15:** Impact of shankhpushpi rasayana on neurodegenerative disorders. **Dr. Guruprasad KP,** Manipal School of Life Sciences, India.

Session 5: Ecotoxicology and genotoxicology (Parallel) (Narmada Seminar Hall)

Chairpersons:	**Prof. M. Nasser,** University of Calicut, India. **Dr. P.A. Sinu,** CU-Kerala, India.
9:15-9:45	**Plenary Lecture 5:** Sensitizing effect of tubastatin A to oxidative damage on HaCaT cells transduced with HPV oncoproteins **Prof. Wilner Martínez-López,** Instituto de Investigaciones Biológicas Clemente Estable, Montevideo, Uruguay.
9:45-10:05	**Invited Talk-16:** Evaluation of cytogenotoxic potential and embryotoxicity of KRS-Cauvery River water and polyisobutylene in zebrafish (*Danio rerio*). **Dr. Upendra Nongthomba,** Indian Institute of Science, India.
10:05-10:25	**Invited Talk-17:** *In vitro* toxicity evaluation of transition metal (zirconium oxide) nanoparticles **Dr. Alok K. Pandey,** CSIR-Indian Institute of Toxicology Research, Lucknow, India.

10:25-10:45	**Invited Talk-18:** Impact of air pollution on genome instability of the general population in Zagreb (Croatia). **Dr. Goran Gajski,** Institute for Medical Research and Occupational Health, Zagreb, Croatia.
10:45-11:05	**Invited Talk-19:** Environmental toxicants, Parkinson's disease and discovering pathways of neuroprotection: insights from *Drosophila* model. **Dr. Sarat Chandra Yenesetti,** Nagaland University (Central), India.
11:05-11:15	**Invited Talk-20:** Genome variation among myocardial infarction of south Indian population. **Dr. M.S. Mustak,** Mangalore University, India.

11.15-11:30	Coffee/Tea Break

Session 6: Epigenetics/genetic susceptibility/molecular mutagenesis and carcinogenesis

Chairpersons:	**Prof. Rajendra Pilankatta,** CU-Kerala. **Prof. V.B. Sameer Kumar,** CU-Kerala
11:30-12:00	**Plenary Lecture-6:** Approaches employed for congenital heart disease studies in two decades: An overview. **Prof. N. B. Ramachandra,** University of Mysore, Mysuru, India.
12:00-12:20	**Invited Talk-21:** The relevance of epigenetic alteration in T helper cells in chronic obstructive pulmonary disease (COPD) and its relationship with non-small cell lung cancer (NSCLC) **Dr. Koustav Sarkar,** SRM Institute of Science and Technology, Chennai, India.
12:20-12:40	**Invited Talk-22:** Environmental chemicals effects on epigenetic modulations. **Dr. Santosh R. Kanade,** University of Hyderabad, India.
12:40-13:00	**Invited Talk-23:** Epigenetic biomarkers for early detection of chronic chlorpyrifos exposure-induced liver cancer. **Dr. V. Thirunavukkarasu,** Bharathiar University, India.
13:00-13:15	**Invited Talk-24:** Transgenerational memory, mutagenic and epimutagenic. **Dr. Jasmine M. Shah,** Central University of Kerala, India.

13:15-14:00	**Lunch and Poster Viewing**
Poster Session Coordinators:	Dr. Jasmin M. Shah, CU-Kerala. Dr. Ajay Kumar, CU-Kerala.
PP-21	Characterization of epileptic seizures-like behavior in *Drosophila melanogaster.* **Deepa Mugudthi Venugopal**, Mangalore University, Karnataka, India
PP-22	Unveiling persistence in the environmental and health impacts of endosulfan.

	Shivangi Sharma, Indian Institute of Science, Bangalore, India.
PP-23	Neuroprotective potential of Curcumin C3 complex in Alzheimer's Disease *Drosophila* Model **Reshma Ramarajan,** Central University of Kerala, Kasaragod, India.
PP-24	A social cost-benefit analysis for assessing the adverse effects of microplastics in shrimp aquaculture sector in Kerala **Anakha S Menon**, Kannur University, Kerala, India.
PP-25	Apreliminary *in-silico* analysis on the toxicity of Mefenamic acid **K. P. Anupama,** Kannur University, Kerala, India.
PP-26	The Genetic landscape of leukemia and Down Syndrome in the Kerala State, India **Shilpa L.S,** Central University of Kerala, Kasaragod, India.
PP-27	Population density of Indian flying fox (P*teropus giganteus*) in different roosting sites in and around Shivamogga, Karnataka. **Dayananda, G.Y.,** Kuvempu University, Shankaraghatta, India.
PP-28	Responses of carp melanophores to oral contraceptive pill (MALA-D) **Somashekar D.S,** Government First Grade College, Shivamogga, Karnataka, India.
PP-29	A health assessment of soil, water, and flora: A case study of Kolar Gold Fields (KGF) Kolar, Karnataka, India. **Jobi Xavier**, Christ University, Bengaluru, India.
PP-30	The harmful effects of pesticides on grasshopper diversity in croplands. **Deepthy T,** Kannur University, Mananthavady, Kerala, India.
PP-31	Molecular mechanism in Teflon induced genotoxicity and structural alteration in Dolphin: *in silico*-analysis. **Arun Kumar,** University of Lucknow, Uttar Pradesh, India.
PP-32	Exposure to polypropylene microplastic promotes EMT and leads to renal fibrosis. **Samiya Baby,** CSIR-IITR, Lucknow, India.
PP-33	Toxicity of pesticides to natural enemies of Walnut green aphid, *Chromaphis juglandicola*. **Shabeer A,** Cluster University of Kashmir, Srinagar, India.
PP-34	Evaluation of mutagenicity of *Vitex peduncularis* Wall. Ex aqueous leaf extracts on *Allium cepa* L plant assay. **Vishnu Shankar Sinha,** Kolhan University, Jharkhand, India.
PP-35	Qualitative phytochemical analysis of *Byttneria herbacea* Roxb. leaf extracts. **Jagdish Prasad,** Tata College, Chaibasa, Jharkhand, India.
PP-36	Elevational effects on black fly distribution (Simulidae: Diptera) in Palani hills of Southern Western Ghats, India. **Basil Mohamedu S,** Sri Meenakshi Government Arts College for Women, Madurai,

	India.
PP-37	Effect of environmental factors on the larval distribution of black flies (Diptera: Insecta) in Munnar hills of Western Ghats, India. **Ramar M,** Sri Meenakshi Government Arts College for Women, Madurai, India.
PP-38	Assessment of genotoxic and cytostatic potential of indole-3-carbinol in K562 cell line **Kavya V Anilkumar**, Jubilee Mission Medical College and Research Institute, Thrissur, India.
PP-39	Genotoxic and cytotoxic events in buccal epithelial cells among students exposed to formaldehyde **Reema Rose Alappat**, Jubilee Mission Medical College and Research Institute, Thrissur, India.
PP-40	Evaluation of oxide nanoparticles induced genotoxicity in human peripheral blood lymphocytes using CBMN assay and comet assay: An *in vitro* study. **P.V. Vidya**, Jubilee Mission Medical College and Research Institute, Thrissur, India.
PP-41	Analysis of dose-dependent cytotoxic and genotoxic potential of thymoquinone in SK-MES-1 lung cancer cell line **Eby Joy,** Jubilee Mission Medical College and Research Institute, Thrissur, India.
PP-42	Sensitization of drug resistance cells using ebselen by disturbing the cellular redox status **Sugumar Baskar,** Annamalai University, Tamil Nadu, India.
PP-43	Synthesized β-cyclodextrin polymer loaded quercetin and doxorubicin reverses P-glycoprotein mediated multidrug resistance in KB ChR 8-5 cancer cells **Charan Singh Pawar**, Annamalai University, Tamil Nadu, India.
PP-44	Andrographolide mediated reversal of multidrug resistance by targeting P-glycoprotein **Deepa Swati Lakra**, Annamalai University, Tamil Nadu, India.
PP-45	Unraveling growth traits: Comparative transcriptome analysis of *Penaeus monodon* and tissue-specific expression profiling of growth-associated genes. **Preety Sweta Hembrom**, Central University of Kerala, India.

Session 7: High-throughput approaches in mutagenesis/ Pharmacogenomics/Public health

Chairpersons:	**Prof. Alagu Manickavelu,** CU-Kerala. **Dr. Tony Grace,** CU-Kerala.
14:00-14:40	**Plenary Lecture-7:** Association of buccal MN cytome assay biomarkers with disease and their relevance for clinical studies. **Prof. Stefano Bonassi**, San Raffaele University, Rome, Italy.
14:40-15:00	**Invited Talk-25:** Genetics and genomics application as tools in biodiversity and ecosystem management. **Dr. Subha Bhassu,** University Malaya, Malaysia.
15:00-15:20	**Invited Talk-26:** Exploring nature's allies: From ants to zebrafishes: Alternative models to assessing environmental mutagens. **Dr. L. Divya,** University of Calicut, Kerala, India.
15:20-15:40	**Invited Talk-27:** Precision medicine through pharmacogenomics. **Dr. Puthen Veetil Jithesh,** Hamad Bin Khalifa University (HBKU), Doha, Qatar.
15:40-16:00	**Invited Talk-28:** *Majoon Chobchini* restrains dendritic cell activation via increased PD-L1 expression and reinvigorates Th17/Treg balance in the treatment of rheumatoid arthritis. **Dr. Mahaboobkhan Rasool,** Vellore Institute of Technology (VIT), India.

16:00-16:15	Coffee/Tea Break

Session 8: Best Young Scientist Paper Award Competition (Sabarmati Seminar Hall)

Chairpersons:	**Prof. R. Aswati Nair,** CU-Kerala. **Dr. Ginny Antony,** CU-Kerala
16:15-16:25	**OP-1:** Expressional ratio of human GADD45α and aurora kinase A in Indian cervical cancer patient cohort: Implications in predicting radiotherapeutic success. **Salini Das**, Chittaranjan National Cancer Institute, Kolkata, India.
16:25-16:35	**OP-2:** Association of NOS3 gene polymorphism and nitric oxide levels in asthma patients –A case-control study. **Aswathi Pootheri**, Vellore Institute of Technology, Tamil Nadu, India.
16:35-16:45	**OP-3:** Morphological and molecular implications of cadmium hormesis in *Solanum lycopersicum* L. **Risha Ravi**, University of Hyderabad, Telangana, India.
16:45-16:55	**OP-4:** Association of circadian disruption and its effects on the quality of sleep among diet-induced obese *Drosophila melanogaster* **Damini, C.S,** University of Mysore, Karnataka, India

16:55-17:05	**OP-5:** Methyl parathion-induced oxidative stress causes genotoxicity and expression of cancer-linked genes in human lymphocytes. **Anet Antony**, University of Calicut, Malappuram, Kerala, India.
17:05-17:15	**OP-6:** Plant regeneration from hypocotyl explants of *Turnera subulata* Sm., a key medicinal and ornamental herb. **Ananthu TR,** Central University, Kerala, Tejaswini Hills, India.
17:15-17:25	**OP-7:** Pre-Natal and lactational exposure to environmental contaminants: DEHP and cadmium induced changes in serum biochemistry and tissue histopathology of liver and brain. **Lubna Jasmine,** Bangalore University, Karnataka, India.
17:25-17:35	**OP-8:** Consequences of cold stress on neuronal health -A comprehensive study on biochemical indices of oxidative origin & cognitive ability. **Tilak D.M,** Bangalore University, Karnataka, India.
17:35-17:45	**OP-9:** Water quality assessment and genotoxicity in fishes of Karamana River, Kerala., India: An insight of microplastic pollution. **Ammu C.U,** Central University, Kerala, Tejaswini Hills, India.
17:45-17:55	**OP-10:** Investigating carboplatin-induced neurotoxicity in *Drosophila melanogaster*. **Raifa Abdul Aziz**, Mangalore University, Karnataka, India.
17:55-18:05	**OP-11:** Curcumin, a natural phytochemical by targeting aurora A/B signaling axis compromises acquired doxorubicin resistance in breast cancer cells. **Souvick Biswas**, Chittaranjan National Cancer Institute, India.
18:05-18:15	**OP-12:** Targeting YBX1 protein interaction network using flavonoid-based drugs: A computational analysis **Sreelekshmi P. K,** Central University, Kerala, Tejaswini Hills, India.
18:15-18:25	**OP-13:** Solasodine overcomes P-glycoprotein-mediated multidrug resistance in drug-resistant cancer cells and tumor xenografts **Pradhapsingh Bharathiraja,** Annamalai University, Tamil Nadu, India.
18:25-18:35	**OP-14:** Evaluation of liquid biopsies for the detection of circulating tumor cells by using magnetic nanoparticles **Priya Yadav,** Annamalai University, Tamil Nadu, India.

17:00-19:00	**EMSI General Body Meeting**

19:00-20:30	Cultural programme - **Indian Dances from CU-Kerala Fraternity (Payaswini Hall)**

20:30-21:30	**Dinner**

January 31, 2024, Wednesday

Session 9: DNA damage, free radicals, antioxidants, repair, and food-borne mutagens

Chairpersons:	**Prof. Sudha K,** CU-Kerala, India. **Dr. Birajalaxmi Das,** Bhabha Atomic Research Centre, India.
9:00-9:45	**Plenary Lecture-8:** Antibiotic resistance in food. **Prof. Iddya Karunasagar,** FAO, Nitte University, Mangalore.
9:45-10:05	**Invited Talk-29:** The artificial light at night (ALAN): An agent for the desynchronization of biological rhythm in Zebrafish (*Danio rerio).* **Prof. Asamanja Chattoraj**, Kazi Nazrul University, West Bengal, India.
10:05-10:25	**Invited Talk-30:** Endosulfan induces DNA damage, genomic instability, and growth defects in mice models. **Prof. Sathees C Raghavan,** Indian Institute of Science, Bangalore, India.
10:25-10:45	**Invited Talk-31:** Investigation of biodegradation of the organopollutant tributyl phosphate by *Sphingobium* sp. RSMS. **Dr. Devashish Rath,** Bhabha Atomic Research Centre, Mumbai, India.
10:45-11:05	**Invited Talk-32:** One health approach: Heightening the fight against antimicrobial resistance. **Dr. Ramendra Pati Pandey,** School of Health Science and Technology UPES, Dehradun, India.
11:05-11:25	**Invited Talk-33:** *In silico* bioprospecting of novel natural lead molecules as potential inhibitors against multi-drug resistant *Acinetobacter baumanii* and *Pseudomonas aeruginosa* **Dr. Sinosh Skariyachan,** St. Pius X College Rajapuram, Kerala, India.

Session 10: Tools in Biology and Lifestyle Diseases (Parallel) (Narmada Seminar Hall).

Chairpersons:	**Prof. Arunkumar K,** CU-Kerala, India. **Dr. M. Nagarajan,** CU-Kerala, India.
9:00-9:45	**Plenary lecture-9:** Biotechnological tools in biodiversity conservation. **Dr. Govindhaswamy Umapathy,** CSIR-Centre for Cellular & Molecular Biology, Hyderabad, India.
9:45-10:05	**Invited Talk-34:** Tear fluid in personalized medicine and public health screening – eyeing beyond. **Dr. Swaminathan Sethu,** Narayana Netralaya, Bangalore, India.
10:05-10:25	**Invited Talk-35:** Methylglyoxal alters redox status and promotes cancer development in HepG2 cells via multiple signalling pathways **Dr. K G Raghu,** Jubilee Mission Medical College & Research Institute, Trichur, India
10:25-10:45	**Invited Talk-36:** Tumor-specific targeted therapy with nanoparticles: preclinical

	experience. **Dr. CKK Nair,** Amrita Institute of Medical Sciences, Kochi, India.
10:45-11:05	**Invited Talk-37:** Photoperiodic shifts and behavioural perturbations: Role of melatonin. **Prof. Ranjitsinh Devkar,** M.S. University of Baroda, India.
11:05-11:25	**Invited Talk-38:** Evaluation of the genotype-phenotype correlation in idiopathic dilated cardiomyopathy (iDCM) in an Indian cohort. **Prof. Rajasekhar Moka,** Manipal School of Life Sciences, Manipal Academy of Higher Education, Karnataka, India.

11:25-11:30	Coffee/Tea Break

Session 11: Endocrine Disrupting Chemicals (EDCs) and Human Reproductive Health

Chairpersons:	**Dr. Indrashis Bhattacharya,** CU-Kerala. **Dr. Ramachandran K, C**U-Kerala.
11:30-12:10	**Plenary lecture-10**: Crisis in the male gamete world: Unraveling the impact of male reproductive health and environment. **Prof. Guruprasad Kalthur,** Manipal University, Karnataka, India.
12:10-12:30	**Invited Talk-39**: Xenobiotics adversely affect female fertility by modulating a mismatch repair gene (mlh1). **Dr. Ravi Ram Kristipati,** CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow, India.
12:30-12:45	**Invited Talk-40:** Polyamines can induce early onset of puberty. **Dr. Arnab Banerjee**, BITS Pilani KK Birla Goa Campus, India.
12:45-13:00	**Invited Talk-41:** Influence of environmental mutagens in m6A level in testis **Dr. Souvik Dey,** Manipal Academy of Higher Education, India.
13:00--13:15	**Invited Talk-42:** changing scenarios in infertility. **Dr. Raghavendra Prasad,** Sunrise Hospital, Kanhanghad, Kerala, India.

13:15-14:00	**Lunch**

Session 12: Career Development/Opportunities/Challenges/Communication/ Environmental Regulatory/Policies/Legislation.

Chairpersons:	**Prof. Iddya Karunasagar,** Senior International Food Safety Consultant, FAO of UN, Mangalore. **Prof. K.V. Rajendran**, CU-Kerala, India.
14:00-14:20	**Invited Talk-43**: Science Communication: Risks of communicating risks. **Sri. Kollegala Sharma,** CSIR-CFTRI, Mysore, India.
14:20-14:40	**Invited Talk-44**: Educational Dialogue in public perception of nuclear radiation. **Dr. M Prakash HANDE,** National University of Singapore, Singapore.
14:40-16:15	**PANEL DISCUSSION** Prof. S. Ravichandra Reddy, Former Director, NAAC, Bengaluru. Prof. M Prakash HANDE, National University of Singapore, Singapore. Prof. Joseph Koyippally, Director, Placement Cell, CU-Kerala. Prof. Muthukumar Muthuchamy, Dept. of Environmental Science, CU-Kerala. Prof. Mohammedunni Alias Musthafa, Dept. of Education,CU- Kerala. Prof. Alagu Manickavelu, Director, IQAC, CU-Kerala. Sri. Kollegala Sharma, CSIR-CFTRI, Mysore, India Dr. Swaminathan Sethu, Narayana Netralaya, Bangalore, India.

6:15-16:30	Coffee/Tea Break

16:30-17:30	**Valedictory Program and Awards Distribution**

16:30-16:35	University Anthem: **Students of Biological Sciences**
16:35-16:40	Welcome Address: **Dr. P.A. Sinu**, Dept. of Zoology, CU-Kerala
16:40-16:45	Presidential Address: **Dr. M. Muralidharan Nambiar,** Registrar, CU-Kerala
16:45-16:50	Valedictory Address: **Prof. Vincent Mathew,** Director of Research, CU-Kerala
16:50-16:55	Distribution of Awards: **Prof. K.C. Baiju,** Vice-Chancellor (i/c), CU-Kerala. **Prof Prakash HANDE,** NUS, Singapore and Regional/Acquisition Editor, Mutation Research-Genetic Toxicology and Environmental Mutagenesis, Elsevier
16:55-17:15	Feedback from Delegates:
17:15-17:25	Felicitation: **Prof. S. Ravichandra Reddy,** Former Director, NAAC, Bengaluru. **Prof. K. Arunkumar**, Dean, School of Biological Sciences, CU-Kerala
17:25-17:28	Vote of Thanks: **Dr. H.P. Gurushankara**, Dept. of Zoology, CU-Kerala
17:28-17:30	National Anthem

International Pre-Conference Workshop on "Methods in Genotoxicology"

Sabarmati Seminar Hall, CU-Kerala

January 28, 2024, Sunday

Workshop Lecture: 01

Dr. Alok K. Pandey
Nanomaterial Toxicology Laboratory
Drug and Chemical Toxicology Group (FEST Division)
CSIR-Indian Institute of Toxicology Research
Vishvigyan Bhawan, 31, Mahatma Gandhi Marg, P.O. Box 80,
Lucknow-226001, India. Email: alokpandey@iitr.res.in

Dr.Alok K Pandey is currently working as a Principal Scientist in the Nanomaterial Toxicology Laboratory at CSIR-Indian Institute of Toxicology Research, Lucknow, India. He completed his Ph.D. in 2007 from the University of Lucknow in Environmental Sciences. His area of work includes Nanomaterial Toxicology and Genetic toxicology. His current research work involves the mechanism of nanomaterial toxicity *in vitro* and *in vivo* models using different cytogenetic techniques as well as cell cycle and apoptosis. The work is also being done on ecotoxicological studies of the nanomaterials. His responsibilities include being the course coordinator of one course in the Academy of Scientific and Innovative Research, the Scientist in-charge of the advanced imaging facility and flow cytometry, and participating in other institutional Committees. He has published more than 60 articles in International Peer-reviewed Journals and five book chapters. He is also serving in more than 25 journals as an Editor/Reviewer. So far, Dr. Pandey has trained more than 40 MSc/MTech Scholars as project trainees. At present, he is supervising 5 PhD, 4 Project fellows, and 2 MSc/MTech students.

Basic genotoxicity tests: Chromosomal aberration

Safety assessment of chemicals, along with the development and validation of test systems to assess the interaction of chemicals, becomes imperative to human health. Genetic toxicology is the study of toxicity of agents on genetic material (DNA), resulting in alterations of the nucleic acids or its components, which leads to inactivation or modifications in its structure or function. Genetic toxicology is an intrinsic component of safety testing and indispensable for risk and safety assessment for new drugs and health products.

A battery of testing procedures often called as "Genetic Toxicology Assays' has been identified after their validation, relevance, practical applicability and reproducibility under standardized conditions. This battery of assays allows detection of a spectrum of genetic end points ranging from gene mutations in a bacteria, DNA and chromosomal damage in various cell types of different live forms and can be routinely employed, *in vitro* and *in vivo* for research and development, population monitoring or as a part of regulatory toxicology. Thus, when employed appropriately with suitable experimental design, these can be used to understand mechanisms of toxicity of chemicals, identification of hazardous environment and finally for health risk assessment.

The chromosomal aberration test is employed to identify agents that causes structural chromosomal aberrations. Chromosomal aberrations (CA) are changes in the chromosome structure (structural), or chromosome number (numerical) which are visible under a microscope in proliferating cells arrested in metaphase using tubulin polymerization inhibitors (e.g. colcemid, colchicines). CA can result from direct DNA breakage, replication on damaged DNA template, deletion or rearrangement of chromosomal material during cell cycle; inhibition of DNA synthesis and abnormal cell divisions (aneuploidy, polyploidy).

The CA test can be performed *in vitro* using cultured cells and peripheral lymphocytes (OECD, 473) and *in vivo*, using the bone marrow cells of mice/rats (OECD, 475). *In vivo* CA involves treating of the animals and then collecting cells e.g. bone marrow for cytogenetic analysis. It has also been widely used in human biomonitoring studies assessing the genotoxicity in exposed populations. A working protocol used in our lab for detection of chromosome damage will be discussed.

Workshop Lecture: 02

Dr. Shamprasad Varija Raghu
Division of Neuroscience
Yenepoya Research Centre (YRC), Yenepoya (Deemed to be University)
Mangalore, Karnataka 575018.
Email: shamprasadvarijaraghu@gmail.com

Dr. Shamprasad Varija Raghu is currently working as an Associate Professor, the Division of Neuroscience, Yenepoya Research Centre (YRC), Yenepoya (Deemed to University), Mangalore. He did his M.Sc and Ph.D. (with Professor Rajashekhar K Patil) from Dept of Applied Zoology, Mangalore University. He was awarded a prestigious DAAD (Germany)

fellowship during his doctoral studies to work with Professor Karl Fischbach at the University of Freiburg, Germany. He carried out his postdoctoral studies at Max Planck Institute of Neurobiology, Germany with Professor Alexander Borst, Director, Max Planck Institute of Neurobiology. He worked as a Research Scientist at A*STAR Neuroscience Partnership (NRP) Singapore and Duke-NUS Graduate Medical School, Singapore with Dr. Adam Claridge-Chang. He was awarded the prestigious Ramalingaswami Fellowship (Dept of Biotechnology, 2015-2023) and Ramanujan Fellowship (Dept of Science and Technology, 2015-2020) to continue his research activities in India. He has now established a "Neurogenetics Lab" on the Mangalore University campus and his lab is working on different genetic and behavioural studies using the model organism *Drosophila melanogaster*. His current lab at Yenepoya Research Centre (YRC) is involved in studies on the impact of gut microbiomes on different neurological disorders and cancer biology. Dr. Raghu published nearly 70 research articles in national and international journals with a total impact factor of about 250. He also published 13 international book chapters. His lab is supported by different funding agencies including DBT, BRNS, and ICMR.

Generation of Gal4-UAS transgenic flies and its application in biological research

Cellular functions are regulated by the controlled level of gene expression and the production of specific proteins. Different signaling pathways control the initiation and regulation of gene expression. The start of transcription is the process in which DNA sequences get transcribed into mRNA, controlled by binding of transcription activator to enhancer sequences found in DNA. It then recruits transcription machinery to the site to induce gene expression. All these cellular processes could be visualized or controlled using different genetic tools. Gal4-UAS is one such transcription activation system co-opted from yeast into *Drosophila* (Brand and Perrimon, 1993; Raghu et al., 2018). It is a *Drosophila* geneticist's main workhorse and is used for gene manipulations (on/off or gene overexpression/down regulations, etc.).

The *GAL4-UAS* binary system involves crossing a *GAL4*-driver and the *UAS*-responder fly lines (**Fig.1**). In the *GAL4* driver transgenic line, the promoter region of the gene of one's interest controls the expression of the coding region of the yeast transcriptional activator, *GAL4*. The *UAS*-responder transgenic line carries the *GAL4*-responsive upstream activating sequence (*UAS*) and is placed upstream of the desired gene's transcribed region. In the progeny of such a cross, the responder transgene is expressed in cells in which the given promoter placed upstream of the *GAL4* coding region drives the expression of the *GAL4* transcriptional activator. *GAL4* binds with the *UAS* and this leads to activation of the responder gene. The *UAS-GFP* is commonly used as a responder line to identify specific cells in which the given promoter driving the *GAL4* synthesis is active. In the *UAS-GFP* transgene, the green fluorescent protein (*GFP*) coding region is cloned downstream of the *UAS* region taken from yeast. Thus, the *GFP* fluorescence acts as the reported gene for the promoter driving expression of the *GAL4* transcription factor. Only in those cells or neurons that express the *GAL4*, the transcription of the *GFP* reporter gene will be activated which can be visualized by recording the fluorescence. In different approaches, modulators/toxic proteins that can alter the activity of

the targeted cell can also be used as a *UAS*-reporter to manipulate the expression of gene/s in target cells.

A number of *GAL4* driver lines that express the *GAL4* in different regions of the central nervous system are available from different Drosophila Stock Centres across the world.

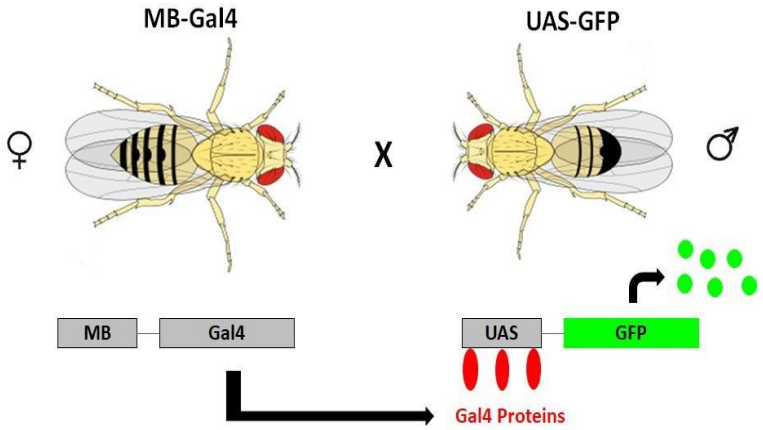


Figure 1: Targeted ectopic expression of MB gene using Gal4-UAS system. The GAL4 gene encoding a transcriptional activator from yeast is introduced into the *Drosophila* genome under the control of the promoter region of gene MB. *Drosophila* lines thus expressing the GAL4 protein in the Mushroom body region are crossed to lines carrying a GFP gene (for visualization) subcloned downstream of the Gal4 binding site or Upstream Activation Sequence (UAS) region.

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Workshop Lecture: 03

Dr. Goran Gajski
Institute for Medical Research and Occupational Health,
10000 Zagreb, Croatia.
+385915255949, *Email:*ggajski@imi.hr

Goran Gajski, PhD is a Senior Scientific Associate at the Institute for Medical Research and Occupational Health in Zagreb, Croatia with a scientific background in biochemistry and molecular biology. In the field of genetic toxicology, he uses various methodological approaches, both in vitro and in vivo, on different cell and animal models to investigate the effects of various physical and chemical agents on organisms, tissues, cells, and cell structures with special emphasis on the DNA molecule. Moreover, the scope of his work also comprises human biomonitoring studies in different environmental and occupational settings. He was involved in several national and international projects as principal investigator and team member and has published more than 120 papers and book chapters that have been cited more than 4000 times with an h-index of 36 (by Google Scholar). For his work, he received several national and international scientific awards, among others the Danubius Young Scientist Award issued by the Austrian Federal Ministry of Science and the National Award for Science in the Field of Natural Sciences issued by the Croatian Parliament. Currently, he is a chair of the International Comet Assay Group an affiliated group of the European Environmental Mutagenesis and Genomics Society. He is a European Registered Toxicologist (ERT) and Editorial Board member of the journal Medicine®.

Application of the blood and buccal micronucleus assays in biomonitoring of children exposed to diagnostic radiation

Goran Gajski[1], Mirta Milić[1], Marko Gerić[1], Marijana Nodilo[2], Željka Knežević[2], Natko Beck[3], Vera Garaj-Vrhovac[1], Saveta Miljanić[2], Mariá Ranogajec-Komor[2], Đurđica Milković[3]

[1]Institute for Medical Research and Occupational Health, 10000 Zagreb, Croatia
[2]Ruđer Bošković Institute, 10000 Zagreb, Croatia
[3]Srebrnjak Children's Hospital, 10000 Zagreb, Croatia

The use of cytogenetic methods is important in human biomonitoring for evaluating the extent of chromosomal damage caused by various genotoxic agents. Spontaneous or baseline frequencies of different cytogenetic parameters can provide valuable data regarding the

accumulated genetic damage appearing during the lifespan of an individual. The lymphocyte micronucleus cytome (L-MN Cyt) assay is a reliable method for measuring chromosome damage, but the buccal micronucleus cytome (B-MN Cyt) assay is gaining popularity due to its minimally invasive nature, making it more suitable for children. As children may be more sensitive to radiation, it is important to continuously monitor their exposure to X-ray diagnostic examinations. Therefore, this study aimed to evaluate the effects of diagnostic chest and sinus X-ray exposure on lymphocytes and buccal cells using both MN Cyt assays. The L-MN Cyt assay showed a significant increase in the number of micronuclei, nucleoplasmic bridges, and nuclear buds after the diagnostic procedure. The B-MN Cyt assay was used to evaluate DNA damaging, replicative, cytostatic, and cell death effects. Micronuclei, as well as other biomarkers of DNA damage (nuclear buds and so-called "broken eggs"), and genomic instability (normal basal cells, normal differentiated cells, binucleated cells, cells with condensed chromatin, pyknotic cells, cells with karyorrhectic chromatin and karyolitic cells), were analyzed. The only significant increase was noted in cells with condensed chromatin, indicating early stages of apoptosis. It should be noted that there were interindividual differences among the monitored children in both assays. Based on our results, the MN Cyt assay can be useful for acute events where children are exposed to genotoxic agents from physical sources. Besides, the B-MN Cyt assay could be used for monitoring genetic damage in children who are often exposed to diagnostic procedures, as it is a minimally invasive method of sample collection. In the meantime, efforts should be made to minimize the annual absorbed dose and conduct further research on the radio-sensitivity time window.

Workshop Lecture: 04

Dr. Anurag Sharma

Department of Environmental Health and Toxicology, Nitte University Centre for Science Education and Research, Nitte (Deemed to be University), Deralakatte, Mangaluru, Karnataka, India-575018; Email:anuragsharma@nitte.edu.in

Dr. Anurag Sharma is an Associate Professor in the Department of Environmental Health and Toxicology at Nitte University Center for Science Education Research (NUCSER), Nitte (Deemed to be University), Mangalore, Karnataka, India. With a Ph.D. from CSIR-Indian Institute of Toxicology Research (awarded by Jamia Hamdard University, New Delhi), his early research honed in on understanding cellular and molecular stress responses to environmental toxicants using the *Drosophila melanogaster* model system. Transitioning to Centre de biologie du développement (CBD) Toulouse, France, for his post-doctoral tenure,

he delved into blood cell development using the same *Drosophila* model system. Currently, Dr. Anurag's focus lies in unraveling the molecular mechanisms behind environmental toxicant-induced immune injury and exploring host-microbe interactions due to environmental toxicant exposure. His contributions include over 25 published research papers in SCI-indexed journals and 9 book chapters. Notably, he has supervised 02 Ph.D. students, and 12 master's theses, and guided 01 post-doc, presenting a h-index of 16 with 1707 citations as per Google Scholar.

Fundamental methods for assessing genotoxicity

DNA, being a key genetic material for organisms, maintains genetic integrity by transferring information to the next generation and is among the possible targets of pharmaceuticals, chemicals, food additives, and environmental pollutants. Despite highly packed structures, DNA cannot escape from the attack of xenobiotics. The altered chemistry of DNA may lead to the loss of basic genetic information and the development of various diseases, including cancer. DNA damage can emanate from diverse sources, encompassing both endogenous factors like replication stress and reactive oxygen species (ROS) generation, and exogenous factors such as radiation chemical exposure, and pathogens attack. The cell possesses intricate repair mechanisms to correct these damages, but when the damage overwhelms the repair capacity, it can lead to mutations, and chromosomal aberrations, and potentially contribute to diseases. Thus, genotoxicity refers to the ability of a substance to cause damage to the genetic material within a cell, leading to mutations, chromosomal aberrations, or other adverse effects. Genotoxicity can range from point mutations to chromosomal aberrations. Several *in-vitro* (human and mammalian cells) and *in-vivo* (animal studies) tests have been developed to assess the health of the DNA. These include gene mutation assays (AMES test, mouse lymphoma TK assay, and hypoxanthine phosphorybosyl transferase assay); chromosomal abnormalities assays (micronucleus test, and chromosomal aberration Test); and primary DNA damage tests (Comet assay, γ-H2AX assay and estimation of 8-oxo-G). Given the diverse nature of toxicants and their intricate biological organization, no single test is universally suitable for accurate genotoxic assessment. Therefore, considerations such as the chemical's mode of action, the selected model system (*in vitro* or *in vivo*), and the strengths and weaknesses of the genotoxicity test must be considered before selecting. This discerning approach is crucial for ensuring a comprehensive and accurate evaluation of the genotoxic potential of various substances.

International Conference on "Environmental Mutagenesis: Impact on Biodiversity and Human Health in a Changing World"
January 29, 2024, Monday

KEYNOTE SPEAKER

Prof. R C Sobti
INSA Sr. Scientist & Professor Emeritus
Former Vice-Chancellor, Panjab University and
Babasaheb Bhimrao Ambedkar University (A Central University of Lucknow)
General President Indian Science Congress Association 2013-14
Department of Biotechnology, Panjab University, Chandigarh 160 014, India.
Email:rcsobti@pu.ac.in

Professor (Dr) R.C. Sobti, Senior Scientist (Indian National Science Academy), Former Vice Chancellor, Babasaheb Bhimrao Ambedkar University, Lucknow (UP) and Panjab University, Chandigarh, Former Education, Advisor, Governor of Bihar is, indeed, a polymath- a renowned academician, distinguished scientist, dynamic administrator and a visionary gifted with an immensely optimistic disposition and integrity of character, words and action. He has also been a member of the EC of the Society of Indian Institute of Mass Communication India (2013-16), Chairman governing council, of the National Council of Science Museum (2014-2018) as well a member of various committees of UGC, DBT, CSIR, DRDO and NACC. He was the general president Indian Science Congress Association (2013-14).

As a protean public intellectual, Professor Sobti is a remarkable leader in the domain of science/scientific knowledge -both in theory and practice.

Starting his career as a cytogeneticist, Professor Sobti has proactively been involved in cancer biology and focused on finding novel tumor markers for cancer detection. He evaluated the role of gene polymorphisms and their expression in the genesis of various cancers, COPD, AIDS, and metabolic syndrome. The identification of disease-susceptible/protective noel genotypes and determination of the crucial role of SACS-1 and STAT genes in the genesis of cervical and prostate cancers are the most noteworthy observations. He has also worked the animal molecular biology to look for solutions to intricate problems facing mankind.

His immense contributions to science include inter alia, 350 high-impact research publications,55 books published by international publishers like Springer Nature, Elsevier,

CRC, Cambridge Scholar, and 23 Sponsored Research projects. He has supervised more than 50 students for the Ph.D., MSc, MPhil, and D.Sc.

He has delivered numerous keynote addresses at reputed National and International forums, based on implications and applications of science and scientific temper for general awareness and improvements of everyday life and lifestyle in a lucid and people-centric manner.

Professor Sobti is a fellow of the Third World Academy of Sciences (TWAS), National Academy of Sciences, Indian National Science Academy, National Academies of Medical Sciences and Agricultural Sciences, and Canadian Academy of Cardiovascular Diseases. He is also associated with many other Academic Associations and Institutions in higher education and research. The litany of honors showered on him includes, among others, the INSA Young Scientist Medal (1978), UGC Career Research Award, Punjab Rattan Award, JC Bose Oration Award, and Life Time Achievement Award of the Punjab Academy of Sciences, Zoology Society of India and the Environment Academy of India. Besides many other medals and awards from various reputed National and International Organizations owing to his exceptional contributions and societal commitments, the government of India has conferred on him the honorary rank of **COLONEL**.

In recognition of his enormous contributions to higher education, he has been bestowed with a large number of prestigious awards and medals which adorn his academic and professional career. The government of India bestowed upon him the honor of "**PADMASHIRI**" in 2009 by way of rightfully acknowledging his great contribution to higher education in India. On 2nd July 2016, he was also honored with the '**Bharath Gaurav', Life Time Achievement Award at the House of Commons, British Parliament London, U.K.**

Professor Sobti, not only excels in creating an academic atmosphere but is also equally steadfast and loyal towards the environment and society. His charismatic aura and unrelenting attitude, which encourage and motivate all, have an inherent capacity to transform the organization into a synergistic, cohesive, and vibrant team.

Professor Sobti's pragmatic approach and dynamic vision encapsulated in his view that education at university should be a mechanism for social change and a liberating force for individuals and society, resulting in the initiation of various **Community Engagement Programs.** His innovative ideas in enthusing the faculty and students to excel in research and academics and his efforts in transferring these ideas to the needy through scientific spirit and temper can be pronounced as distinct and exceptional. Professor Sobti has not only instilled the importance of science and scientific perspective in personal and societal development but has also rigorously campaigned and spread awareness about the ill effects of the abuse of scientific and technological advancements for greed. He has set examples and personally taken initiatives to make the campuses wherever he has worked as Vice Chancellor - an environment conducive, safe, and healthy through the successful implementation of numerous socially relevant and meaningful initiatives.

Professor Sobti has always gone beyond the call of duty in every arena, be it for his innovative ideas, constant encouragement, and speedy actions aimed at the comprehensive development of society. Professor R.C. Sobti is a personification of energy synergy,

positivity, creativity, and development. He encompasses the best of tradition and modernity both to engineer a dynamic today-which is of vital significance to create a great future. He is the epitome of kindness, hard work, and solidarity an active researcher, and a perfect protagonist in the popularization of science and can carry along a large community toward a developed and progressive Nation.

Delineation of the impact of microenvironment on cancer

Tumors necessitate intricate interactions with neighbouring blood arteries, immune cells, supportive tissue structures, and specific cell types unique to the tumor site to proliferate, acquire invasiveness, and undergo metastasis. Tumours influence their surrounding microenvironment by releasing soluble signals, which in turn cause deterioration and remodelling of the tissue structures that restrict their growth. Tumours consist not just of cancer cells but also include other types of cells, such as fibroblasts, macrophages, and endothelial cells, as well as secreted proteins, blood vessels, and the extracellular matrix (ECM). The interaction between TME structural components and cells permits cancer cells to acquire an invasive phenotype, spreading to distant sites from the primary site via a complex and multistep metastatic cascade. The tumor microenvironment plays an active role in tumor formation and might contribute to treatment resistance rather than being a passive spectator. At first, the cells and extracellular matrix (ECM) surrounding tumor cells do not actively support their growth. However, tumor cells alter their environment to favour their development as time passes. Tumor growth necessitates tumor cells to surmount hypoxia and nutritional deprivation while also exhibiting waste removal capabilities and the ability to generate secondary tumors. Enhanced understanding of neoplastic cells and their microenvironment leads to developing more effective pharmaceutical agents targeting the tumour cells and their surrounding milieu. Tumorigenesis is an intricate and ever-changing process encompassing interactions between cells and the extracellular matrix (ECM), enabling the growth of tumor cells, resistance to drugs, and the spread of cancer to other parts of the body. It emphasizes how tumor cells alter normal cells to promote tumor growth, such as transforming normal fibroblasts, macrophages, and endothelial cells into pro-tumorigenic phenotypes. Tumor cells release multiple elements that cause the conversion of a previously non-cancerous environment into a cancer-promoting milieu. After their formation, solid tumors maintain ongoing interactions with many types of stromal cells, such as local and infiltrating fibroblasts, macrophages, mesenchymal stem cells, endothelial cells, pericytes, as well as secreted factors, and the extracellular matrix (ECM) present in the tumor microenvironment (TME). The TME, or tumor microenvironment, plays a crucial role in the development of tumors, the response to drugs, and the treatment outcome. Crucially, stromal cells and released substances can have an initial anti-tumorigenic effect, but as time passes, they can encourage the development of tumors and create resistance to therapy. In response to hypoxia, the body increases the process of angiogenesis, which involves the creation of new blood vessels. This is done to actively support and facilitate the growth of tumours by providing them with oxygen and nutrients while eliminating metabolic waste. Angiogenesis facilitates the development of blood vessels that support the spread of tumor cells. To successfully treat tumors and develop new drugs, it is necessary to identify and target the pro-tumorigenic elements of the tumor microenvironment (TME). These elements include cancer-associated fibroblasts (CAFs), cancer-associated macrophages (CAMs), hypoxia, and the inhibition of ECM-receptor interactions, in addition to targeting the tumor cells. Therapeutic success relies on reprogramming stromal cells and the immune response to become anti-tumorigenic.

Session 1: Gene-Environment Interaction and Human Health

Plenary lecture-1

Prof. Narinder K Mehra
Hon Emeritus Scientist of ICMR,
Vice President (international), Indian National Science Academy and
Former Dean, All-India Institute of Medical Sciences, New Delhi.
Email:narin.mehra@gmail.com

Prof Mehra is an Honorary Emeritus scientist of the Indian Council of Medical Research, and Former Dean and National chair of All India Institute of Medical Sciences, New Delhi. As vice president (international affairs) of the Indian National Science Academy (INSA), he played a key role in the S20 engagement group during the G20 Presidency of India. He is an internationally acclaimed expert in the area of Transplant Immunology and Clinical Immunogenetics, for which his singular efforts culminated in establishing this specialty for the first time in India, thus facilitating solid organ and hematopoietic stem cell transplants in the country. He is vastly experienced in policy, education promotion, and strategic planning for science. He was the main resource for preparing the National Guidelines for Stem Cell Research and Therapy and Guidelines for Umbilical Cord Blood Banking. During the COVID-19 pandemic, he published a white paper, "*COVID-19:* host immunity and vaccines" and took an active part in public education.

Prof Mehra has been the President of the Indian Immunology Society, councilor for the International Union of Immunological Societies, co-chair of the IUIS Gender equality committee, and founder Secretary-General of the Federation of Immunological Societies of Asia-Oceania. He is a Fellow of the Indian National Science Academy, National Academy of Sciences, National Academy of Medical Sciences, Member *Honoris Causa* of the Hungarian Academy of Sciences, and 'Fellow' of The World Academy of Sciences (FTWAS)**.** Recently, he has been elected 'Honorary Fellow' of the Royal College of Physicians (FRCP) of the UK and 'Fellow' of the Geneva-based International Science Council (FISC).

He has over 100 scientific awards and academic honors including the coveted S.S. Bhatnagar Prize of the CSIR, Dr B.R. Ambedkar Prize of ICMR for excellence in medical research, and the Tata Innovation Fellowship of the DBT, Govt of India. The French Government conferred on him the *Chevalier of the National Order of Merit.* He also received the Khwarizmi International Award from the Iranian Research Organization for Science and Technology. He was a member of the international jury for the high-value *Else Kroner Fresenius International Award* in Immunology and for selecting high-impact joint research projects of the Canadian Institutes of Health Research and the Israel Research Foundation. He has published over 480 research papers and regularly writes columns for the leading newspapers on COVID-19 and viral host immunity.

Twin crises of air pollution and anti-microbial resistance and impact on human health

Human health is determined by the interaction of our environment with the genome, epigenome, and microbiome, all of which shape the transcriptomic, proteomic, and metabolomic landscape of cells and tissues. Often, genetic and environmental factors contribute to a given disease in a non-additive manner, yielding a gene-environment interaction. We live in an environment of microbes that influence both the soil and the planet's health with a direct effect on human and animal health. In recent years, the concept of One Health has gained universal acceptance for achieving holistic health through inclusivity and holism involving human, animal, and environmental health. The immediate concerns are with regards to the impact on biodiversity, growing concern about air pollution and environmental pollutants, a threat to food supplies, livelihoods, and economies from diseases in food animals, and an increase in waterborne diseases across communities. Increasing physical inactivity, tobacco use, and consumption of alcohol are factors for the rising threat of diet-related non-communicable diseases including cancer, diabetes, and chronic respiratory and cardiovascular diseases. Further, the rampant misuse of anti-microbial drugs in both human and veterinary populations as well as in agriculture farming is the leading cause of growing anti-microbial resistance (AMR), making the treatment and management of even common infections like pneumonia challenging. Recent studies have highlighted a direct link between air pollution and increasing antibiotic resistance leading to high numbers of premature deaths. In 2019, AMR was associated with over five million fatalities, of which 1.3 million were directly due to bacterial resistance. A strong policy must be in place to curb environmental degradation through a science-based approach.

Invited Talk-1

Dr. Mohanan PV
Toxicology Division, Biomedical Technology Wing
SreeChitraTirunal Institute for Medical Sciences and Technology (Govt. of India),
Poojappura, Trivandrum 695 012, Kerala, India
Email: mohananpv10@gmail.com

Dr. Mohanan is a Fellow of the National Academy of Science, India, and the Royal Society of Biologists, UK. He was a JSPS Post doctoral Fellow at the University of Tsukuba, Japan in the field of Neurotoxicity. As a toxicologist, he has been intimately associated with all the medical devices/technologies developed at SCTIMST (Govt. of India). Currently, he heads both the Division of Toxicology and Dept. of Applied Biology. Dr. Mohanan was a member

of the Empowered Committee on the 'Rapid Response Regulatory Framework for COVID-19 to deal with applications for development of vaccines, diagnostics, prophylactics, and therapeutics and an expert member in the statutory Committee, **RCGM, DBT, New Delhi. Mohanan is also serving as an expert member at the DST, SERB, DBT, ICMR, CSIR, and FSSAI Scientific committees. He is a**n Expert member of the Joint Food and Agriculture Organization of the United Nations and the World Health Organization (JECFA), USA. Mohanan is a member of the Scientific Advisory Committee of ICMR-NARFBR, Hyderabad. He is a Visiting Professor and Visiting Researcher at Toyo University, Japan, and a Certified Biological Safety Specialist. Mohanan is an Adjunct Professor at the Indian Institute of Technology, Hyderabad, and Jamia Hamdard University, New Delhi. He received a lifetime achievement award from the Society of Toxicology India, for his outstanding contribution to the field of toxicology. The development of Human-on-a-chip is a new mega project, apart from several other externally funded research projects. Patented an ELISA kit for the measurement of pyrogenicity. Mohanan made significant contributions to the development of medical device regulations in India. He received a certificate of appreciation from the Hon. Minister of Science and Technology, Govt. of India for his contribution to India getting full adherent status on GLP from OECD. He has authored 275 publications, edited 9 books, 5 patent filed, and 3 design registrations. Presently he is the Secretary General of the Society of Toxicology, India, and Vice President Kerala Academy of Sciences, India.

Organs-on-a-chip for safety evaluation and modelling of disease

The organs-on-a-chip technology aims to combine several organ equivalents within a human-like metabolizing environment or *in vivo*-like environment. These technologies mimic organ interactions observed in the human body and lead to the absorption, metabolism, excretion, and toxicity of the molecules of interest. The microfluidic-based organs-on-a-chip devices provide a robust platform for culturing different cells separately under continuous perfusion. The complexity of these devices can vary from a single-cell device (organ-on-a-chip) to a multi-organ-on-a-chip. The success of the organ-on-a-chip system has stimulated researchers to challenge a more systemic level *in vitro* human biology through a multi-organ-on-a-chip (MoC) technology. These are biomimetic systems built on a microfluidic chip, in which cross-organ communication is established, allowing the study of organ processes and modelling of systemic diseases. Microchannels and chambers are etched onto biocompatible materials like PDMS where physiologically relevant, organ-specific microenvironments are fabricated. Major Applications of organs-on-a-chip are toxicity screening, drug metabolism, pharmacokinetics, ADME profiling, cancer studies, and other disease modelling.

Invited Talk-2

Dr. Bani Bandana Ganguly
MGM New Bombay Hospital and MGM Institute of Health Sciences,
Navi Mumbai, India Vashi Sector 3, Navi Mumbai 400703.
Email:bani.b.ganguly@mgmhospitalvashi.net

Bani Bandana Ganguly, PhD, FICMCH is involved in genetic diagnosis of heritable and acquired genetic disorders. Her expertise also includes assessment of genotoxicity of industrial chemicals *in vitro* and *in vivo*, and radiation cytogenetics, including bio-dosimetry and chromosomal participation in damage production *in vitro*. Her work on genetic screening of methyl isocyanate gas-exposed population of Bhopal, India immediately post-exposure and 30 years later has highlighted the significance of mortality-based stratification of cohorts, and elevated chromosome aberrations and delayed cell replication in the severely exposed individuals. She was the recipient of national and international awards and felicitations as a mark of her achievement in research and diagnosis. Dr. Ganguly has published more than 100 research articles, mostly in reputed international journals. Her recent publication of a book, titled "Genetics and Neurobiology of Down Syndrome" published by the Academic Press, USA in 2022 further indicates her involvement and interest in dispersing the facets of genetic disorders to layman and high-profile researchers. She is well versed in quality assurance and management pertaining to medical diagnosis (ISO 17025, 15189, 17043) and conducted a number of accreditation assessments on behalf of NABL (QCI) in the capacity of Lead and Technical Assessor. She has an immense interest in establishing an up-to-date genetics lab in India, which can comprehensively cater to genetic diagnosis and research for the people living below the poverty line, and improve their health and living.

Effects of environment, habit, and habitat on human health

Human health is subjected to myriads of exposure starting from habitat through living and lifestyle factors. In the present era, individuals are exposed to varieties of life-saving drugs right from their stay in the mother's womb. A growing trend towards the consumption of restaurant food, use of cosmetics and beauty products, and addiction to drugs, alcohol, and tobacco is contributing to the restructuring of the DNA architecture and so as the function of the genes. Environmental admixture of chemicals, gases, radio-nuclides, cyber-particles, and micro-plastics is posing additional threats. Cross-border exchange of technologies/produces and dispersion of environmental pollution can be controlled to some extent by the regulatory authorities of developing/developed nations. With this notion, Union Carbide India Ltd. (UCIL) was established in Bhopal for manufacturing pesticides using methyl isocyanate (MIC) gas as an ingredient of 'Sevin'. However, a reduction in

manufacture led to the storage of huge quantities of MIC gas, and a lack of quality control measures resulted in the leakage of ~20 tons of MIC into the atmospheric air in December 1984. That MIC disaster claimed thousands of lives immediately and many more subsequently. The galore death toll was aggravated owing to the absence of knowledge about the gravity of MIC toxicity and its antidotes. Truly, most industrial chemicals are not tested for their toxicological potential, but in use for decades. Post-disaster, MIC was being tested in every reputed toxicology laboratory and the result was released in 1987 in the Environmental Health Perspective journal. However, exposure assessment could not be thought of then amid the extreme medical crisis. Later, exposure stratification was carried out based on the immediate death toll. Cytogenetic screening immediately post-disaster and 30 years later revealed a high incidence of chromosomal alterations (chromosomal aberrations, sister chromatid exchanges, micronuclei) in the MIC-exposed population, which was pronounced in the severely exposed cohort. Cell cycle kinetics was significantly reduced in the severely exposed population. A follow-up cytogenetic study demonstrated an age-related increase in chromosomal abnormalities; however, the interaction of age and exposure status was not significant in the Tukey HSD test. In addition, abnormalities were higher in the people consuming tobacco. The study further highlighted the current status of stable and unstable aberrations in the circulating lymphocytes of the MIC-exposed survivors. The stable and unstable rearrangements observed in single cells may not pass down to the next generation but indicate genetic instability. Nevertheless, the interaction of lifestyle with additional environmental/occupational exposures over a period of 30 years against a background MIC exposure remained un-elucidated. The result collected 30 years later does not indicate the direct effect of MIC, but rather a concerted effect of life- and lifestyle, occupation, and gene-environment interaction. Altogether, the MIC accident was catastrophic for the survivors as they continued to experience multiples of co-morbidities amid extreme economic crises and loss of kin.

MIC's use to make pesticides, without knowing the severity of its toxicity could have been averted by using lesser toxic ingredients. There are hundreds to thousands of such chemicals, which are not known for their genotoxic potential. Ultimately, these highly toxic chemicals/pollutants are indirectly consumed by humans through feeds and feeders, and these particles subsequently pose a sequel of health effects through slow poisoning. Pollutants are continually contaminating the air-water-soil reaching out to every corner of the globe and affecting every life. Industrial emissions/discards are not confined to its territory but flow into the big sea and vast atmosphere. What so ever the amount of chemicals-gases-particles released into the environment, development in all sectors is inevitable to meet the needs of human life. However, if the requirement is fulfilled by alternative supplies, instead of expanding the manufacture irresistibly and contributing to inflation, the environment can be saved to some extent from the daily load of hazardous wastes, and that can be controlled by the regulatory policies and practices of every nation.

Key words: Chromosomal alterations; environmental pollution; human health; life- and living-style; methyl isocyanate gas disaster.

Poster Presentations

PP-1

Monitoring the susceptible/resistance status of *Anopheline* species in Mangaluru City Karnataka, India

Pradeep D[1], Mazumdar D[2], Mohanty AK[2], Mustak MS[1]
[1]*Depatment of Applied Zoology, Mangalore University, Mangalagangothri-574199, Karnataka*
[2]*ICMR-National Institute of Malaria Research, Field Unit, Goa*
Email:pradeepdsagar@gmail.com

Vector-borne diseases are highly prevalent in many parts of India. Mangaluru is located in the southwest coastal part of Karnataka state. Mangaluru city is endemic to malaria, reporting more number of malaria cases to Karnataka state. In the last two decades, rapid urbanization in Mangaluru city resulted in a substantial number of immigrant labourers from other parts of India, prominently from Northeastern regions where malaria is highly endemic, this has accelerated the spread and incidences of malaria in Mangaluru city and surrounding areas. To reduce the incidence of malaria, the control of its vector species is of paramount importance. From many parts of the world, the malaria vector species showed resistance against the recommended conc, of larvicide due to improper practices. This resistance has impacted the recommended level of larvicidal activity for efficient malarial vector control. This study was undertaken in Mangaluru city to assess the current status of insecticide susceptibility of Anopheline larva against temephos. The larvicidal activity was tested against the early third-stage instar larvae. of *Anophelines*. The percentage average mortality of larvae observed after 24 and 48 hours. The susceptibility status of the larvae was evaluated by LC50 and LC90 values. The LC50 and LC90 test values are 0.0178 mg/lit and 0.0567 mg/lit after 24 hours and after 48 hours the values are 0.0006 mg/lit and 0.0489 mg/lit respectively. The result showed that Anophilines are susceptible to the Organophosphate insecticide, Temephos. This information is useful for the vector-borne disease control programme.

PP-2

Role of tumor heterogeneity in expression of epithelial-mesenchymal transition-associated genes and oral squamous cell carcinoma metastasis

Shubham Singh[1], N. Rajendra Prasad[1]
[1]*Department of Biochemistry and Biotechnology, Annamalai University, Chidambaram-608002, Tamil Nadu, India*
Email:ssrsi007@gmail.com

Tumor heterogeneity refers to the heterologous population of cancer cells with varying genotypic and phenotypic traits that may affect cellular behavior, including morphology, gene expression, proliferation, and metastatic potential. Oral squamous cell carcinoma is the most common type of cancer occurring in the oral cavity and affects the mucosal epithelium in the Indian population. Circulating tumor cells are considered a primary cause of tumor metastasis, with epithelial–mesenchymal transition being the major contributing factor. This study is aimed to investigate the oral squamous cell carcinoma for heterogeneity and its effect

on epithelial–mesenchymal transition-associated markers using Golden Syrian hamsters. Animals are divided into the following three groups: (1) Control; (2) 7,12-dimethylbenz[a]anthracene; and (3) 7,12-dimethylbenz[a]anthracene + doxorubicin, with six animals per group. Following tumor generation, blood would be collected from the hamsters at set intervals (1 week, 2 weeks, 1 month, and 2 months). The collected blood from near the tumor region would be subjected to immunofluorescence using specific antibodies that capture epithelial–mesenchymal transition cells present in the blood. The isolated tumor cells would be subjected to whole genome sequencing and the sequencing results would be analyzed for heterogeneity among the genes of epithelial–mesenchymal transition markers. The results of this study may provide insights regarding the mutational frequencies during cancer metastases and progression.

Keywords: Tumor, heterogeneity, circulating tumor cell, Golden Syrian hamster, epithelial–mesenchymal transition

Highlights:

- Epithelial–mesenchymal transition promotes metastasis through circulating tumor cells.
- Circulating tumor cells are the potential prognostic biomarkers for early detection of cancer.
- EMT-specific genes affected by heterogeneity can be targeted for predicting metastasis.
- Molecular and genetic profiling of CTCs can be helpful for better treatment strategies.

PP-3

Morphological alterations induced by lithium chloride (LiCl) on *Drosophila melanogaster*

Vijaykumar R., Srinath B. S. and N. Shivanna**

Department of Zoology, Karnatak University, Dharwad-580003.

** *Email:drnshivanna@rediffmail.com*

Morphometrics is an essential technique to analyse the body size and shape, which influences sexual dimorphism as well as abnormalities in insects. Lithium is an alkali metal and it is used as an antidepressant. However, excessive intake or accumulation of lithium chloride can cause vulnerability to organisms. It has both positive and negative effects on *Drosophila.* For the present study, *Drosophila melanogaster* was employed to know the effect of high (75mM) concentration of lithium chloride (LiCl) exposure on its morphology using Geometric Morphometric Analysis (GMA), traditional morphometrics and FA (Fluctuating Asymmetry). The study revealed an increase in FA between control and treated flies for wing length and Sternopleural index; whereas in the case of wing width, there was a decrease in FA. Studies on wing morphometrics using GMA revealed subtle variations between control and treatment concerning shape and size. The mean morphological characters such as Total Length (TL), Head Length (HL), Thorax Length (ThL), abdominal length (AL), and Abdominal Width (AW) were also quantified and compared between male and female control and treated flies. It revealed no significant differences for TL, HL, ThL, and AL. A statistically significant difference was found for AW between control and treated flies in both males and females. Overall, the LiCl of 75mM concentration exposure affected abdominal width and FA of wing length, width, and sternopleural index of male and female flies.

PP-4

Ionic liquid functionalized-silica coated magnetic iron oxide nanoparticles: synthesis and optimization of anionic azo dye adsorption for quantitative analysis in complex food matrices

Garima Sagar[1,2], Alok Kumar[1,2], Ajay Pandey[1,2], Somendu Kumar Roy [1,2*]

[1] *Analytical Sciences & Services, Industrial Support through, Technological Solutions, CSIR - Indian Institute of Toxicology Research,, Lucknow, Uttar Pradesh 226001*

[2]*Academy of Scientific and Innovative Research (AcSIR), AcSIR Headquarters, Ghaziabad, Uttar Pradesh 201002*

** Email:somenduroy@iitr.res.in*

Contaminants in the form of food dyes pose serious health risks to consumers, especially when their intake surpasses established safety thresholds. Continuous monitoring of these contaminants is imperative, but the complex composition of food matrices demands efficient extraction methods before instrumental analysis. In this study, we developed a specialized adsorbent of silica-coated iron oxide particles functionalized with 1-hexyl-3-methylimidazolium hexafluorophosphate ionic liquid for the extraction of anionic azo dyes. Here, metanil yellow (MY) dye was used as a model dye. The adsorbent was characterized using Fourier transform infrared spectroscopy (FTIR), X-ray powder diffraction (XRD), and thermogravimetric analysis (TGA). These techniques provided insights into the adsorbent's physical properties, such as functional groups, crystallinity, morphology, and thermal stability. Factors affecting dye adsorption, such as pH, amount of adsorbent, and contact time, were optimized. The maximum adsorption of metanil yellow (MY) dye occurred at pH 4 with 50 mg of adsorbent for less than 5 minutes. Kinetic studies conducted at different dye concentrations (20, 40, and 80 µg/mL) revealed that the adsorption process followed pseudo-second-order kinetics, with R^2 values ranging from 0.9822 to 0.9989. The experimental equilibrium data was fitted to Langmuir, Freundlich, and Temkin isotherm models, and the Freundlich isotherm yielded the best fit, with an R^2 value of 0.9566, indicating multilayer adsorption. In conclusion, the synthesized silica-coated iron oxide particles functionalized with an ionic liquid demonstrated excellent adsorption properties, especially in the removal of MY dye from food matrices.

Highlights

- Pseudo-second-order adsorption, rapid and effective
- Freundlich model prevails, indicating multilayer adsorption
- The adsorption characteristics of silica-coated iron oxide particles functionalized with an ionic liquid were excellent.

Keywords - Magnetic adsorbent, Ionic liquid, Adsorption kinetics, Anionic azo dye

PP-5

Assessing Chromosomal Abnormalities, DNA Damage, and Oxidative Stress in Patients with Rheumatoid Arthritis

Sombodhi Bhattacharya[1], Soumi Dey[1], Mohnish Ram[1], Aarthi Y[1], Aswathi P[1], Radha Saraswathy[1]

[1]Biomedical genetics research laboratory, Department of Biomedical Sciences Vellore Institute of Technology, Vellore.

Rheumatoid arthritis (RA) is an autoimmune inflammatory arthritis affecting the synovial joints. The synovial joint is a very active immune niche due to the presence of macrophages and fibroblasts. Rheumatoid arthritis is caused due to autoimmunity which further leads to joint inflammation by fibroblasts and macrophages and joint destruction due to osteoclastogenesis. The disease has an unknown etiology but multiple factors like genetics, (HLA polymorphisms, Mutations in immune cells) epigenetics (aberrant histone changes, methylation, and non-coding RNAs), and environmental factors (environmental pollutants, lifestyle habits, and gut microbiota) have been associated with the disease. DNA damage and its association with Rheumatoid arthritis has garnered attention in recent years. DDR pathway genes like genes involved in MMR and BER have been associated with the disease. DDR genes have also been associated with T cells, telomere dynamics, and disease progression. cGAS-STING pathway, an innate immune pathway activated by DNA has been widely linked to DNA Damage and its association with the disease. In this study, we have evaluated Chromosomal anomalies using Cytokinesis Block Micronuclei assay (CBMN), DNA damage using Alkaline Comet assay, and Anti-oxidant capacity to measure Oxidative stress using DPPH assay in n=31 RA patients and n=50 age and gender-matched controls. We found significantly higher levels of chromosomal anomalies ($P < 0.0001$), higher levels of DNA Damage ($P<0.0001$), and lower levels of anti-oxidant capacity which signifies higher levels of oxidative stress ($P<0.0001$) in RA patients as compared to controls. However, an increased number of samples need to be analysed to conclude if any associations between DNA damage and anti-oxidant capacity with disease activity and pathogenesis.

Keywords: DNA Damage, Chromosomal anomalies, Oxidative stress, Autoimmunity, Rheumatoid arthritis

Highlights

- DNA Damage holds special importance in Autoimmunity due to DDR gene polymorphisms and the cGAS-STING pathway.
- We conducted a comprehensive study determining Chromosomal anomalies, DNA Damage, and oxidative stress in RA patients.
- We found a significant increase in DNA Damage, Chromosomal Anomalies, and Oxidative stress in RA patients.
- However, a greater number of samples still needs to be analyzed to come to any conclusions.

PP-6

Green synthesis and characterization of *Wrightia tinctoria* extract encapsulated Zein–Alginate nanoparticles for controlled drug release

Dhanya A. T., Vaagdevi N., Santosh R. Kanade*
Department of Plant Sciences, School of Chemical Sciences,
University of Hyderabad, Telangana - 500046
Email:san@uohyd.ac.in; pl349@uohyd.ac.in

"Green synthesis" a recent trend in nanoparticle synthesis enables the production of eco-friendly and sustainable nanoparticles without using any toxic or hazardous chemicals. This work envisages the green synthesis of zein–alginate nanoparticle encapsulating extract from the plant *Wrightia tinctoria*, which is renowned for its medicinal properties such as anti-proliferative, anti-inflammatory, and analgesic effects. The limitations of herbal medicines such as poor solubility, poor bioavailability, increased systemic clearance, and low therapeutic index can be minimized by encapsulating the active components in suitable biopolymeric nanoparticles.

Amid the milieu, dry leaf powder was soxhlet extracted with 80% methanol and was fractionated with ethyl ether and ethyl acetate to obtain three different fractions. Analysis for total phenolics and flavonoids exhibited higher concentrations of both in ethyl acetate fraction. In order to improve the efficacy of ethyl acetate extract, it was encapsulated in zein – alginate nanoparticle (ZAEA-NP) by ultrasonication method. The morphological characterization by SEM revealed smooth-surfaced, spherical nanoparticles with appropriate size. The *in situ* and *ex-situ* characterization by UV–visible and FT–IR spectroscopic analysis confirmed the incorporation of all the components in ZAEA-NP. The ZAEA-NP exhibited 58% encapsulation efficiency, 63% recovery, and 2.2% of drug content and the TGA and DSC data substantiated the good thermal stability of ZAEA-NP. The efficacy of ZAEA-NP for drug delivery will be analyzed by studying the drug release patterns at various pH. The study foresees the development of an effective green synthesized nanoparticle for drug delivery which can be utilized for different disease models.

Keywords: Green synthesis, *Wrightia tinctoria,* ZAEA-NP, Ultrasonication, SEM, TGA, DSC

PP-7

Environmental monitoring and health effects assessment of people using suspected polluted water bodies.

Shridhar J. Kondhalkar, Santosh Kumar HS and Ravichandran B
ICMR-Regional Occupational Health Centre (Southern)-NIOH,
Bangalore, Karnataka, India. Email:shree729@gmail.com

It is well established that water pollution harms aquatic ecosystems and human health. Because heavy metals are poisonous and accumulate in aquatic creatures, contamination of aquatic habitats by these metals is a serious concern. The study site (Vrishabhavathi river) carries sewage and effluent from various industries across the western part of Bangalore and

is the largest watershed in Bangalore. The physico-chemical parameters of water sampled from different locations in study area ranged for chloride (170-500 mg/L, 100-630 mg/L and 180-450 mg/L), total hardness (20-780 mg/L, 80-820 mg/L and 80-610 mg/L), nitrate (0-117.3, 0-192.4 and 0-93.5) and fluoride (0.68-5.1mg/L, 0.35-1.97mg/L and 0.35-1.90 mg/L) in river, borewell and drinking water respectively, found to be higher than the permissible limit of BIS/WHO. The concentrations of heavy metals were measured with an inductively coupled plasma Optical emission spectrometer (ICP-OES). The metals Cr, Cu, Fe, Mn; Fe, Mn; and Fe, Mn were found higher than BIS prescribed limits in the river; borewell, and drinking water respectively. Health assessment was carried out among 55 participants (27 males and 28 females) aged between 28-75 years (mean age 49.6±10.8 years). The majority of participants, 27 (49.1%) did not have formal education and had agriculture as their predominant occupation (47.3%). 17% of participants' hemoglobin was low (anemic) most of them were females. The BMI of the participants was 9% underweight, 26% overweight and 16% were obese. DNA damage study showed mild damage at 45% (>25-50%), moderate damage at 18% (>50-75%), and severe damage at 11% (>75% DNA in tail) among study participants. This may be due to the effects of these above metals present in the fodder and vegetables grown in the contaminated water, which is consumed by local people. Other lifestyle factors may aggravate the effects. An elaborate study is required to assess the concentration of heavy metals and their effect on the same community.

Key words: Water pollution, toxic contaminants, heavy metals, health assessment, and DNA damage.

PP-8

Physio-biochemical characterization of *Chlamydomonas reinhardtii* upon exposure to Bisphenol A

Sakshi Dubey, Banoth Udayasri, Subhashree Samanta, Santosh R. Kanade*

Department of Plant Sciences, School of Life Sciences
University of Hyderabad, Telangana, India
** Email:san@uohyd.ac.in; 22lpph07@uohyd.ac.in*

White pollution refers to the enormous amount of plastic waste released into the ecosystems, which includes primary and secondary microplastics such as phthalates, bisphenol A, and nonylphenol. Among these, Bisphenol A is known to cause neurological disorders and cancer. On continuous exposure, aquatic organisms, including microalgae, must develop inherent mechanisms to cope with such harmful conditions. The microplastics are internalized and form hetero-aggregates with the microalgae. However, the molecular mechanisms involved in the breakdown of these compounds still need to be deciphered. Thus, we aim to analyze the dose-dependent effect of BPA on the primary physio-biochemical properties of *Chlamydomonas reinhardtii*. Treatment with BPA formed hetero- and homo-aggregates with reduced growth and photosynthetic efficiency as indicated by the chlorophyll and carotenoid content in early periods. The 39% decline in the fresh wt. at 24 hours, slightly recovered to 36% at 96 hours. The cell density of the treated sample reduced from 10^5 in control to 10^4 cells/ml at 24hrs and gradually recovered to $5.2x10^5$ cells/ml at 96hrs. Further, it altered the reactive oxygen species and the expression of antioxidative enzymes like SOD and catalase. Increased lipid peroxidation is evident by the elevated levels of MDA at higher doses

(717.6nmol, 452.7nmol, and 421.3nmol in 20, 40, and 60mg/L). The total protein, sugar, and starch directly revealed the effect on the growth of microalgae. The secretome profile demonstrated that the differential expression of specific proteins may have a role in minimizing the toxicity of microplastic. Further validation of these results will help to identify and understand the molecular mechanism involved in the algal adaptive mechanism.

Key Words: White Pollution, Bisphenol A, *Chlamydomonas reinhardtii*, Secretome

PP-9

Hormetic level cadmium-induced differentially expressed metabolites and transporters in *Solanum lycopersicum*

Manish Yadav, Risha Ravi, and Santosh R. Kanade*
Department of Plant Sciences, School of Life Sciences,
University of Hyderabad, Gachibowli, Hyderabad, 500046, Telangana, India
** Email:san@uohyd.ac.in*

Hormesis is a well-known phenomenon with the stimulatory effect of low doses of toxic substances on growth and is well-reported in plants and animals. Cadmium (Cd), a heavy metal, has significantly impacted plant growth and development at a lethal level. Even though the specific role of Cd has not been reported in plant growth, recent evidence shows it exhibits a hormetic effect. Our study found that low concentrations of Cd improved plant growth with a reduction in stress markers like Malondialdehyde (MDA). Further, the photosynthetic efficiency and total sugar content increased significantly compared to the control and high concentrations of Cd-treated plants in roots. The transcriptome and RT-PCR data showed significant differences in the expression of cysteine synthase, sugar, and auxin transporter genes like CYS, STPN3, MFS1, PMT1, MDR1, PIN3, and PIN4. The transporters may be involved in transporting various metabolite and growth-promoting factors, but further investigation is required. The GC-MS data demonstrated the differential expression of essential metabolites like 5'-Methylthioadenosine 3TMS derivative, phenylethylmalonic acid bis(trimethylsilyl) ester, and Gulonic acid gamma-lactone 4TMS derivative which may be involved in plant growth and development, where further validation is essential. Overall study demonstrated that a low Cd concentration promotes a plant's overall growth by differentially expressing the key gene/s involved in transport and metabolism. The mechanistic understanding and signaling pathways involved in triggering key gene/s could be targeted to increase the production of secondary metabolites through biotechnological approaches, especially in aromatic and medicinal plants.

Keywords: Hormesis, Heavy metals, Cadmium, Cysteine Synthase, Transporters

PP-10

Age and gender-wise analysis of nuclear anomalies using cytokinesis-block micronucleus cytome (CBMN) assay in asthma, obese, and obese individuals with asthma

Sohini Dey[1], Nethra Raghuraman[1], Medha Nagaraj[1], Aswathi Pootheri[1] Sombodhi Bhattacharya[1], Narmada Ashok [3] Wilner Martinez Lopez [2], Radha Saraswathy*

1Dept of Biomedical Sciences, Biomedical Genetics Research Lab, School of Biosciences & Technology, Vellore Institute of Technology, Vellore-632014, Tamil Nadu, India
2Genetics Department, Instituto de Investigaciones Biológicas Clemente Estable, Avenida Italia 3318, 11600, Montevideo, URUGUAY
3Department of Pediatrics, Nalam Medical Centre and Hospital, Vellore, Tamil Nadu, India
**Corresponding Author Email:radhasaraswathy@vit.ac.in*

Asthma is a heterogeneous disease caused by a combination of genetic, physiological, and environmental factors, commonly characterized by chronic airway inflammation and variable expiratory airflow limitation due to obstruction of small airways in the lungs. It affects over 300 million people worldwide and around 30 million in India, resulting in symptoms including coughing and wheezing. Obesity is the accumulation of excess fat in the body, affecting over 650 million people worldwide and 135 million people in India. Research has revealed that a higher body mass index in obesity can exacerbate the severity of asthma by impacting lung function and mechanics, leading to inflammation and blockage of small airways and potentially complicating its diagnosis. These conditions may be present together without any defined causal relationship. Obese individuals with asthma may experience heightened levels of oxidative stress in their airways and throughout their bodies, potentially contributing to poorer treatment outcomes. This study aims to analyse nuclear anomalies in control (n = 100), asthma (n = 90), obese (n=65), and obese with asthma (n = 82) individuals across various age groups with no other significant disorders or chronic illnesses, collected from the Nalam Medical Centre and Hospital, Vellore, using the Cytokinesis-Block Micronucleus Cytome assay. In this study, the frequency of nuclear anomalies was significantly higher in patients ($p<0.05$) when compared to controls. The highest number of nuclear anomalies were observed in the age category 35-55 years in asthmatic individuals, 40-50 years in obese individuals, and 40-55 years in individuals carrying obesity plus asthma.

Keywords: Asthma; Obesity; Genetics; CBMN assay; oxidative stress

Highlights:

- Asthma is characterized by chronic airway inflammation and variable expiratory airflow limitation.
- Obese asthmatics face elevated oxidative stress, impacting treatment outcomes.
- The study assessed nuclear anomalies in control, asthmatic, obese, and obese asthmatic groups.
- Peak nuclear anomalies: 35-55 years in asthma, 40-50 years in obesity, and 40-55 years in obesity with asthma.

PP-11

Latent prostate cancer in South India: incidence, risk factors, and implications for diagnosis and treatment

Ishvaria S [1], Nallasivam Palanisamy [2], L.T. Kalaiselvi [3], Radha Saraswathy[1*]
[1]*Biomedical Genetics Research Laboratory, Department of Biomedical Sciences, School of Biosciences & Technology, Vellore Institute of Technology, Vellore, Tamil Nadu, India.*
[2]*Department of Urology, Henry Ford Health, Detroit, MI, 48202 USA*
[3]*Department of Forensic Medicine, Government Vellore Medical College & Hospital, Vellore, Tamil Nadu, India.*
***Correspondence:** Dr. Radha Saraswathy Email:radhasaraswathy@vit.ac.in*

Prostate cancer, a complex disease affecting the male prostate gland, often manifests as latent adenocarcinoma, an asymptomatic form typically discovered incidentally during postmortem examinations. The study conducted at Government Vellore Medical College and Hospital in Tamil Nadu, India, aimed to assess the incidence of this latent form. It is known that risk factors for prostate cancer include age, lifestyle, race, and family history, and there is growing evidence suggesting environmental factors like pesticides, heavy metals, and industrial pollutants may play a role. However, further research is required to establish these links. The focus of this study on latent prostate cancer is crucial for understanding the early stages of the disease and progression, which can inform the development of targeted therapies and enhance patient management. Analyzing latent cancer helps identify markers indicating a likelihood of aggressive cancer development, aiding in risk stratification and paving the way for personalized treatment plans. This approach also aims to refine diagnostic criteria, reducing overdiagnosis and overtreatment, thereby preserving the quality of life. Therefore, such research is instrumental in the prevention, early detection, and effective treatment of prostate cancer, with significant implications for long-term patient outcomes, especially in the South Indian population. The study involved a prospective analysis of prostate gland histopathological slides from autopsies of 65 men aged 45-86 (mean age: 57) who died under medico-legal circumstances. Among these, 7 cases (11%) were diagnosed with invasive adenocarcinoma with a Gleason score of 3+3=6 or 3+4=7, predominantly in individuals over 60 years. The findings underscore the importance of forensic autopsy in identifying latent health conditions, highlighting the need to consider such diseases in healthcare planning and regional health strategies. We will be evaluating the known prostate cancer biomarkers like ETS gene fusions on cancer-positive cases to understand the role of these markers in the development of latent prostate cancer. In conclusion, this research offers valuable insights into the unique aspects of latent prostate cancer in South India, enhancing our understanding of the disease and guiding future strategies in detection, treatment, and prevention

Keywords: Prostate cancer, Latent prostate cancer, Biomarkers, Personalized treatment

Highlights

- Identification of 11% of the cases with cancer is a significant observation, some with high Gleason scores of 3+4 = 7.

- The importance of a forensic autopsy in identifying latent health conditions.
- Offers insights into unique aspects of latent prostate cancer in South India, guiding future detection, treatment, and prevention strategies.
- Understanding the role of prostate cancer biomarkers in latent prostate cancer development will guide future detection, treatment, and prevention strategies.

PP-12

Anti-yeast effects of Cu-Ag bimetallic nanoparticles (NPs) are exerted through the ROS-mediated damage of intracellular biomolecules.

Abhishek Sinha
Department of Life Sciences, Atria University, Anandnagar, Hebbal, Bangalore, 560024, India. Email:abhishek.s@atriauniversity.edu.in

Drug resistance is becoming an acute problem in tackling changing patterns of infectious diseases. The same is the case with fungal infections as well. Rather than expecting novel antibiotics to change the scenario; alternate antifungals are needed. Nanoparticles have long been considered one such alternative antifungals. However, the lacuna of usage of NPs is associated with their poor safety standards and lack of selectivity. Bimetallic NPs provide us with the opportunity to come up with better antifungals as they contain synergistic properties of both NP constituents. In the present study, the antifungal effect of Cu-Ag-based bimetallic NPs was tested against model yeast *Saccharomyces cerevisiae* to find out the effective fungicidal concentration of the bimetallic NP and compare it with monometallic NPs. The effective fungicidal concentration of bimetallic NPs is much lower than its monometallic counterparts. The mechanism of inhibition is associated with its effect on triggering intracellular Reactive Oxygen Species (ROS) generation. The ROS intern triggers the damage of DNA, membrane lipids, and cellular proteins. In the case of Cu-Ag-based NPs DNA damage was visible and was part of the mechanism of action. Although the present study deals with non-pathogenic yeasts, the scope will be broadened by testing it against Pathogenic and opportunistic pathogenic yeasts like *Candida albicans* and *Malassezia furfur*.

Keywords: ROS, Nanoparticles, DNA damage, antifungals

Highlights:

- Cu-Ag NPs carry anti-yeast properties.
- The Cu-Ag Bimetallic NP provides a better antimicrobial effect than its monometallic variants.
- Bimetallic NPs induce intracellular ROS generation.
- DNA damage occurs as a consequence of ROS.

PP-13

Influence of $KBrO_3$ and pomegranate juice (*Punica granatum*) on oxidative stress and neurodegeneration in the brain of *Drosophila melanogaster*

Jyoti Aiwale and N. Shivanna
Genetics and Biology of Drosophila Laboratory, P.G. Department of Studies in Zoology, Karnatak University, Dharwad 580003, Karnataka, India.
Email:jyotiaiwale@kud.ac.in

Potassium bromate ($KBrO_3$) is widely used as a food additive and it is a major by-product of water disinfection. $KBrO_3$ causes severe toxicity in humans and experimental animals including neurodegeneration. The effect of $KBrO_3$ on *D. melanogaster* has been studied by taking flies from $KBrO_3$-treated larvae for the analysis of Superoxide dismutase (SOD), Reduced Glutathione (GSH), Acetylcholinesterase (AChE) activity and histology of brain. The biochemical analysis revealed that the quantity of SOD, GSH, and AChE has increased in $KBrO_3$-treated flies compared to control. In female flies, only SOD activity has increased than control. When $KBrO_3$-treated flies were fed with Pomegranate juice (PJ), it showed that GSH and AChE level is similar to control whereas, the level of SOD is intermediate between the treated and control. Histology study revealed, the neurodegeneration in Kenyon cells of Mushroom body, neuropile area of the antennal lobe, lobules and also causes lesion and shrinkage in the brain of $KBrO_3$ treated flies as compared to control. PJ treatment reduces the further damage to neurodegeneration by showing a lesser number and size of vacuoles compared to $KBrO_3$-treated flies.

Keywords: Potassium bromate, Pomegranate juice, Superoxide dismutase, Reduced glutathione, Acetylcholinesterase, neurodegeneration.

PP-14

Age and gender-based analysis of DNA damage using alkaline comet assay in asthma patients

Swathi R[1], Aswathi Pootheri[1], Narmada Ashok[3] Wilner Martinez Lopez[2], Radha Saraswathy*

[1] Dept of Biomedical Sciences, Biomedical Genetics Research Lab, School of Biosciences & Technology, Vellore Institute of Technology, Vellore-632014, Tamil Nadu, India.
2. Genetics Department, Instituto de Investigaciones Biológicas Clemente Estable, Avenida Italia 3318, 11600, Montevideo, Uruguay.
3. Department of Pediatrics, Nalam Medical Centre and Hospital, Vellore, Tamil Nadu, India
**Corresponding Author Email:radhasaraswathy@vit.ac.in*

Asthma which is a prevalent non-communicable disease associated with an extremely high degree of variation and chronic airway inflammation, resulting in unexpected narrowing of passages during exhalation. These clinical manifestations include a range of symptoms, some common ones being cough, wheeze, difficulty in breathing, or tight chest. During this study, several possible risk factors are examined, including the influence of occupation, socio-

economic status, heredity, global warming, and environmental contamination on the occurrence of asthma. The study aimed to assess DNA damage in asthma and control individuals. A number of subjects (n=200) were recruited from Nallam Medical Centre and Hospital Vellore, who were distributed as follows: asthma patients (n=100), and age-matched controls (n=100). Alkaline comet assay was used to analyse the DNA damage in these subjects. Results showed a higher level of DNA damage among the 35-55-year-old group of both genders. The DNA damage was highly significant in patients ($p<0.05$) when compared to controls. Therefore, DNA damage evidenced through the comet assay could be employed as a biomarker to identify beforehand the severity of asthma.

Key Words: Asthma, DNA Damage, Genetics, age-related DNA damage, Alkaline Comet Assay

PP-15

Comparative analysis of antioxidant level among Prediabetes and Type 2 diabetes mellitus individuals – a proposed study

Aarthi.Y[1], Bharani Gopalan[3], Meera S[3], M Prakash Hande[2] and Radha Saraswathy[1*]

[1] Department of Biomedical Sciences, School of Bio Sciences and Technology, Vellore Institute of Technology, Vellore, Tamil Nadu, India

[2] Department of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore.

[3]Department of General Medicine, Mother's Care Diabetes Centre, Vellore, Tamil Nadu, India.

[3] Department of Community Medicine, Government Vellore Medical College and Hospital, Vellore, Tamil Nadu, India.

Prediabetes is a condition with an increased level of blood glucose less than the onset of diabetes mellitus. Based on a recent study, the estimated overall prevalence of prediabetes in India by 2023 was about 15.3% and diabetes mellitus was about 10.4%. Oxidative stress is defined as an imbalanced level of reactive oxygen species that leads to a reduction in antioxidant levels within the human body. Previous studies have shown that excessive levels of free radicals and decreased antioxidant defence mechanisms are involved in the pathogenesis of prediabetes. It has also been suggested that increased oxidative stress contributes to the progression of prediabetes into diabetes. Insulin resistance and decreased insulin secretion may result from elevated oxidative stress and inflammation. Age and gender-matched controls, prediabetes and type 2 diabetes individuals will be recruited. Serum antioxidant level will be measured using the DPPH scavenging potential assay. Early appropriate assessment of oxidative stress alterations is essential for preventing the progression of disease.

Keywords: Prediabetes, Type 2 diabetes mellitus, Oxidative stress, Antioxidant, and DPPH.

PP-16

Biodiversity at risk: Probing molecular damage in collembola exposed to heavy metals in agricultural environment

Samar Mahmood and Hina Parwez
Aligarh Muslim University,
Email:Samarmahmood040@gmail.com

The protracted exposure of soil to heavy metals emanating from sewage sludge culminates in their gradual accrual, imparting potential risks to biodiversity and human health. Recognizing these hazards, the World Health Organization (WHO) has set benchmarks for permissible heavy metal concentrations in agricultural soils. Our investigation squarely targets evaluating heavy metal levels in soil samples procured from a local industrial area.

This research centers on agricultural fields adjacent to industrial zones, where heavy metal concentrations surpass permissible thresholds. Soil samples exhibiting elevated heavy metal content were meticulously gathered and scrutinized in the laboratory. The findings underscore a notable accumulation of heavy metals in Collembola sourced from these samples, with a noteworthy reduction in Collembola diversity compared to unexposed habitats.

The study extends its purview to gauge the repercussions of heavy metals on Collembolans, delving into their energy reserves and reproductive indices. Assessment of antioxidant enzyme levels serves as a metric for evaluating oxidative stress, encompassing scrutiny of DNA, lipid, and protein damage and generating reactive oxygen species. Baseline DNA damage was quantified through conventional in vitro comet and micronuclei assays. Determining the LC_{50} concentration unveiled genotoxic damage at concentrations below LC50, evidenced by micronuclei and DNA breaks in the comet assay.

A conspicuous decline in antioxidant enzyme levels was noted, accompanied by heightened lipid peroxidation (LPO) and protein carbonyl levels. Our results underscore the predisposition of heavy metals to instigate oxidative species in Collembolans, precipitating macromolecular damage, and compromised antioxidant defenses. This study emphasizes the ecological ramifications of heavy metal exposure on soil microarthropods, underscoring the imperative for comprehensive environmental monitoring and management strategies in the dynamically evolving landscape that increasingly impacts biodiversity and human health.

PP-17

Maternal ancestry of Kalpeni, a southern island of the Lakshadweep archipelago

Shivanand S Shendre, Jaison J Sequeira, Idrees Babu, Mohammed S Mustak
Depatment of Applied Zoology, Mangalore University,
Mangalagangothri-574199, Karnataka, India.

Kalpeni is one of the southern islands in the Lakshadweep archipelago. Human settlement in this island and its ancestral origin is still unclear due to very little population study. To understand the maternal ancestry of the extant population of this island and its affinity with neighbouring populations, we analysed the hypervariable region (HVS1) of the mitochondrial

DNA of 94 samples from Kalpeni island. Our findings suggest that the islanders show substantial West Eurasian-specific maternal ancestry, which is largely similar to the Maldives and Sri Lanka. There is a prevalence of U4 (West Eurasian-specific) and M30 (Indian Specific) haplogroups. These results hint at the West Eurasian and Indian Specific admixture in the extant populations of the archipelago. Due to its geographical isolation in the Arabian Sea, Lakshadweep acts as a maritime stopover from ancient times and therefore, this admixture can be attributed to these voyages undertaken for trade. Interestingly, the southern islands (including Kalpeni) show different admixture patterns as compared to the northern islands. Overall, these findings enhance our interest in studying in-depth, the founder population groups, and the genetic footprint of diseases that harbor these ancient islanders.

PP-18

Comparative analysis of antibiotic resistance and gut microbiome composition in broiler chickens versus indigenous chickens

Adon Babu, Gourav Biswas, Neeraja Mano, Yaksini E.D., Krithi C M, Nisha Bardhan, Shemmy Sadanandan and Tony Grace
Department of Genomic Science,
Central University of Kerala, Kasaragod, India.

In recent years, there has been a growing interest in investigating the microbial communities inhabiting the gastrointestinal tracts of various animals. This interest stems from the pivotal roles these communities play in host health, nutrition, and disease resistance. This study centers on the gut microbiota of poultry species, with a particular focus on indigenous chickens, and broiler chickens. This research sheds light on their microbial diversity, composition, and responses to antibiotic exposure through 16s metagenome sequencing and Disc diffusion method. Significant distinctions in microbial diversity were observed among these groups, with indigenous chickens exhibiting the highest species diversity, and antibiotic-treated broiler and antibiotic-free broiler chickens showing the lowest diversity. This highlights the adaptability of indigenous poultry breeds. Notably, antibiotic administration to broiler chickens substantially impacts their gut microbiota, disrupting the relative abundance of bacterial taxa, and may have implications for health and immunity. The study also delves into the pressing issue of antibiotic resistance, revealing varied resistance and susceptibility patterns in response to commonly used antibiotics. The results indicated that nearly 75% of antibiotics exhibited resistance across all groups, including indigenous chickens. Surprisingly, antibiotics from the penicillin class, like Amoxicillin and Ampicillin, showed complete resistance in all groups, along with other common antibiotics like Ciprofloxacin and Cotrimoxazole. The findings underscore the need to address antibiotic resistance in poultry production to improve animal and human health. By providing insights into microbial diversity, antibiotic responses, and potential solutions, this research contributes to the ongoing efforts to enhance poultry production systems while safeguarding the well-being of animals, humans, and ecosystems.

PP-19

WNT Signaling: Decisive bifurcation in human pluripotent stem cell differentiation towards amnion and placenta

Asha Shaji Antony[1, #], Devika AS[1, #], Saravanan S[1], Shaji R. V[2], V B Sameer Kumar[1], Raghu Bhushan[3], Smita Sudheer[1, *]

[1]*Department of Genomic Science, Central University of Kerala, Tejaswini Hills, Periye.P. O, Kasaragod District, Kerala – 671316, India*

[2]*The Centre for Stem Cell Research (CSCR), a unit of the Institute for Stem Cell Science and Regenerative Medicine (inStem), Vellore, India*

[3]*Yenepoya (Deemed to be University), University Road, Deralakatte, Mangalore 575018, Karnataka, India.* [#]*Equal Contribution*

[*]*Correspondence Email:smitasudheer@cukerala.ac.in, smitasudheer12@gmail.com*

In implanting blastocysts, trophoblast differentiation yields the chorion, and delamination and cavitation of epiblast results in the formation of amnion, constituting the protective amniotic sac crucial for fetal health during pregnancy. The avascular, mechanically robust amnion maintains structural integrity, while the chorion, a vascularized fibrous layer, facilitates fetal-maternal exchange. Investigating signaling environments governing the development of these layers is imperative for understanding pregnancy-associated complexities like preterm premature rupture of fetal membranes (pPROM) and intrauterine growth retardation (IUGR). Human Pluripotent Stem Cells differentiate into trophoblast upon the inhibition of pluripotency pathways, with active BMP signaling (known as BSBSU, BAP, or B2i treatment). We have previously shown that B2i treatment of hPSCs induces trophoblast, and prolonged treatment leads to specialized placental cells. Here, our results indicate that short-term B2i treatment induces both cytotrophoblast and amnion cells, potentially sharing common progenitors. This study underscores the pivotal role of WNT signaling activation or inhibition in decisively directing the common progenitors toward either amnion or placental lineages.

PP-20

Isolation of MRS agar positive bacteria from commercial/homemade curd samples and commercial probiotics and their RAPD analysis: A brief preliminary work

Soorya PV[1], Payghan Bhagyshri Dipak[1#] , Mayuri[1#,] Neha Mahale[1#] , Meera Devan [1θ], Puli Madhu Sudhana Rao[1θ], Tanushree S Yaragoppa[1θ], Thejaswini Venkatesh[1*]

1Dept of Biochemistry and Molecular Biology, Central University of Kerala, Periye, Kasargod. # θ These authors contributed equally

**corresponding author*

Probiotics are live microorganisms that when administered in certain numbers confer a health benefit beyond the inherent general nutrition. Probiotics are currently used in the treatment of gastrointestinal diseases, and allergic conditions: rhinitis, atopic dermatitis food allergy, Clostridium difficile–associated diarrhoea, Irritable bowel syndrome, inflammatory bowel

disease; metabolic disorders, and its beneficial effects are attributed to adaption and probiotic factors. Curd is a form of fermented milk and it is a source of probiotics. In the current study, we procured homemade curd (n=3), commercial curd (N=3), and commercial probiotics (n=3). Serially diluted samples were plated on MRS agar media and 25 different probiotic colonies were isolated. 13/25 bacterial species isolated were Gram positive and 17/25 were catalase positive. Additionally, RAPD (Random amplification of polymorphic DNA) was performed to characterize the strains. Three combinations of RAPD primers were chosen from Coeuret et al. (2003) which could identify more than 5 strains of lactobacillus. The primers included were M13, 1254; OPL-01, OPL-04; OPL-01, OPL-2, OPL-4, OPL-5. Phyllogenetic tree analysis showed two clusters of probiotics with the following combinations of primers: M13 and M1254; OPL1, OPL2, OPL4, OPL5, and OPL1, OPL4. In future studies, these probiotic bacteria will further be subjected to 16S ribosomal RNA sequencing and we will examine its antifungal properties, bile acid resistance, and cell proliferation in the presence of chronic drugs.

Session 2: Environmental mutagens and Health

Plenary lecture-2

Prof. M. Prakash HANDE
Department of Physiology, Yong Loo Lin School of Medicine,
National University of Singapore, Singapore
Email:phsmph@nus.edu.sg

M. Prakash HANDE is an Associate Professor at the Department of Physiology, Yong Loo Lin School of Medicine, NUS. He has published more than 176 peer-reviewed research articles in international journals such as *Nature Genetics, Cell, Science, Genes and Development, PNAS,* etc. (Scopus **H-index: 55; Citations: ~13,600**). His research interests are telomeres and telomerase in ageing and cancer, experimental cancer therapeutics, and biomarkers of radiation exposure. Dr. Hande teaches cancer biology and ageing to life sciences students. He taught interdisciplinary seminars such as Biomedicine and Singapore Society and Radiation and Society at Tembusu College, National University of Singapore. He holds adjunct professor appointments at the Vellore Institute of Technology, Vellore, India, and Mangalore University, Mangalore, India. He was a consultant to the Division of Human Health, International Atomic Energy Agency (IAEA), Vienna, Austria in 2015 -2016 during his sabbatical leave from NUS. Dr Hande was an expert member of the workgroup of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) from 2017 - 2021. Dr Hande is a member of Committee 1, International Commission on Radiological Protection (ICRP) from July 01, 2021. He is with the ICRP task group 121 on Effects of Ionising radiation exposure in offspring and next generations as Co-Chair and a member of ICRP task group 118 on Relative Biological Effectiveness (RBE), Quality Factor (Q), and Radiation Weighting Factor (*w*R). He has been a member of the editorial board of Mutation Research – Genetic Toxicology and Environmental Mutagenesis since 2017 and has been an associate editor of the International Journal of Radiation Biology since November 2021. He is now a Regional Editor (acquisition editor) of the journal Mutation Research – Genetic Toxicology and Environmental Mutagenesis since July 2022. He is appointed as Assistant Dean, Safety and Research Facilities Management, Yong Loo Lin School of Medicine, NUS from July 2021.

Fukushima’s Recovery from 2011 nuclear meltdown: Fighting toxic rumours

On March 11, 2011, the east coast of Japan was struck by an 8.9-magnitude earthquake and a tsunami, resulting in damage to the Fukushima Daiichi Nuclear Power Plant (FDNPP). This incident came to be known as Japan's ‘triple disaster’. A loss of power at the nuclear facility resulted in core meltdowns and hydrogen explosions in multiple units. Due to this, radioactive contaminants spilt into the surrounding residential areas. As a preventive measure, all residents from twelve towns within a 20 km radius of the FDNPP were ordered to evacuate. Efforts are being made to decommission the nuclear reactors, decontaminate the affected areas and rebuild the infrastructure. Progress has been impressive in the decontamination and recovery process in the cities which were affected by the triple disaster (Earthquake, Tsunami, and Daiichi Nuclear Accident) - more importantly, decommissioning of the nuclear reactors and (radioactivity) decontamination of the areas around the reactor area. I will share my experiences of the visits to Fukushima prefecture in the last five years (2018 to 2023), to the FDNPP area in 2018, and the interim storage facility in 2022 and 2023.

Invited Talk-3

Dr. Vinay Jain
Radiation Biology and Health Sciences Division,
Bio-Science Group, Bhabha Atomic Research Centre,
Mumbai 400 085, India.

Dr. Vinay Jain is a Scientific Officer (Grade F) in the Radiation Biology and Health Sciences Division of Bhabha Atomic Research Centre, Mumbai. He is also an Assistant Professor at Homi Bhabha National Institute, Mumbai. Dr. Jain did his graduation and post-graduation in Biomedical Sciences from the University of Delhi. He then graduated from the prestigious BARC training school and joined Bhabha Atomic Research Centre in 2007 as a Scientific Officer. He received a post-graduate diploma in Nuclear Science and engineering from Homi Bhabha National Institute, Mumbai. He completed his PhD in Life Sciences from the same institute. The title of his thesis was "Studies on cellular responses to DNA damage in human cells exposed to low dose ionizing radiation". Dr. Jain has carried out his post-doctoral research in the field of “Cancer genomics” at Kornberg School of Dentistry, Temple University, Philadelphia, U.S.A. Dr. Jain has received many awards including the "Young Scientist Award" felicitated by the Environment Mutagen Society of India (EMSI) in 2017. He has also won many best paper and poster awards at national and international conferences.

Biological mechanisms involved in radio-adaptation to chronic low dose radiation in individuals from high-level natural radiation areas of Keralacoast.

Vinay Jain[a,b], Divyalaksmi Saini[a] and Deepak Sharma[a,b]

[a]*Low-Level Radiation Research Section, Radiation Biology and Health Sciences Division, Bio-Science Group, Bhabha Atomic Research Centre, Trombay, Mumbai 400 085, India.*
[b]*Homi Bhabha National Institute, Anushakti Nagar, Mumbai 400094, India.*

Assessment of health risks associated with low-dose ionizing radiation (LDIR) exposure to the human population is a thrust area of research. Due to a lack of sufficient biological data, Risk assessment of health effects such as cancer and hereditary diseases/disorders at LDIR is estimated by extrapolation from the risk observed at high acute dose exposures such as atomic bomb survivors in Hiroshima and Nagasaki using Linear No Threshold (LNT) hypothesis. High-level natural radiation areas (HLNRA) of the Kerala coast where background radiation doses range from <1mGy/yr to 45 mGy/yr provide a unique opportunity to study the molecular effects and underlying mechanisms of low dose/dose rate radiation directly on humans.

The present work focuses on understanding the cellular responses and underlying mechanismsactive in peripheral blood mononuclear cells (PBMC) of individuals residing in HLNRA and normal-level natural radiation areas (NLNRA) of the Kerala coast. Multiple molecular endpoints have been studied including DNA damage analysis, gene expression, and genetic variant analysis using several sensitive and high-throughput techniques including next-generation sequencing. Our results showed a non-linear response in terms of the frequency of DNA double-strand breaks (DSBs) in ~ 200 individuals from different background dose groups of HLNRA using gamma-H2AX as a biomarker. No attrition in telomere length was observed in these individuals. In-vivo Radio-adaptive response (RAR) studies showed reduced induction and faster repair of DSBs in HLNRA individuals. Gene expression analysis revealed the involvement of DNA repair, RNA splicing, chromatin modification, and telomere maintenance genes inefficient repair observed. Exome sequencing revealed a similar number and pattern of genetic variants in the HLNRA and NLNRA group, however, few unique single nucleotide variants(SNVs) were identified. In conclusion, no adverse effect of chronic radiation has been observed so far, and the above findings provide important insights into understanding the mechanisms involved in radio-adaptation in the human population living in HLNRA of Kerala coast. Detailed findings will be discussed during the presentation.

Invited Talk-4

Dr. N. Rajendra Prasad
Department of Biochemistry and Biotechnology, Annamalai University, Annamalai Nagar 608 002, Email:drprasadnr@gmail.com

N. Rajendra Prasad, PhD. is an Associate Professor in the Department of Biochemistry and Biotechnology, at Annamalai University. He is also serving as a Deputy Director of Research and Development at Annamalai University. Dr. Prasad has 23 years of professional experience in the field of Cancer Biology at Annamalai University. He has acquired his research training at the Armed Forces Radiobiology Research Institute, USA, and the National Cancer Institute, National Institute of Health, USA. His research interest is investigating natural medicinal compounds to overcome ABC-transporters mediated multidrug resistance in cancer and to develop a predictive assay system to select the best choice of chemotherapeutic drug in a personalized manner. He is also studying the signal transduction events of ionizing and non-ionizing radiations in human cells. He has received the DBT-Overseas Associateship Award, ICMR-International Award for Biomedical Scientists, and Tamilnadu Young Scientist Award. He is serving as an Editorial Board Member in several reputed journals.

Ultraviolet radiation-induced dna damage, molecular changes, and natural countermeasures

Ultraviolet radiation (UVR) is a very prominent environmental toxic agent. UVR has been implicated in the initiation and progression of photocarcinogenesis. UVR exposure elicits numerous cellular and molecular events which include the generation of inflammatory mediators, DNA damage, epigenetic modifications, and oxidative damages mediated activation of signaling pathways. The UVA waveband (315 nm - 400 nm) induces indirect oxidative DNA damage. The existence of oxidized guanine in genomic DNA can cause transversion mutation such as G-T or G-A binding, the accumulation of which can lead to detrimental consequences. Whereas the UVB and UVC wavebands induce bulky direct DNA damages such as the formation of cyclobutane pyrimidine dimers, 6-4 photoproducts (6-4 PPs), and Dewar isomers of photoproducts. The yields of CPDs and 6-4 PPs are highest at around 260 nm. The enhanced levels of CPDs and (6-4 PPs) formation are repaired by nucleotide excision repair pathway (NER). UVR-initiated signal transduction pathways are believed to be responsible for tumor promotion effects. The UVR-induced carcinogenic

mechanism has been well-studied using various animal and cellular models. Recently, experimental evidence showed that natural nutraceuticals and phytoceuticals are vital targets for UV-mediated cellular and molecular events and prevent cellular milieu from UVB-mediated health effects. This presentation covers the current progress in the study of UVR-mediated DNA damage, carcinogenesis, and appropriate experimental models for the study of both ultraviolet A- and UVB-mediated carcinogenesis. Further, natural phytochemicals that could be exploited as potential countermeasures for UV-induced DNA damage and subsequent cellular signaling will be discussed.

Invited Talk-5

Prof. Radha Saraswathy
Professor Higher Academic Grade, Dept. of Biomedical Sciences,
School of Biosciences and Technology,
Vellore Institute of Technology, Vellore-632014
Email:radhasaraswathy@vit.ac.in

Radha Saraswathy MSc honours, Panjab University, Chandigarh (1982), MPhil in Genetics and Cytogenetics (1984), and Ph.D. in Medical Genetics (1993) Bharathiar University, Coimbatore. She is well-trained to conduct both cytogenetic tests and molecular genetic tests to diagnose various genetic diseases. Her first clinical genetic training was at Vijaya Hospital, Chennai where she initiated and ran the medical genetic research laboratory and genetic counselling unit for one year. From 1995 to 1998 for three years, she had her postdoctoral research training in medical molecular cytogenetics using FISH techniques and PCR at Dept. of Radiation Genetics and Chemical Mutagenesis, Leiden University, The Netherlands with Prof AT Natarajan. During this period she worked on the effect of various radiomimetic chemicals such as, methane methylsulphate (MMS), mitomycin C (MMC); other chemicals such as 3-Aminobenzamide (3-AB) and X-rays, ultraviolet (UVB) and gamma rays on human fibroblasts, Chinese hamster cell lines and human leucocyte cultures. Then she was appointed as the chief geneticist to conduct genetic tests for various eye disorders at Aravind eye hospitals, Madurai for two years during which time she was a chief research collaborator with Dr. Fielding, National Eye Institute, NIH, USA, and Dr. Stone, University of IOWA, USA in analyzing genetic polymorphism and molecular genetics of various eye disorders of more than thousand patients. Further, she worked as a CSIR-Research Associate in a project entitled –The application of low dose gamma radiation technology in the analysis of human genetics disorders for two and-a half years. Recognizing her involvement and contribution to medical genetic research, DRDO funded her as the principal investigator to carry out research in radiation biology of human precancerous syndromes and cancers. At present, she is a Senior professor, Dept of Biomedical Sciences, SBST, VIT, Vellore. She is conducting

collaborating research with various Government hospitals both in Chennai and in and around Vellore in various aspects of human genetic disorders, National and International collaborators. These research works resulted in international publications. She is well qualified to carry out in-depth research in Medical genetics, radiation genetics, and chemical mutagenesis. At present her research areas are Genetic studies in Cardiology, Eye disorders, Diabetes, and associated disorders, Cancerous and precancerous syndromes, and screening for prediabetes in Vellore district. She joined VIT in Dec 2002 and has held various positions; and was instrumental in bringing a master's programme in Biomedical Genetics and Genetic counseling, Microbiology, and Biotechnology.

Impact of environmental exposures on human health

An association between meteorological parameters, including daily mean temperature (℃), relative humidity (%), rainfall (mm), wind speed (m/s) with the concentration of air pollutants (PM2.5, PM10, NO2, SO2, CO, O3, and NH3), seasonal variations, and the respiratory disorders observed from January 2021 to December 2023 will be presented. The air quality data were obtained from two monitoring stations (CAAQMS), in Vellore and Ranipet districts. Respiratory disorder patients n= 4500 were analysed in this study. Most of the data reported in the literature is based on the metropolitan areas in the countries and there is a lack of data from non-urban areas. Keeping this in mind, an attempt was made to correlate the profiles of air pollutants with the quality of health in the data collected from both locations of the monitoring stations in non-urban areas.

Invited Talk-6

Dr. Indranil Chattopadhyay
Department of Biotechnology,
Central University of Tamil Nadu, Thiruvarur, India.
Email:indranil@cutn.ac.in

Dr. Indranil Chattopadhyay published research papers in peer-reviewed journals in advanced genomic technology such as microarray, next-generation sequencing technology such as DNA and RNA library preparation, and ChIP-sequencing, metagenomic library preparation for NGS technology, Real-Time PCR, and bioinformatics data analysis. He already published his research work related to oral microbiome and gut microbiome in several peer-reviewed journals with high impact factors. He also published research papers in the RNA sequencing field.

Genetic alterations in tobacco and betel quid-associated esophageal squamous cell carcinoma of high-risk region in India

Esophageal squamous cell carcinoma (ESCC) develops as a result of interaction between an environmental carcinogen, genetic and geographic factors. High prevalence of ESCC has been reported in the Northeast region of India where there is widespread use of tobacco and fermented betel quid. Next-generation sequencing has been utilized to identify genomic alterations in 169 genes associated with upper aerodigestive tract cancer in 25 ESCC patients of this region. We identified novel insertions in the coding region of gene *TP73, RHOB, MSH2, DLG1, FAT2, PLAG1, MET, IGFIR, DCC, and KLK8, ACTN4 and TP53* genes and novel deletions in coding regions of *AXIN2, NOTCH2, TBRG4 and FBLN1* genes. We also identified novel coding non-synonymous single nucleotide polymorphisms (SNPs) in *TP53, MLF1, TSC1, CCNB1, TNFRSF10B, NQO1, TSC2, GAS7, ERBB4 and IL1β* gene. Comparative Toxogenomic Database showed that genes with novel SNP (*CCNB1, ERBB4, NQO1, TNFRSF10B, and TP53*) and genes (*DLG1, MSH2, RHOB, TP53 and TBRG4*) with novel insertion and deletion (Indels) found in this study were found to be associated with toxic chemical compounds present in tobacco and AflatoxinB1 which are produced by fermented areca nut. Identification of these genetic alterations may be useful to understand the pathobiology of tobacco and betel quid-associated ESCC in this high–risk region of India and developing therapeutic targets for ESCC.

Invited Talk-7

Dr. K. B. Sainis
Distinguished Scientist (Retired),
Former Director, Bio-Medical Group, BARC
President, EMSI

Prof. K. B. Sainis retired as a Distinguished Scientist and Director, of Bio-Medical Group, Bhabha Atomic Research Centre, Mumbai in October 2013. Subsequently, he was Raja Ramanna Fellow, BARC and Honorary Professor, IIT-Bombay. After obtaining M. Sc. degree in Biochemistry from the University of Poona in 1970, he completed the Biology – Radiobiology Training Course of BARC Training School with top honours and joined Medical Division, BARC as a Scientific Officer. He also underwent one year of training in Immunology at the ICRF Tumor Immunology Unit, University College, London under a fellowship from International Atomic Energy Agency. He obtained his PhD degree in 1980 in Biophysics from the University of Pune. During 1985-87 he carried out post-doctoral research at the New England Medical Center, Tufts University School of Medicine, Boston, USA. In the last 44 years, he and his colleagues have carried out very significant research in

cancer immunobiology, effects of radiation on immune response, immunomodulation by anti-oxidants, radio-protective agents and constituents of medicinal plants, autoimmunity, and tuberculosis. He has more than 100 publications to his credit.

Dr. Sainis is a recipient of Homi Bhabha Medal of BARC Training School (1972), Young Scientist Medal and Award of INSA (1981), Shanti Swarup Bhatnagar Prize of CSIR in Medical Sciences (1994), Senior Scientist Award of Indian Nuclear Society (2003) and the Senior Immunologist Oration and Award of Indian Immunology Society (2010) as well as DAE group Achievement Award (2009). He is a fellow of the National Academy of Sciences and Maharashtra Academy of Sciences.

Dr. Sainis served as the Distinguished Representative of India on the United Nations Scientific Committee on Effects of Atomic Radiations (UNSCEAR) from 1999 to 2013. He was also Chairman of the International Atomic Energy Agency's prestigious Standing Advisory Group on Nuclear Applications (SAGNA). He is the incumbent President of EMSI.

Low dose radiation and the immune system: Implications for human health

Exposure to high doses of ionizing radiation has unequivocally been shown to be deleterious to human health due to the induction of oxidative stress, DNA damage, cell death, and suppression of immunity. On the contrary, the studies on the effects of exposure to low-dose radiation (LDR, <100mGy) have reported conflicting observations. Epidemiological studies involving nuclear workers, children exposed to CT scans, and people residing in high-background natural radiation areas have shown contrasting effects of acute and chronic low-dose radiation. Acute exposure to low-dose radiation causes a very small but significant increase in lifetime cancer risk, reported primarily in children below 20 years. On the contrary, chronic exposure to cumulative radiation dose below 100mGy is associated with longer lifespan, lower cancer risk, and radio-adaptive responses in the USA and China. Experiments in animal systems, including those from our laboratory, showed stimulation of T cell response to mitogens and T cell-mediated cytotoxicity in some strains while the same type of immune responses were suppressed in another strain. Contributions of the genes involved in cell cycle regulation and apoptosis process were demonstrated. Epidemiological studies on cancer incidence, congenital abnormalities, and other biological endpoints in the human population from high-level natural radiation areas of Kerala in India have not shown any adverse effects of chronic low-dose radiation. Analysis of gene expression and epigenetic markers showed upregulation of genes associated with DNA damage response and immunity. Taken together, the data on acute low-dose radiation exposure in children may bolster the LNT hypothesis that forms the basis of dose limits for radiation protection. In contrast, the lack of evidence for any deleterious effects of low-dose chronic radiation in the normal human population and the demonstration of radio-adaptive response in older people may allay the fears of protracted radiation exposure.

Session 3: Molecular signatures and/or effect of environmental chemicals

Plenary lecture - 3

Prof. Roberta Bulla
Laboratory of Immunology, Department of Life Sciences,
University of Trieste, Trieste, Italy

Dr. Roberta Bulla is an Associate Professor of Immunology at the University of Trieste and a National Scientific Qualifications (ASN) for full professor. She has a B.S. degree in Biology and a Ph.D. Degree in Experimental and Clinical Pathology from the University of Trieste. The research program coordinated by Roberta Bulla focuses on the study of the complement system in embryo implantation in physiologic and pathologic pregnancy. More recently, she extended her studies to the canonical and non-canonical roles of the complement system in tumour growth and invasion. The scientific output of Roberta Bulla has been stable over time and consists of more than 140 publications of which six book chapters and 84 peer-reviewed research papers published in international journals, such as Nature Communication, P.N.A.S., Blood, Frontiers in Immunology, Scientific Reports, Journal of Immunology, and European Journal of Immunology. Her global impact factor is 433 and her mean impact factor per paper is 5.15. She has about 3000 citations and a Hirsch Index (HI) of 29 (Scopus). Since 1998, she has lectured at 36 international congresses and meetings. The scientific activity documents the wide network of national and international connections. She was a member of the successful European Network of Excellence on Embryo Implantation Control (EMBIC).

The role that the complement system at the placental level in both physiologic and pathologic pregnancy

The placenta has a unique structural organization that allows fetal cells expressing paternal alloantigens to establish peaceful cohabitation with the maternal immune system. The complement components found in placental tissue are largely derived from the blood circulating in the placental vessels. However, some complement components can also be produced locally by macrophages and other cell types. The deposition of complement components at the tissue level is normally seen in the context of inflammatory diseases. This is not the case in the placenta, where deposition of complement components can also be documented under physiological conditions that do not result in damage to the fetus. The protection of the semi-allogeneic human conceptus from maternal complement activation products is achieved by the surface expression of complement regulators that act at different steps of the complement sequence. These complement regulators are localized at a strategic position on the surface of the trophoblast of the villus and protect the fetus from damage that

may result from uncontrolled complement activation. However, pathological pregnancy conditions can lead to the deposition of a larger amount of complement activation products that may exceed the protection of the local complement regulators.

Invited Talk-8

Dr. Gaurav Sharma
Department of Translational & Regenerative Medicine,
Postgraduate Institute of Medical Education & Research,
Chandigarh, 160012, INDIA

Dr Gaurav Sharma's expertise in Transplant Immunology and Clinical Immunogenetics analysis with solid organ and hematopoietic stem cell transplantation, investigating biomarkers for infectious and autoimmune diseases, and research in regenerative medicine. He has experience of more than 15 years in the field of Histocompatibility and Immunogenetics. He has received prestigious National and International awards including the FIMSA award (2008), the Young Immunologist Award (2015), and the Travel Award (2019) by the Chinese Society for Immunology, Global Health Awards by the Bill and Melinda Gates Foundation (2010 & 2012) and several others. He is an active member of the Indian Society for Histocompatibility and Immunogenetics (ISHI), American Society for Histocompatibility and Immunogenetics (ASHI), European Federation for Immunogenetics (EFI) and Asia Pacific Histocompatibility and Immunogenetics Association (APHIA). He has published his research contributions in international journals of repute and contributed significantly to molecular diagnostic services in HSCT for various malignant and non-malignant hematopoietic conditions. He has been involved in the identification of novel mutations in the promoter region of 58 lineages of classical HLA class 1 genes, which could serve as a reference for exploring allele-specific HLA expression and health implications. Recently he has been honoured with the Life Membership of the National Academy of Medical Sciences (NAMS) for his above-stated contributions to the field of Immunohematology.

Histocompatible HLA Haplo-banking: A Step towards *'off the shelf'* regenerative medicine

Gaurav Sharma and Disha Agarwal
Department of Translational & Regenerative Medicine,
Postgraduate Institute of Medical Education & Research,
Chandigarh, 160012, INDIA.

The advent of reprogramming mechanisms and thereby manufacturing induced pluripotent stem cells (iPSCs) has become a landmark in the field of stem cell biology with the potential for regenerative medicine. However, it can be labor intensive, time-consuming with lengthy processes involved, and prohibitively expensive to manufacture autologous iPSCs as a

personalized regenerative medicine approach. Therefore, there is a need to move towards cost cost-effective, less time-consuming feasible off-shelf approach for wider population-wide utility of adoptive cell-based and/or regenerative therapies. This objective seems feasible through developing histocompatible homozygous HLA haplobanks offering considerable global and/or population-specific coverage with minimal allo-sensitization. To this end, the human leukocyte antigen system (HLA) represents a highly polymorphic gene-dense region (~37,516 alleles known so far) that directs histocompatibility and is involved in antigen presentation to orchestrate adaptive immune responses. Identifying the most common HLA haplotypes at the population level and selecting homozygous donors for those top-ranked haplotypes is a prerequisite for formulating these haplobanks, wherein clinical grade haplolines of select donors can be stored. Briefly, the process of 'iPSC haplobanking' refers to the banking of iPSC cell lines, selected to be homozygous for different HLA haplotypes, from which therapeutic products can be derived and matched immunologically to patient populations. The iPSC HLA haplobanks created from cord blood and peripheral blood donors are already a reality in South Korea and Japan, thus providing a strategic roadmap to *'off the shelf'* cell therapy and/or regenerative medicine for various diseases.

Invited Talk-9

Prof. Chandi C. Mandal
Department of Biochemistry, School of Life Sciences,
Central University of Rajasthan.
Email:chandicmandal@gmail.com

Prof. Chandi C. Mandal, Dean, School of Life Sciences, and Head, Department of Biochemistry, Central University of Rajasthan, India [2013-to present]; Postdoctoral training from University of Texas Health Science Center at San Antonio, Texas, USA [2006-2012]; Ph.D. from Indian Institute of Technology at Kharagpur, India [2000-2005]; M.Sc. (Biochemistry) from Calcutta University, India. Prof. Mandal's academic endeavor is not only reflected in the publication but his research work has also been highlighted multiple times in Newspapers and reported in Television channels. Prof. Mandal is an editorial board member of various reputed journals such as Scientific Reports, Frontiers in Endocrinology, BMC Cancer, PLOS ONE, Journal of Biochemical and Molecular Toxicology, Current Drug Targets, and oncology letters. Prof. Mandal edited various thematic issues on "cancer and bone metastasis", "lipid and cancer", etc. He has enlisted in the TOP 2% of scientists in the world made by Stanford University in 2021, and 2023, published in Plos Biology.

Prof. Chandi C. Mandal's research aims at understanding molecular mechanisms of dysregulated gene expressions and cellular signaling networks associated with debilitating cancer diseases, by carrying out cell-based experiments, cancer tissue, and database analysis along with the support of animal model studies. Exploring the impact of various metabolic disorders including diabetes, obesity hypercholesterolemia, and extrinsic risk factors (cold temperature) on the peculiar trans-differentiation property of epithelial breast cancer cells into osteoblast- and adipocyte-like cells is a major focus. Non-toxic drug candidates are preferred to cease dysregulated signaling pathways by hindering the gene targets. Research in this laboratory also seeks to examine if cholesterol-lowering statins, omega-3 fatty acids, and anti-diabetic metformin can be combined with other anti-cancer drugs to show better.

Targeting DNMT1-mediated methylation in the mutation-prone zones in cancer genome for the treatment of breast cancer

Genetic and epigenetic changes act simultaneously for the initiation, development, and metastasis of cancer diseases. Both somatic mutations and abnormal methylation in the cancer genome bring the most complex molecular pathology in cancer tissues. This research work focused on the determination of mutation status in association with methylation patterns in various tumor suppressor genes and oncogenes. A collective analysis of 96 genes (42 tumor suppressor genes and 54 oncogenes) found the nucleotide G and C as the most commonly replaced, whereas the nucleotide A and T as the most commonly formed residues after mutation, and identified that CG nucleotides of the amino acid codons were most susceptible to mutation, and found a consensus DNA "T/AGC/GAGGA/TG" sequence present within these mutation prone DNA segments. Molecular docking studies depicted that the enzyme methyltransferase DNMT1 upon binding to this consensus DNA motif methylates at the C residue of CpG islands of the mutation-prone zones. Our ongoing preliminary studies also suggested that DNMT1 binds to this T/AGC/GAGGA/TG motif. Subsequently, this work revealed that the cholesterol-lowering drug simvastatin prevented bone morphogenetic protein 2 (BMP-2) induced DNMT1 expression and its oncogenic activities including migration, invasion, and stemness potential in various breast cancer cell lines. It is for the first time reported here that targeting DNMT1 meditated methylation by introducing this DNA motif in a cell might prevent oncogenic potential.

Keywords: Epigenetics, DNMT1, methylation, breast cancer, cholesterol and BMP-2.

Invited Talk-10

Dr. Jay Manikandan
Director of Sales–Asia Pacific
NanoString Technologies, Inc.
Email:jmanikandan@nanostring.com

Dr Jay Manikandan is a Director of Asia Pacific at NanoString. Currently, Jay leads a team that promotes translational genomic applications to the world's leading biomedical research institutes, academic research centers, pharmaceutical companies, and clinical centers. In his past research, Jay has combined experimental components with bioinformatics approaches in a unified effort to improve the diagnosis, treatment, and prevention of life-threatening diseases through the identification of risk factors, drug targets, and biomarkers which resulted in nearly 100 peer-reviewed publications.

The Spatial Biology Revolution in Life Sciences: Multi-omic whole-transcriptome digital spatial profiling combined with single-cell and sub-cellular spatial molecular imaging

Next-generation sequencing of bulk samples revolutionized our understanding of LifeScience research and the ability to discover biomarkers and understand cancer biology at a completely new level (e.g., TCGA dBase). Single-cell sequencing, however, pointed out the critical weaknesses of bulk-sequencing approaches, for both understanding sample heterogeneity and rare-cell populations. Single-cell sequencing (sc-Seq) approaches, while great at discovering new cell classes and rare cells, suffer from the extreme limitation of requiring tissues to be dissociated, so that you never know how these (newly discovered) cell types are organized in space, or function in the context of tissue architecture. To solve this problem, NanoString has developed a next-generation of optical barcodes that enables spatially resolved, unlimited multiplexing of proteins and mRNA (in-situ) from very difficult tissue types (e.g., formalin-fixed paraffin-embedded, FFPE).

Platform talk-1

Phytochemicals composition in sequential solvent extracts and its fractions and minerals analysis of *Michelia champaca* Linn flower as a potential source for wound healing and anticancer

[1]Sreenivasa Rao Amaraneni*, [2]Ravi Kumar H and [3]Haripradas TPN

[1]East Point College of Engineering & Technology, East Point Group of Institutions, Jnana Prabha, East Point Campus, Virgo Nagar Post, Avalahalli, Bangalore-560049, Karnataka, India.
sramaraneni@yahoo.com
[2,3]Dept of Life Science Bangalore University Bangalore 560056, Karnataka, India
Email:ravikumarh79@gmail.com; Haripradastpn@gmail.com

Flowers are an integral part of our lives and are used for therapeutic purposes in Ayurveda and Siddha in India. The plant secondary metabolite chemicals play an important role in scavenging free radicals, fighting infection promoting a faster wound-healing process, and reducing cancer. *Michelia champaca* Linn flower is well known and is being used in traditional medicine for the treatment of wound healing and other ailments. The phytochemicals such as saponins, alkaloids, cardiac glycosides, flavonoids, terpenoids, and tannins from the *M. champaca* Linn flower, have been attracting increasing attention due to their potential beneficial effects on human health, particularly, wound healing and anticancer properties. The *M. champaca* Linn flowers had many confirmed in vitro activities that can promote wound healing effects. Despite many claims and in vitro studies with supportive results in wound healing, not much detailed scientific study has been conducted on phytochemical and mineral constituents of *M. champaca* Linn flower for wound healing activity. The objective of our study is to assess the phytochemical composition of sequential solvent extracts and their fraction of *M. champaca* Linn flower and also to assess the mineral content of *M. champaca* Linn flower. The *M. champaca* Linn flower was extracted by sequential Soxhlet extraction with petroleum ether and methanol for 12 hours and the extracts were concentrated for Analysis. The total phenol, flavonoid, and alkaloid contents of the crude extract and its fractions of the plant were determined by GC-MS, and minerals were analysed by the AAS/ICP-MS. This study on the detailed chemical and mineral composition of *M. champaca* flower would be helpful for the development of herbal formulations for wound healing and anticancer

Keywords: Phytochemicals, Minerals, *Michelia champaca* Linn flower, extract, fraction, wound healing and anticancer

Platform talk-2

AURKA, a major miscreant: Imparting radioresistance in cervical cancer

Salini Das[1], Dilip Kumar Ray[2], Manisha Vernekar[3], Debarshi Lahiri[4], **Sutapa Mukherjee[1]***
[1]*Department of Environmental Carcinogenesis & Toxicology*
[2]*Department of Medical Physics*
[3]*Department of Gynaecological Oncology*
[4] *Department of Radiation Oncology*
Chittaranjan National Cancer Institute
37, S. P. Mukherjee Road, Kolkata 700026, India
Email:sutapamukherjee@cnci.ac.in*, **sutapa_c_in@yahoo.com

Acquired Radioresistance is a major challenge hindering the therapeutic success of cervical cancer. Radiotherapy, a conventional mode of treatment modality in cervical cancer seeks extensive experimental exploration regarding its molecular mechanism to determine the underlying root cause of developed resistance. Oxidative stress-mediated cell killing by promoting Reactive Oxygen Species (ROS) generation is a prima facie strategy of radiotherapeutic action. Therefore, ROS regulation might be a prerequisite adaptive feature for acquiring radioresistance which led us to determine whether altered redox homeostasis could impart radioresistance in cervical cancer. Aurora Kinase-A or AURKA, a mitotic serine/threonine kinase, has been reported to promote therapy resistance. Therefore, concomitant regulation of AURKA and ROS accumulation in the scenario of radioresistance was chiefly addressed in this study. Targeting ROS-mediated AURKA regulation by Aspirin was further examined. Altered ROS accumulation was noted in cervical squamous carcinoma biopsy samples along with *in vitro* cell line SiHa (cervical squamous carcinoma) and its radio-resistant subline SiHa/RR. Appreciably, elevated S-phase ROS vis-à-vis overexpressed-AURKA was observed in patient groups as well as radioresistant cells which significantly correlated with poor radiation response. Additionally, ROS-induced HIF1α overexpression facilitated transcriptional upregulation of AURKA upon binding at the novel region of AURKA promoter. Accumulation of AURKA was noticed within the mitochondria which eventually blocked Cytochrome C release to evade apoptosis. Aspirin efficiently counteracted S-phase ROS-driven AURKA activation. Cell-cycle specific S-phase ROS accompanied with AURKA detection can be used as a predictive marker for assessing radiotherapeutic response among cervical cancer patients.

Keywords: S phase ROS, HIF1α, AURKA, Radioresistance, ASA

Highlights:

- Chronic irradiation promotes S Phase specific reactive oxygen species (ROS).
- S Phase ROS triggers HIF1α activation and activated HIF1α promotes transcription of AURKA.
- Elevated AURKA localizes into mitochondria to block the cytosolic release of Cytochrome C and hinders radiotherapeutic response.
- Repurposing Aspirin reverses radioresistance by quenching S-Phase ROS, favouring cytosolic release of cytochrome c through downregulating mitochondrial AURKA.

Platform talk-3

Influence of particulate matter 2.5 on pro-carcinogenic cue in exposed population of Kolkata and surrounding areas

Sukanya Ghosh, Rupa Chaudhuri, Priyanka Saha, Anurima Samanta, **Dona Sinha***
Department of Receptor Biology and Tumor Metastasis
Chittaranjan National Cancer Institute, 37, S.P. Mukherjee Road, Kolkata-700026
Email:donasinha2012@gmail.com; dona.sinha@cnci.ac.in

Air pollutant particulate matter with a diameter ≤2.5 (PM2.5) severely deteriorates the air quality of Indian cities and is an important public health concern. The present study investigated the impact of PM2.5 exposure on the pro-carcinogenic signalling of the asymptomatic populations (without any comorbidity and addiction) working 8-10 h/day for last 5 yrs in the metropolitan area (ME) of Jadavpur, Kolkata, the sub urban (SU) area Mejia, Bankura and the rural area (RU) Boria, Diamond Harbour during 2021-2022. It was observed that ME predominantly had a higher daily mean PM2.5 concentration (106.5±3.3 µg/ml) than SU (82.69±3.126 µg/ml) and RU (76.06±47.41 µg/ml) area. Transcriptomic analysis of the sample populations of ME and RU revealed non-small cell lung cancer among the top three deregulated pathways which was further validated in a larger population. The high PM2.5 exposure at ME (N, 36) caused depletion of haemoglobin and lung function parameters than SU (N, 43) and RU (N, 38) areas. The pulmonary and systemic microenvironment of the ME individuals had exacerbated signalling of prooncogenic drivers like EGFR/ PI3K/AKT/ mTOR, JAK2/ STAT3, HIF-1α and VEGF, cyclin D1, and low Bax/ Bcl-2 ratio which indicated towards cell proliferative machinery and inhibition of apoptosis. At present these alterations are at the sub-clinical level but after a long period of latency, these may overt as pulmonary diseases including lung cancer. Therefore, immediate strategies may be adapted to curb PM2.5 emissions which might reduce the lung cancer burden in the future.

Key words: Particulate matter2.5, asymptomatic population, pro-carcinogenic signalling, lung cancer

Highlights:

- Transcriptomic analysis of high PM2.5-exposed people revealed lung cancer among the top three deregulated pathways.
- Metropolitan individuals with high PM2.5 exposure had depleted Hb and decrement in lung function.
- High PM2.5 exposure upregulated PI3K-AKT mediated cell proliferative machinery and reduced apoptosis.
- The PM2.5-associated cellular and molecular alterations may increase the risk of lung carcinogenesis in the future.

Platform talk-4

Transgenerational impact of atrazine: Impaired sexual maturation and subfertility in F1 male rats with congenital deformities in F2 progeny.

Neelam Pandey, Priyanka Maske, Chandrashekhar Mote and Vikas Dighe
ICMR-National Institute of Research in Reproductive and Child Health, Parel, Mumbai-400012. Email:neelampandey05@gmail.com

The study explored the reproductive and developmental repercussions of Atrazine (ATR) exposure in male rats during gestation and lactation. Pregnant rats (F0 dams) received ATR at doses of 2, 10, 70, and 100 mg/kg b.wt/day from gestation day 6 to postnatal day 21. F1 male progeny exhibited delayed testicular descent at 10, 70, and 100 mg/kg b. wt/day, along with significantly diminished serum testosterone levels, sperm count, and motility. Testicular defects were observed in F1 males. Molecular analysis revealed upregulation of Androgen receptor (AR), Estrogen receptors (ER α and ER β), StAR, Aromatase, and INSL-3, indicative of estrogenic and/or anti-androgenic activity. Fertility assessment in F1 males demonstrated subfertility and increased pre-and post-implantation loss at 10, 70, and 100 mg/kg b. wt/day doses compared to controls. Furthermore, the study extended its investigation to F2 fetuses, uncovering congenital disabilities such as reduced weight, crown-rump length, anogenital distance, and other morphological deformities. These findings underscore the transgenerational impact of ATR exposure, affecting the F2 generation through the male germline. In conclusion, Atrazine exhibited estrogenic and/or anti-androgenic properties, disrupting reproductive and developmental processes in F1 male rats. The study raises concerns about potential transgenerational effects and emphasizes the importance of understanding the risks associated with ATR exposure in the context of reproductive health.

Platform talk-5

Neurotoxic effect of electromagnetic radiation in SH-SY5Y cell line

Deena. K[1] and **Sivasamy. R[1]**
Molecular Genetics and Cancer Biology Laboratory
Department of Human Genetics and Molecular Biology
Bharathiar University, Coimbatore-641 046
Email:rshgmb@buc.edu.in

Electromagnetic radiation exposure has become increasingly complex due to the widespread adoption of wireless communication technologies. Environmental factors, such as the rising population exposure to electromagnetic fields, are crucial in EMF-related health effects. These include exposure to radio-frequency radiation emitted by mobile phones, mobile phone base stations, wireless LAN (Wi-Fi), and other wireless appliances. Our research focused on electromagnetic radiation due to its growing prevalence in daily life, as seen in the widespread use of technology devices. Cell cultures provide an efficient model for studying genotoxic conditions. The present study aimed to investigate the impact of electromagnetic

radiation-emitted devices on neurotoxicity in the SH-SY5Y cell line model system. The cell line was exposed to electromagnetic radiation (2.4 GHz) for four hours daily. We employed various techniques, including pathological analysis and DNA damage assays, to assess neurotoxicity levels. The exposed cell line showed no significant increase in reactive oxygen species compared to control cells. Additionally, the comet assay revealed very low levels of DNA damage, and the nuclear staining study did not reveal any abnormal structures. Our findings suggest that four-hour daily exposure to Electromagnetic radiation (2.4 GHz) has a minimal impact on neuronal development. However, our results showed not much effect caused by 2.4 GHz on neuronal development during the 4h/day exposure periods, but prolonged usage might cause an effect on neurons.

Keywords: Electromagnetic Radiation, Neurotoxicity, Reactive Oxygen Species, SH-SY5Y Cell Line, DNA Damage.

January 30, 2024, Tuesday

Session 4: Biodiversity and Conservation/Bioprospecting/bio-discovery and risk assessment

Plenary Lecture 4

Prof. Hansruedi Glatt
German Institute of Human Nutrition (DIfE), Department of Nutritional Toxicology, Potsdam-Rehbrücke; and Federal Institute of Risk Assessment (BfR), Department Food Safety, Berlin, Germany. Email:glatt@dife.de

Hansruedi Glatt obtained a Ph.D. in biology from the University of Basel (Switzerland). He was a Professor of Toxicology and Pharmacology at the University of Mainz (Germany, 1987-1994), a Professor of Molecular Toxicology at the University of Potsdam (Germany, 1994-2013), and Head of the Department of Nutritional Toxicology at the German Institute of Human Nutrition in Potsdam-Rehbrücke (1994-2013). He also taught in the Master Program in Toxicology at the Charité Berlin (2008-2018) and the Postgraduate Programme "University Course Toxicology" at the Medical University of Vienna (2015-present). He is active as a Guest Scientist at the German Federal Institute of Risk Assessment (2014-present).

Major research areas involve the role of biotransformation in genetic toxicology, with focus on non-P450 enzymes, such as sulfotransferases; genetically modified cell and animal models; DNA and protein adducts in such models and humans; polycyclic aromatic hydrocarbons, food-borne mutagens and natural mutagens of plant origin (e.g., alkenylbenzenes, pyrrolizidines, glucosinolates, arbutin).

Hansruedi Glatt has published nearly 340 articles in scientific journals (including five articles in "Nature" and "Science") and 45 book chapters. He received several awards, amongst others the GUM award (German-speaking section of the European Environmental Mutagen Society) in 2003 and the Frits Sobels award of the European Environmental Mutagen Society in 2014.

Characterization and mechanistic aspect of the genotoxicity of some secondary plant metabolites present in foodstuff

The presentation involves three integrated research topics: (1) Genotoxic effects of secondary plant metabolites (arbutin, methyleugenol, neoglucobrassicin, lasiocarpine, aristolochic acid)

in in vitro models, experimental animals, and human tissues. (2) The study of enzymes involved in their metabolic activation – specific forms of cytochromes P450 (CYP) and sulphotransferases (SULTs) expressed in various tissues of mammalian organisms, myrosinases present in cruciferous plants, and enzymes from intestinal bacteria: These enzymes – together with transmembrane transporters – exerted a major impact on the target sites for genotoxicity. Genetic modification of cell and animal models was an important tool in the elucidation of activation pathways. Additionally, genotoxic effects of methyleugenol in humans were correlated with the expression and genetic polymorphisms of SULT1A1. Germ-free mice were used in studies on neoglucobrassicin. (3) DNA adducts (detected by 32P-post labelling, mass spectrometry, and/or immunohistochemistry) and protein adducts (detected mass spectrometry): DNA adducts represent a primary genotoxic effect, usually leading to the induction of gene mutations, as studied in *in vitro* models. They have the advantage that they can be studied in any experimental system (from cell-free to human tissue specimens). In addition, DNA and protein adducts are biomarkers indicating exposure of the corresponding cells and tissues to the reactive metabolites (ultimate genotoxicants) of the test compound.

Invited Talk-11

Dr. Sudin Bhattacharya
Ex. Scientist/Faculty (Senior Assistant Director Grade). Former Head, Dept. of Cancer Chemoprevention & Former In charge, Dept. of Anticancer Drug Development and Chemotherapy. Chittaranjan National Cancer Institute, Kolkata 700 026, West Bengal, India.
Email:sudinb1957@gmail.com/sudinb1957@yahoo.co.in
Address for communication: Harinavi, Kolkata 700 148, West Bengal.

Dr. Sudin Bhattacharya post-graduated from Jadavpur University, Kolkata in Chemistry (Organic Chemistry) (1979). Doctoral degree: 1986 (Synthetic Organic Chemistry related to Medicinal Chemistry), Jadavpur University, Kolkata. Awards: National Scholarship from Govt. of India from 1974-1979; Visiting Scientist at German Cancer Research Centre (DKFZ), Heidelberg, Germany in the year 2000. Membership of Academic Societies: Life member, Indian Association for the Cultivation of Science, Kolkata; Life member, Indian Association for Cancer Research; Life member, Environmental Mutagen Society of India; Life member All India Congress of Cytology & Genetics and Life Member Society for Mitochondrial Research and Medicine. Research interest: Anticarcinogenesis Drug Development, Cancer Chemoprevention and Chemoprotection, Toxicology. Publications: More than 90 in different national and internationally reputed journals. Guest Editor: Journal of Oncology. Resource Person: DST SERB for evaluation of projects. Reviewer: Several International and National journals “Scientific Reports”, “Chemical Research in Toxicology”,

"European Journal of Medicinal Chemistry" "Bioorganic Medicinal Chemistry Letter, "Bioorganic Medicinal Chemistry", "Chemico Biological Interactions", "Cancer Letters", "Journal of Food and Chemical Toxicology", "Free Radical Research", "Biological Trace Element Research", " Molecular and Cellular Biochemistry" etc.

Investigating thiazolidine-2, 4-dione based small molecule, O-prenylated benzylidene-thiazolidinedione, as chemoprotectant with simultaneous chemoenhancement of cisplatin efficacy against breast cancer cells. A pre-clinical *in vivo* study.

S. Singha Roy[a], P. Chakraborty[b], S. Hazra, Abhishek Basu[c] & **S. Bhattacharya[d]***

*Dept. of Cancer Chemoprevention, Chittaranjan National Cancer Institute, Kolkata- 700 026, West Bengal, India. a;TCG Life Science, Salt Lake Kolkata, b;Office of the Chief Medical Officer of Health, Barasat, North 24 Parganas, c;NIH, MD, USA, d; Retired, *E-mail:sudinb1957@yahoo.co.in*

Introduction: Drug-induced toxicity and acquired resistance of tumors to established treatment regimes still constitutes a major concern in cancer therapy. Induction of apoptosis has been recognized as an excellent therapeutic approach to enhance the sensitivity of tumors toward therapy. To find a lead compound in this approach, we synthesized a series of novel benzylidine-thiazolidine-2,4-dione compounds. A prenylated derivative (PBT) was established as the potent lead molecule which showed significant antioxidative and antiproliferative activity *in vitro*.
Objective: PBT was used along with the standard chemotherapeutic drug cisplatin to improve its therapeutic efficacy. Method: PBT (4 mg/kg b.w., p.o.) was administered alone or in combination with cisplatin (5 mg/kg b.w., i.p.) in Swiss albino mice bearing murine breast adenocarcinoma (EAC) cells. Results and discussion: PBT sensitized carcinoma cells towards cisplatin therapy and simultaneously decreased cisplatin-induced toxicity in the host and enhanced host life span. Regulation of p65NFκβ is thought to be one of the major regulatory mechanisms induced by PBT. PBT enhanced apoptosis in cancer cells by activating molecules like Bax, cytochrome-c, caspases etc and down-regulating the anti-apoptotic ones like Bcl-2. PBT along with cisplatin significantly enhanced the oxidative stress in tumor cells. Significant inhibition in the Vascular endothelial growth factor (VEGF) expression and Matrix metalloprotein-9 (MMP-9) level after PBT treatment in tumor bearing host further supports the sensitization mechanism accomplished by PBT. We also report that PBT decreased cisplatin-induced p65NF-κβ dependent inflammatory response in kidney tissues via down regulation of COX-2 and iNOS. Under such survival condition of the host, Nrf-2 was increased with a concomitant increase in the activities of phase II detoxifying enzyme GST. The compound also protects bone marrow cells from cisplatin. induced genotoxic damage. Conclusion: The present study clearly demonstrated the chemosensitizing and renoprotective effect of PBT as adjuvant with cisplatin therapy.

Key words: benzylidine-thiazolidine-2,4-dione, Cisplatin, Apoptosis, Chemoprotection, Chemoenhancement.

Highlights:

- Successful synthesis of PBT,
- Treatment enhanced the life span of the tumor-bearing mice
- PBT treatment confers kidney protection
- PBT influences oxidative stress and apoptosis in tumor cells

Invited Talk-12

Prof. Nandjee Kumar
Department of Botany
Magadh University, Bodhgaya-824234
Email: kumarnandjee@gmail.com

Prof. Nandjee Kumar did M Sc from Patna University in 1971(1968-70) with specialization in Cytogenetics and Plant Breeding and a Ph.D. from Ranchi University in 1984 on "Genetics of Cyto-embryological characteristics of *Raphanus sativus* L". He joined Magadh University Service as Lecturer in Botany in 1971, elevated to the post of Reader in 1984, and Professor in 1987. He has been actively engaged in research with the publication of over 100 research papers and reviews in reputed national and international journals. He got published three valuable books. He guided research leading to Ph.D. degrees for dozens of scholars. He has made a significant contribution to the cyto-genetics of cultivated cruciferous crops and produced several interesting mutants of radish and turnip. His current research areas are cyto-genetics, biochemistry, and geno-toxicology. He has been a resource person at several seminars, conferences, and refresher courses. He successfully organized the 34th conference of the Environmental Mutagen Society of India and the International Symposium on "Genomics and Molecular Basis of Human Diseases" from March, 17-19, 2009, and the 15th All India Congress of Cytology & Genetics and Fogarty International Workshop on "Arsenic contamination in ground water: Health effects, Molecular epidemiology, susceptibility, and Mitigation" during Nov.21-23,2011. He has the credit of representing India in participating and presenting his research paper at the International Conference on Environmental Mutagens held in Florence, Italy on August, 20-25, 2009, and at the 2nd Asian Conference on Environmental Mutagens at Pattaya, Thailand during Dec.15-18, 2010. He has successfully steered the administrative assignments of the Director, of the Institute of Biochemistry, Pro-Vice-Chancellor, and Vice-Chancellor of Magadh University, Bodhgaya.

Comparative study of impact of plant extracts and antibiotics on bacterial growth

Earlier literature reported that phytochemicals of leaf extract and macrolide antibiotics have genotoxic potential. The present paper explores the impact of plant extracts, antibiotics, and their combination on bacterial growth. Ethanolic (70%) leaf extract of three medicinal plants *Vitex negundo, Pongamia pinnata* and *Jatropha gossypifolia* was prepared as devised by Kassa *et al.* (2014). Four antibiotics Ciprofloxacin, Azithromycin, Amoxicillin, and Chloramphenicol disks were used. The desirable number of wells of two test organisms i.e.

Escherichia coli (MTCC 433) and *Staphylococcus aureus (MTCC 2940*) was prepared with the help of sterile cork-borer (diameter 6 mm) in inoculated agar plates in separate petri dishes. Now 50 µl and 100 µl of the three plant extracts were poured into the wells. In another set of four wells, the antibiotic disks were placed separately and in the other set of four wells, the plant extracts combined with antibiotic disk were placed for a synergistic effect on bacterial growth. All the wells were incubated for 24 hours at 37^0 C (Elisha et al. 2017; Bereksi, 2018). After incubation the diameter of the zone of inhibition was measured in triplicate and the mean value of the zone of inhibition was recorded. The results confirmed that the zone of inhibition due to antibiotics was much higher almost double in comparison to the plant extract, however no significant variation of inhibition was found among the three plant extracts but among the antibiotics, a significant variation was noted and the maximum inhibition was shown by chloramphenicol. It was interesting to note that the combination of plant extracts enhanced the efficacy of antibiotics inhibiting bacterial growth and the maximum zone of inhibition was noted with chloramphenicol in combination with *Jatropha gossypifolia* extract. Conclusively the phytochemicals of *Jatropha gossypifolia* might have stimulated the antibiotics to enhance their efficacy.

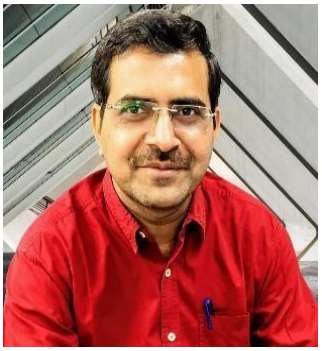
Invited Talk-13

Prof. Medha R
Professor of Biochemistry & Associate Dean (Research),
Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER),
Puducherry-605006 India. Email:linkmedha@gmail.com

Genomics of dermatological disorders

The skin is comprised of a variety of cell types that express specific molecules essential for maintaining its structural integrity. Any mutation in these molecules can disrupt their function, leading to skin disease. The human genome project has made significant progress in understanding the genetic makeup of dermatological disorders. Our research group has focused on autoimmune skin disorders, specifically psoriasis and vitiligo, for the past ten years. Both diseases are complex, involving a combination of genetic and environmental factors. Given the intricate and unclear nature of their pathogenesis, our research aims to comprehend the immunogenetic mechanisms underlying the development of these autoimmune dermatological disorders in our population. This endeavor will provide new insights into their immunopathogenesis and facilitate the development of innovative therapeutic approaches for their management.

Invited Talk-14



Dr. Ashwani Kumar
Metagenomics and Secretomics Research Laboratory, Department of Botany, University of Allahabad (A Central University), Prayagraj, 211002, (UP), India.
Email:ashwanikumar@allduniv.ac.in

Dr. Ashwani Kumar is working as an Associate Professor in the Department of Botany, University of Allahabad, Prayagraj, UP India, and previously worked as an Assistant Professor at Dr. Harisingh Gour Vishwavidyalaya (Central University), Sagar MP since June 2013. He worked as a Postdoctoral fellow at the Durban University of Technology and Rhodes University, South Africa (June 2011-June 2013). He worked for Six months at the University of Saskatchewan, Canada (As GSEP Fellow during 2009-2010). He was awarded the Shastri Mobility Program Fellowship (2019) by Shastri Indo-Canada, MHRD, Govt. of India at Concordia University, Montreal, Canada, in 2019. His laboratory of Metagenomics and Secretomics research focuses on harnessing the power of microbiomes for plant growth improvement under stress conditions as well as pesticide remediation. He supervised 5 Ph.D. students and received project grants from DST SERB-CRG (37 Lakh as PI), the DBT Builder program (3.5 Crore, PI), UGC startup grant (6 L) as a PI, and three project grants from DBT, MoEF, LTEO, Govtof India as Co-PI (more than 8 crores). He has published 80 articles in international journals of high repute with a cumulative Impact factor of over 450, with Google Scholar citations-7300 (Scopus Citations: 4650); i10 index of 75; h index of 40. He also published book (2) with Springer and CRC Press, over 30 book chapters, and gave over 40 talks at International Conferences. Dr. Kumar was a Keynote Speaker at several national and international conferences and seminars. He has received several National and International Awards/Fellowships such as 1) the Commonwealth Fellowship from the University of Saskatchewan, Canada, 2) the Claude Leon Fellowship, South Africa 3) the National Research Foundation Fellowship, South Africa, 4) the Durban University of Technology, Fellowship, Durban, South Africa 5) Rhodes University Fellowship, in South Africa. He is a CEM member of the International Union of Conservation of Nature & Natural Resources (IUCN), Future Earth, and Global Forest Biodiversity Initiative. He was Elected as a Fellow of the Linnean Society of London (The oldest society in the World), the Young Academy of India, the Fellow National Institute of Ecology, and the International Society of Environmental Botanists. He is a life member of the Biotech Research Society of India, theNational Institute of Ecology, and the International Society of Environmental Botanists, India. He is an Editor of Plos One, Plos

Sustainability, Frontiers in Microbiology, Frontiers in Agronomy, MDPI-Sustainability, MDPI-Plant, Frontiers in Bioscience- Landmark, One Ecosystem, Metabarcoding and Metagenomics Journal, Heliyon Cell Press. Featured 4 times in the top 2% Scientists of the World list prepared by Stanford University, USA available on Elsevier website.

Metagenomics and metabolomics tools for revealing the adverse impact of environmental toxicants and augmenting sustainable farming

There is no denying that the environment and human health are in jeopardy because human activities are becoming more and more disruptive worldwide. There is a domino effect of environmental and health problems that have emerged due to modern industry. In animals, including humans, these chemicals wreak havoc on the central nervous system, leading to neurodegenerative illnesses. Consequently, examining the impacts of commonly used pesticides on the soil ecosystem is crucial since they may be soil pollutants. Members of the Organization for Economic Cooperation and Development (OECD) have prioritised learning about the effects of pesticides and their breakdown products on land ecosystems. Metagenomics and Metabolomics have shown promise as a toxicological indicator in several investigations. As metagenomics can be used for taxonomic and functional profiling of microbial communities in the ecosystem, the use of metabolic profiling and metabolomics in these studies demonstrates their ability to comprehend and identify biochemical changes in organisms resulting from various environmental conditions. In the present study, we utilized the power of metagenomic and metabolomics techniques to investigate microbial-mediated pesticide remediation and the negative influence of pesticides on earthworms and soybean crops. The main goal of this study is to provide the scientific facts for pesticide management and application and to provide a clean, green, and sustainable environment for future generations.

Invited Talk-15

Prof. Guruprasad KP
Professor, Manipal School of Life Sciences, Planetarium complex,
Manipal Academy of Higher Education, Manipal
Email:guruprasad.kp@manipal.edu

Dr. K.P. Guruprasad obtained his master's degree in Zoology from the University of Mysore, Mysore, India (1994). He received PhD degree from the University of Mysore, Mysore, India (2004) in the field of Cytogenetics. He served as a Lecturer at JSS College of Arts,

Commerce, and Science, Mysore (1994-1995), Mahajana Pre University College, Mysore (1994-1995), Department of Studies in Zoology, University of Mysore (1999) and in the St. George College of Management and Science, Bangalore University, Bengaluru (2001-2004). Later he joined the Manipal School of Life Sciences, Manipal Academy of Higher Education, Manipal, and served as Assistant Professor (2004-2009); Associate Professor (2009-2018) and currently he is working as Professor (2018-Till date). He also has an additional responsibility as HOD of the Department of Ageing Research and Associate Director (Research) of the school.

Dr. Guruprasad teaches Zoology, Genetics, Molecular Cell Biology, Research Methodology, Ethical issues, and related courses for both bachelor's and master's programs of the school. Dr. Guruprasad is a cytogeneticist and also an expert in Flow cytometry. He has experience in handling experimental animals including rodents, rabbits, and *Drosophila* in addition to cell and molecular techniques. He is actively involved in academics, research, and diagnostics at Manipal School of Life Sciences, MAHE. He is involved in Ph.D. program coordination at the school, the Institutional Biosafety Committee of MAHE, and also in various activities of the Institute and University. Dr. Guruprasad and his research team are interested in understanding the molecular mechanisms involved in quality ageing and geriatric disorders and also the modulation of such multifarious mechanisms by traditional medicines especially Ayurveda formulations. The present projects are aimed towards understanding Medhya rasayanas and other Ayurveda formulations which target several intrinsic cellular and molecular mechanisms of rejuvenation, DNA repair, cognition, immune response, gene expression, and epigenetic changes thereby leading to an improved quality of aged life. The current work focuses on the understanding of rasayanas on dementia especially Alzheimer's disease, depression, rheumatoid arthritis, and multifarious age-related disorders using *Drosophila*, rodents, and concurrent studies with humans. He has published more than 45 research articles and he has been involved in major projects related to the role of rasayana in ageing and DNA repair.

Impact of shankhpushpi rasayana on neurodegenerative disorders

Swathi M., Raghu KS., Thyagarajan S., Russell LC., **Guruprasad KP**

Department of Ageing Research, Manipal School of Life Sciences, Manipal Academy of Higher Education, Manipal – 576 104, Karnataka. India

Brain ageing could bestow progressive loss of memory, intellectual deterioration, and neurodegeneration. A significant increase in the global prevalence of age-related cognitive deficits and dementia has increased and established management is yet underway. Prevention of illness by traditional medicines, especially Rasayana (rejuvenate) herbs of Ayurveda is being extensively studied for their effectiveness in health management and also in aging. Ayurveda formulations prepared from a single or by many plants or their products contain diverse bioactive molecules. But, it is very difficult to analyze them due to their complex synergistic action. Reports are available on the efficacy of diverse Ayurveda medicinal plants for the effective treatment of multifarious disorders due to their multi-function and multi-targeting role. Medhya Rasayana of Ayurveda is prescribed for the treatment of cognitive disorders and memory enhancement. There is a need to understand and explore the beneficial effects of Medhya Rasayana. In this direction, the present investigation was focused on

understanding the role of traditional Rasayana in depression and Alzheimer's disease in the context of global gene expression to identify relational mechanisms and their implications *in vivo* test models.

Acknowledgment: We thank Manipal School of Life Sciences, Manipal Academy of Higher Education, Manipal, Karnataka, India, for providing the infrastructure and facilities.

Session 5: Ecotoxicology and genotoxicology (Parallel)

Plenary Lecture 5

Prof. Wilner Martínez-López
Instituto de Investigaciones Biológicas Clemente Estable, Montevideo, Uruguay. Email:wilnermartinezlopez@gmail.com

Dr. Wilner Martínez-López is an Associate Professor at the Genetics Department of the Biological Research Clemente Estable Institute in Uruguay, and he has obtained a Medical Doctor degree at the Faculty of Medicine as well as the Ph.D. in Genetics at the Faculty of Sciences from Uruguay. Dr. Martínez-López has been working in the fields of cytogenetics, mutagenesis, and genetic toxicology for more than 30 years. He has published more than 70 papers in peer-reviewed journals. After ending a post-doc position in a Marie Curie Program from the EU at the Molecular Cytogenetics and Mutagenesis Laboratory at Tuscia University (Italy), under the supervision of Prof. Fabrizio Palitti, Dr. Martínez-López has been working on how epigenetics mechanisms can modulate the DNA damage response. On the other hand, he is in charge of a Reference Laboratory in Uruguay on Biological Dosimetry, being a member of the Latin American BioDosimetry Network (LBDNet) as well as the BIODOSNET from the WHO. Besides, during the last few years, Dr. Martínez-López has been the Head of the Basic-Clinic Laboratory on Radiation Protection from the Academic Unit on Radiation Protection at the Faculty of Medicine of the University of the Republic of Uruguay, to improve radiation protection in exposed workers as well as on patients subjected to radiotherapy.

Sensitizing effect of tubastatin A to oxidative damage on HaCaT cells transduced with HPV oncoproteins

Mechoso B.[1], Perini V.[1], Liddle P., Boccardo E.[2], **Martínez-López W.[1]**

[1]*Genetics Department and Biodosimetry Service, Instituto de Investigaciones Biológicas Clemente Estable, Montevideo, Uruguay;*

[2]*Oncovirology Laboratory, University of Sao Paulo, Brazil.*

Email:wilnermartinezlopez@gmail.com

Cervical cancer is the third most common cancer among women worldwide. Similarly, cervical cancer is the third type of cancer with the highest incidence in women in Uruguay. This tumor is etiologically associated with some types of human papilloma virus (HPV), known as high-risk oncogenic HPV. Persistent infection by these viral types (mainly HPV 16 and 18), is associated with the development of severe cervical dysplasia and carcinomas. The E6 and E7 onco-proteins encoded by these viruses induce the degradation of p53 and pRB. However, the sustained expression of these onco-proteins is not sufficient for the development of cancer. Therefore, we have studied the degree of sensitization to oxidative damage generated by reactive oxygen species in human keratinocytes-derived cell lines (HaCaT cells) transduced with the E6 and E7 genes of HPV 16. *In vitro* assays were performed exposing cells to different doses of hydrogen peroxide. It has been observed that the cells expressing viral oncoproteins E6 and E7 survived after treatment with the oxidizing agent as well as showed a slow repair of DNA damage, which led to an accumulation of genetic damage evidenced through the analysis of micronuclei. By employing a pan HDACi (valproic acid) as well as an HDAC6i (tubastatin A), which can modulate more specifically the expression of peroxirredoxins in keratinocytes, it was analyzed the sensitization effect to induced-oxidative damage in normal and transduced HaCaT cells. The analysis of primary damage by comet assay as well as the induced micronuclei frequency did show an accumulative effect of oxidative damage in transduced HaCaT cells with respect to normal ones in the presence of tubastatin A. The fact that tubastatin A produces a differential sensitizing effect to oxidative damage on cells overexpressing E6 and E7 oncoproteins could be used to treat HPV-related cancers in combination with radiotherapy or chemotherapy.

Invited Talk-16

Prof. Upendra Nongthomba
Indian Institute of Science (IISc.)
Bangalore – 560012, India.
Email:upendra.nongthomba@gmail.com

Dr. Upendra Nongthomba is serving as Professor and Chair of the Department of Developmental Biology and Genetics, at the Indian Institute of Science, Bangalore, India. Prof. Nongthomba got his Ph.D. from the Department of Studies in Zoology, University of Mysore, and did a post-doctoral stint at the University of York, United Kingdom. He has made seminal contributions in the field of Muscles and Neurobiology by using genetically tractable model organisms, Fruitfly,-*Drosophila melanogaster*, and Zebrafish,-*Danio rerio*. His group has also made important contributions in host-pathogen interactions, and drug discovery, including identification of small molecules from Ayurveda formulations and local health traditions. In recent years, his group has been working on environmental pollutants, particularly micro- and nano-plastics, and their health hazard impacts. He has been serving as associate editor of the Journal of Genetics. He is a life member of the Indian Society of Cell Biology, Indian Developmental Biologist's Society, Society of Biological Chemists, India, and Society of Mitochondrial Research, India. He is a recipient of the Sir C. V. Raman Young Scientist State Award from the Govt. of Karnataka.

Evaluation of cytogenotoxic potential and embryotoxicity of KRS-Cauvery River water and polyisobutylene in zebrafish (*Danio rerio*)

Abass Toba Anifowoshe and **Upendra Nongthomba**
Department of Developmental Biology and Genetics, Indian Institute of Science
Bangalore – 560012, India.

Pollutants and other forms of environmental stress (lifestyle and social behavior) are of global concern due to significant negative impacts on human health. One of the major environmental concerns is water pollution, including rivers. In India, one of the major rivers that receives different wastes is the Cauvery River (CR), which results from indiscriminate discharge of waste from human and industrial activities, resulting in unexplained health hazards to human and other animal species. In detail health hazard impacts of consuming polluted Cauvery water have not been investigated so far. We analyzed the biological, physical, and chemical parameters as well as microplastics present in the CR water, and then evaluated the toxicity effects on the zebrafish (*Danio rerio*) model. Zebrafish offers many advantages as a toxicological research model, including rapid development, optical transparency, a large number of offspring, and an excellent vertebrate model. For the first

time, we identified the presence of microplastics (polybutene (≤15 μm), polyisobutene (≤ 20 μm), and polymethylpentene (≤3 mm) and cyclohexyl in CR water samples. Zebrafish embryos treated with the CR water samples and polyisobutylene microplastics (PIB-MP) induced increased reactive oxygen species (ROS) production, which triggered subcellular organelle dysfunctions, DNA damage, apoptosis, pericardial edema, skeletal deformities, and increased mortality. Zebrafish larvae exposed to various concentrations of PIB-MP showed reduced swimming and hyperactivity, delayed hatching, changes in mRNA levels of genes (*mnsod, cu/znsod, gsr*, and *gstp1*) encoding antioxidant proteins, skeletal deformity, and increased mortality. The PIB-MP accumulated in the larvae and adult fish gut within 7 to 21 days, respectively, and induced intestinal mucosa damage. Our findings show that KRS-CR water can induce cytogenotoxic and embryotoxic defects in zebrafish due to hypoxic water conditions triggered by the PIB microplastic influx. The present study provides valuable insights for environmental health hazard evaluation and would help in the development of future river water treatment strategies by policymakers.

Invited Talk-17

In vitro toxicity evaluation of transition metal (zirconium oxide) nanoparticles

Alok K. Pandey, Durgesh Prasad Mourya
Nanomaterial Toxicology Laboratory,
Drug and Chemical Toxicology Group (FEST Division)
CSIR-Indian Institute of Toxicology Research, Vishvigyan Bhawan, 31,
Mahatma Gandhi Marg, P.O. Box 80, Lucknow-226001, India

Zirconium oxide (Zirconia) nanoparticles are used in various industrial and biomedical applications such as dental implants, thermal barrier sprays, and fuel cells. The interaction of nanoparticles with the environment and humans is inevitable. Despite the enormous application potential of these nanoparticles, there are still some gaps in the literature regarding potential toxicological mechanisms, environmental effects, and the genotoxicity of Zirconia nanoparticles. Zirconia nanoparticles used in the study were less than 40nm and tested on V-79 cells. Zirconia nanoparticles showed significant internalization in cells at 100 μg/mL and 150 μg/mL concentrations. Zirconia nanoparticles showed low cytotoxicity and were found to generate ROS in V-79 cells. In alkaline comet assay, Zirconia nanoparticles (10μg/mL, 50μg/mL, and 100μg/mL) exposed cells exhibited significant DNA strand breaks, while the neutral comet assay, which was used for double-strand breaks assessment, only revealed significant damage at 100 μg/mL. Chromosomal aberration induced by Zirconia nanoparticles mainly resulted in the generation of gaps, few fragments and breaks which signifies the low clastogenic activity of these nanoparticles in the V-79 cell line. In MN assay, Zirconia nanoparticles resulted in no significant micronuclei induction at any given concentration. In the HPRT mutation assay, the particle shows a dose-dependent increase in the mutant frequency. The above result shows the genotoxic and mutational potential of Zirconia nanoparticles tested on V-79 cells. It is evident that Zirconia nanoparticles cause dose-dependent cytotoxicity and genotoxicity but still, more studies are needed to evaluate the clastogenic potential and the possible mechanism involved.

Invited Talk-18

Evaluation of genetic instability in the general population exposed to air pollutants: A study in Croatia with analysis combining comet and micronucleus assays

Goran Gajski[1], Marko Gerić[1], Gordana Pehnec[1], Katarina Matković[1], Mirta Milić[1], Vilena Kašuba[1], Luka Delić[1], Andreja Jurič[1], Irena Brčić Karačonji[1], Ivana Jakovljević[1], Silvije Davila[1], Jasmina Rinkovec[1], Ranka Godec[1], Silva Žužul[1], Ivan Bešlić[1], Ana-Marija Domijan[2], Ante Cvitković[3,4,5], Mandica Sanković[6], Antun Šumanovac[5,7], Pascal Wild[8,9], Irina Guseva Canu[8], Nancy B. Hopf[8]

[1]*Institute for Medical Research and Occupational Health, 10000 Zagreb, Croatia*
[2]*Faculty of Pharmacy and Biochemistry, University of Zagreb, 10000 Zagreb, Croatia*
[3]*Teaching Institute of Public Health Brod-Posavina County, 35000 Slavonski Brod, Croatia*
[4]*Faculty of Dental Medicine and Health, J. J. Strossmayer University of Osijek, 31000 Osijek, Croatia*
[5]*Faculty of Medicine, J. J. Strossmayer University of Osijek, 31000 Osijek, Croatia*
[6]*City of Vinkovci, Department of Physical Planning, Construction and Environmental Protection, 32100 Vinkovci, Croatia*
[7]*County General Hospital Vinkovci, 32100 Vinkovci, Croatia*
[8]*Center for Primary Care and Public Health (Unisanté), University of Lausanne, 1011 Lausanne, Switzerland*
[9]*PW Statistical Consulting, 54520 Laxou, France*

Air pollution is regarded as one of the major issues in environmental and public health and has been recognized by leading world authorities as a risk factor associated with adverse health outcomes. Air pollution can alter DNA molecules and consequently human health in either ambient or occupational settings. Exposure to various air pollutants has been linked to the onset of cardiovascular and respiratory disease, premature mortality, and induction of cancer and its related costs. By reducing air pollution levels, countries can reduce the disease burden from stroke, heart disease, lung cancer, and chronic and acute respiratory diseases, including asthma. In line with the above-mentioned, we aimed to explore how air pollution can affect genomic instability and consequently our health by determining possible associations between air pollutants and biomarkers of exposure and effects. Therefore, firstly we retrospectively evaluated genomic instability in the general population (N=130) living in Zagreb (Croatia). We associated these genomic instabilities measured in blood with the comet and micronucleus assays with air pollution levels in the period from 2011 to 2015. There was no observed significant positive association between assayed parameters apart from benzo(a)pyrene (B[a]P), which showed a significant negative association. Our results also showed that the measured air pollution parameters were mainly below regulatory limits, except for B[a]P. Secondly, we investigated the possible effects of air pollution and BTEX (benzene, toluene, ethylbenzene, *o*-, *m*- and *p*-xylene) exposure on genomic instability using the comet and micronucleus assays on blood as well as on buccal cells of the general population (N=60) living in Zagreb (Croatia) during colder and warmer periods from 2021 to 2022. All measured outdoor air pollutants agreed with previously reported values and were below the regulatory limit, except for PM_{10} particles and B[a]P bound to PM_{10}, which

exceeded those levels. Yet again, we did not observe a noteworthy impact of air pollutants on tested parameters. Since air pollution is identified as a major health threat, further research in this domain is necessary to ensure public health. Our future goal is to repeat such studies in other cities, where exposure to different air pollutants is expected.

Supported by the Croatian Science Foundation (HUMNap).

Invited Talk-19

Prof. Sarat Chandra Yenisetti
Professor, Drosophila Neurobiology Laboratory (DNBL)
Department of Zoology, Nagaland University (Central)
Lumami 798627 Zunheboto Dt., Nagaland, India
Tel:+91- 9402908988; Email:sarat@nagalanduniversity.ac.in

Sarat Chandra Yenisetti graduated from Silver Jubilee Government College, Kurnool, Andhra Pradesh (united); post-graduated from Jnana Bharathi Campus, Bangalore University, Bengaluru, Karnataka; obtained Ph. D. from Kuvempu University, Karnataka, India, and received post-doctoral training in neurogenetics from the National Institutes of Neurological Disorders and Stroke (NINDS) of National Institutes of Health (NIH), Bethesda, United States of America, and University of Regensburg, Germany. By obtaining distinction Sarat maintained consistency throughout his academic career.

With the support of colleagues, Sarat established a state-of-the-art *Drosophila* Neurobiology Laboratory (DNBL) in the Department of Zoology, Nagaland University, Lumami. Dr. Yenisetti acknowledges with gratitude the support received from the Nagaland University, India; the Department of Biotechnology (DBT), India; the University Grants Commission (UGC), India; the Ministry of Tribal Affairs, India; the Ministry of Minority Affairs, India; the Department of Science and Technology (DST), India and the Indian Council of Medical Research (ICMR), India. His laboratory also received support from DBT's prestigious U-Excel (Unit of Excellence in Biotechnology) program.

Sarat follows *Drosophila* approaches to understand dopaminergic neurodegeneration and identify therapeutic targets for neuroprotection; knowledge of which will help to reduce the burden of Parkinson's disease (PD) in humans. His laboratory-developed adult life phase-specific *Drosophila* models of PD and demonstrated their importance to understand the pathophysiology of late-onset neurodegenerative diseases (NDDs). Further, proved that deciphering the age-mediated regulation of brain-specific molecular networks is essential to

screen small molecules/nutraceuticals/drugs with potential neuroprotective efficacy and develop/modulate the therapeutic approaches for late-onset NDDs such as PD.

Prof. Yenisetti believes in the synergic influence of human diversity and opines that with an amazing human mixture and associated intellectual assortment, India can be a remarkably innovative society!! Sarat is multilingual (Telugu (his mother tongue), Kannada, Hindi, and English) and excited to perceive the kaleidoscopic flavors of human geography by traveling across the country on an adventure bike that allows unassuming access to interaction. Sarat lived in/visited the USA, Japan, Germany, Taiwan, Republic of Korea, Scotland (United Kingdom), Brazil, and Canada to participate in academic assignments.

Environmental toxicants, Parkinson's disease and discovering pathways of neuroprotection: Insights from *Drosophila* model

Exposure to environmental toxins has been found to be a risk factor for sporadic Parkinson's disease (PD) which constitutes 95% of total cases. *Drosophila* is an excellent model organism for studying neurodegenerative diseases including PD. New insights into the adult life course approaches to health and disease illustrate gene expression profile variation among different phases of adult life; emphasizing the necessity to develop life stage-matched animal models to late-onset human disease(s) such as PD, which are critical to understanding the pathophysiology of age-related disease progression and importantly to screen small molecules as therapeutic agents and further to develop novel therapeutic strategies to PD. With this idea, we developed an adult life stage-specific (ALSS) (health and transition phase (during which late-onset neurodegenerative diseases such as PD set in) *Drosophila* model of idiopathic PD. Fly model of sporadic PD exhibits mobility defects (independent of mortality), inhibited mitochondrial complex I activity, dopaminergic (DA) neuronal dysfunction, and altered brain dopamine metabolism. Then we explored further brain-specific differential regulation of molecular pathways in an adult life stage-specific fashion. I will be discussing mechanistic insights into the adult life stage-specific dopaminergic neuroprotective efficacy of nutraceuticals, knowledge of which will be of great support to developing efficient therapeutic strategies for late-onset neurodegenerative diseases such as PD.

Invited Talk-20

Prof. Mohammed S Mustak
Department of Applied Zoology, Mangalore University,
Mangalaghngothri-574199, India. Email:msmustak@gmail.com

Dr.Mohammed S Mustak is currently working as a Professor and Chairman in the Department of Applied Zoology, at Mangalore University, Karnataka, India. After his Ph.D. degree in CFTRI- Mysore He continued his Post doctoral Research at the Graduate School of Medical Sciences -Tottori University, Yonago, Japan. Dr. Mustak's specialisation is on population and evolutionary genetics. His area of research interest is to solve the debatable question such as the understanding the genome variation in cardiovascular diseases such as myocardial infarction and cardiomyopathy among the south Indian population. He has published many papers in highly reputed journals.

Genome variation among Myocardial infarction of South Indian population

A myocardial infarction (MI) results from a complicated interaction between an individual's genetic makeup and their exposure to several environmental circumstances, making it a polygenic, multifactorial CVD. The precise causes of MI vary greatly depending on historical and regional factors. Millions of DNA sequence variants in the human genome have opened the door to research into the genetics of cardiovascular disease and other disorders across populations. Genome-wide association studies (GWASs) have shown great promise in recent years in uncovering rare and common variations associated with numerous diseases, where the full genome is mapped and gene loci impacting susceptibility or resistance were later identified. Using a genome-wide method to improve the ability to identify new susceptibility genes might be a game-changer. Whole-genome analysis, in addition, will allow for the highest standard of inspection possible. Furthermore, the central mechanism in India, particularly in southern India, has not been studied. In the current investigation, we used a GWAS and candidate gene strategy to investigate the link between a set of new and candidate gene markers and MI in a large sample cohort. 417 MI patients were properly diagnosed and characterized, as well as 439 age-matched healthy controls. A larger cohort of MI cases and controls was used to duplicate and validate the microarray significant SNP's revealed in the discovery panel

Session 6: Epigenetics/genetic susceptibility/molecular mutagenesis and carcinogenesis

Plenary Lecture-6

Prof. N B Ramachandra
DAE- Raja Ramanna Chair
Department of Studies in Genetics and Genomics
University of Mysore, Manasagangotri, Mysuru-570006.
Email: nallurbr@gmail.com

Dr. Nallur B. Ramachandra, a distinguished academician served for 30 years in the University of Mysore, Department of Studies in Zoology. He was instrumental in starting a new Department of Studies in Genetics and Genomics in 2015 and was the founder Chairman for 5 years until his superannuation. He was a Post-doctoral Fellow at McMaster University, CANADA, a Senior Research Associate at the University of California, Los Angeles, USA, and a visiting Professor to teach a course at the University of Innsbruck, Austria.

He has completed 18 research projects and published > 280 research papers in highly reputed peer-reviewed journals. He has delivered > 300 invited lectures and is a member of several national and international academic and professional bodies. Under his guidance, **3**0 Ph. Ds are completed, and two students are working.

He was a recipient of "The University of Mysore Golden Jubilee Foundation Award". His research contribution was recognized by the State Government of Karnataka and awarded "The Sir C.V. Raman Young Scientist Award for Life Sciences in 2007 and the Dr. Raja Ramanna Scientists State Award in 2015. He was a recipient of the Prof. G. K. Manna Memorial Award in 2015 by the 102nd Indian Science Congress Association. He is an Elected Fellow of the Indian Academy of Sciences, Bangalore (2017); an Honorary Fellow of Karnataka Science and Technology Academy (2020), and an Elected Fellow of the Indian Academy of Biomedical Sciences (2022). His current affiliations are DAE- Raja Ramanna Chair, DOS in Genetics and Genomics, University of Mysore; Professor (Honorary) - Sri Sathya Sai University of Human Excellence, Kalaburagi; Consultant- Human Genetics Unit, AIISH, Mysuru.

Approaches employed for congenital heart disease studies in two decades: An overview

With the advent of technology, unraveling the genetic factors causing congenital heart disease (CHD) is fascinating. This was supported by the prevalence of different types of CHD cases globally. In view of this, in my laboratory, we conducted systematic genetic

studies on CHD over two decades. For this study, we employed pedigree analysis, prevalence analysis, chromosomal anomaly studies, consanguinity studies, candidate gene studies, and whole exome sequence analysis. Some of the novel findings are as follows: (a) Majority of the studies revealed the autosomal recessive patterns of inheritance. (b) A ventricular septal defect is the most common CHD in India. (c) The uncle-niece marriage and first-cousin marriages are the prominent causes of CHD. (d) Chromosomes 18 and 9 are involved in CHD cases. (e) The candidate genes, *GATA4* and *NKX2.5*, showed nonsynonymous variations in VSD cases. (f) The exome sequence analysis revealed the high-risk genes, namely, *NOTCH1*, *NCOR1*, *HEY1*, *HEY2*, and others. These studies indicate that consanguineous marriages increase the prevalence of CHD in India and help us to educate families and prevent the birth of children with abnormal cardiac development. These studies will also guide us to create a gene panel for better diagnosis for possible treatments.

Invited Talk-21

Dr. Koustav Sarkar
Department of Biotechnology, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu 603203, India
Email: koustavm@srmist.edu.in

Dr. Koustav Sarkar completed his Ph.D. at the age of 29 years from Chittaranjan National Cancer Institute/Jadavpur University, Kolkata, India. Currently, he is a Research Assistant Professor in the Department of Biotechnology, SRM Institute of Science and Technology, Chennai, India. He presented papers at more than 65 national and international conferences. Dr. Sarkar has been involved in research over the last twenty years (including a Ph.D. and three Post-Docs) and made several important contributions to the development of advanced science and technology. He was involved in understanding the molecular mechanisms of the development of human immune responses in health & disease. Dr. Sarkar has already published 61 high-impact scientific publications in internationally reputed journals. He was also co-author of four book chapters. During Ph.D., Dr. Sarkar developed a process for isolating glycoprotein(s) from neem leaf, which has immunomodulatory and cancer-preventive functions. One patent (Patent Number: 259434; Grant Date: 12-Mar-2014) has been granted for this invention. He found out that the neem leaf glycoprotein helped to generate carcinoembryonic antigen-specific anti-tumor immune responses utilizing macrophage & dendritic cell-mediated antigen presentation to T and B cells and the induction of type 1 protective immunity. To study the intricate molecular mechanisms involved in type 1 protective immunity, Dr. Sarkar moved to the USA. Research from his US laboratory was essential in revealing for the first time a novel nuclear function for a well-known cytoskeleton

structure-associated protein, Wiskott Aldrich Syndrome Protein (WASp) in the transcriptional regulation of T helper cell 1 (Th1)-differentiation through its effect on epigenetic modifications at the T-BET gene-promoter locus. Since that time, Dr. Sarkar has been actively involved in further understanding how different types of epigenetic mechanisms are involved in T helper cells of lung cancer in association with Chronic Obstructive Pulmonary Disease (COPD).

The relevance of epigenetic alteration in T helper cells in chronic obstructive pulmonary disease (COPD) and its relationship with non-small cell lung cancer (NSCLC)

Koustav Sarkar[1], Geetha Shanmugam[1], Sudeshna Rakshit[1], Pradeep R[1], Melvin George[2]

[1]Department of Biotechnology, SRM Institute of Science and Technology, Kattankulathur, Chennai, Tamil Nadu 603203, India
[2]Department Clinical Pharmacology, SRM Medical College Hospital and Research Centre, Kattankulathur, Chennai, Tamil Nadu 603203, India

Chronic Obstructive Pulmonary Disease (COPD) and Lung cancer are the major reasons for lung disease-related mortality worldwide. Chronic inflammation is a key attribute of COPD and a potential driver of lung carcinogenesis. Among various environmental risk factors, cigarette smoke plays a crucial role in the development and progression of COPD and lung cancer. Several epidemiological studies show that COPD patients are at a greater risk of developing lung cancer independently of cigarette smoking which suggests the role of genetic predisposition in the disease development. Uncovering the mechanistic link between these two diseases is hampered due to their heterogeneous nature: each is characterized by several sub-phenotypes of diseases. Our laboratory is mainly focused on studying the specific epigenetic mechanisms that occur in both COPD and lung cancer. The purpose of the current study is to uncover the link between alterations in inflammatory cytokine levels and disease progression in $CD4^{+}$T cells of patients suffering from COPD and lung cancer. We also investigated the epigenetic regulation of mitochondrial Transcriptional Factor A (mtTFA) to delineate the role of oxidative stress-mediated inflammation in Lung cancer and COPD. The RT2 Profiler PCR array was used to examine the differential expression pattern of inflammatory genes in $CD4^{+}$ T helper (Th) cells from COPD, NSCLC, and control subjects. Candidate inflammatory gene loci were selected and the enrichment of transcriptional factors and histone modifiers was analyzed using ChIP-qPCR. In comparison to control subjects, a set of genes (e.g., BMP2, CCL2, IL5, VEGFA, etc.) is over-expressed whereas another set of genes (e.g., AIMP1, IFNG, LTA, LTB, TNF, etc.) are under-expressed in both COPD and NSCLC patients. The increased percentage enrichment of inflammation-associated transcription factors including NF-kB, CREB, HIF1□, and MYC at the loci of inflammatory genes was revealed by our chromatin immunoprecipitation (ChIP) data. H3K4me3, H3K9me3, H3K14Ac, HDAC1, 2, 3, 6 all showed dysregulated enrichment at the VEGFA gene locus. One of the epigenetic modifications, histone methylation, was found to be abnormal in the mtTFA complex in COPD and NSCLC patients in comparison to controls. Although there is mounting evidence of several links between these disorders, therapeutic options remain inadequate. Our findings contribute to the body of knowledge about therapeutic techniques that use inflammatory cytokines as a prognostic marker and highlight the need for epigenetic therapy for these debilitating lung diseases.

Invited Talk-22

Environmental chemicals effects on epigenetic modulations

Krishna Ghosh and **Santosh R. Kanade**
Department of Plant Sciences, School of Life Sciences,
University of Hyderabad, Gachibowli, Hyderabad Telangana 500046
Email:san@uohyd.ac.in

Epigenetics is the connecting link between environment and genetics where environmental factors induce epigenetic changes that are the key to transforming the genetic information into phenotype. The reversible nature of epigenetic events is targeted for molecular interventions. Epigenetic events such as DNA methylation and histone modifications like methylation, acetylation, phosphorylation, ubiquitination, etc modulated by various environmental factors thereby altering the expression of genes which leads to functional alterations. Pesticides, organic compounds, dioxins, and other endocrine-disrupting chemicals have been shown to modulate the expression and activity of several DNA methyl transferase, demethylase, and histone modification enzymes. Our study showed the impact of specific environmental chemicals like an organochlorine pesticide (α-endosulfan), plasticizers like bisphenol A, 4-nonylphenol(4-NP), as pro-proliferative at low concentrations, and significantly induced transcription of multiple epigenetic regulators of DNA methylation, histone arginine methylation, lysine acetylation as well as polycomb group proteins. Specifically, it is demonstrated that 4-NP significantly upregulated both of the catalytic components of PRC2 (EZH2 a lysine methyltransferase) and PRC1 (RNF2, an E3 ubiquitin ligase) in a SP1/CREB1/E2F1-dependent mechanism. The 4-NP-induced EZH2 and RNF2 elevated global levels of their catalytic products: H3K27me3 and H2AK119ub1 in MCF-7 and HEK293 cells. Further, it is shown that these repressive histone marks get enriched selectively in the p21 promoter, but not in the cyclin D1 promoter finally repressing p21 transcription significantly and specifically affecting on cell cycle.

Invited Talk-23

Dr. Thirunavukkarasu Velusamy
Associate Professor, Department of Biotechnology,
Bharathiar University, Coimbatore, India. Email:thirunavukkarasu@buc.edu.in

Dr. Thirunavukkarasu Velusamy has almost two decades of dedicated research expertise in Translational Genomics and Proteomics and has made significant contributions to understanding the pathology of various cancer subtypes and infectious diseases. He holds Ph.D. in Biochemistry from Annamalai University and has more than 10 years of Post doctoral research experience in esteemed research institutes in the US. He has a strong technical background in the field of Hemato-oncology. He was honored with the prestigious Ramalingaswami re-entry fellowship by the Department of Biotechnology (DBT) - India in the year 2016. Dr. Velusamy boasts an impressive scholarly record with over 50+ publications in renowned international journals including Nature Communications, Blood, and J Exp Medicine, showcasing the depth of his scientific impact with 2800+ citations and an i-10 index of 39. Additionally, his innovative work has resulted in four US patents, underscoring his commitment to advancing knowledge and contributing to the field of biomedical research. Presently, his research team focuses on studying the epigenetic alterations in cancer, developing novel cancer biomarkers, developing new age-targeted therapeutics using computational drug discovery approaches, and augmenting the differentiation phenotype of cancers. Dr. Velusamy is supported by various funding agencies such as DBT, DST, and UGC for his academic research.

Epigenetic biomarkers for early detection of chronic chlorpyrifos exposure-induced liver cancer

Organophosphate pesticides (OPPs) are widely used for agriculture & industrial purposes to control pests. Globally more than half of the pesticides are utilized in Asia, and India stands 12th in pesticide usage globally and 3rd in Asia after China and Turkey. Chlorpyrifos (CPF), is the most commonly used OPPs in Indian agriculture to control different kinds of pests, including termites, mosquitoes, and roundworms. Only around 0.1% of pesticides are believed to reach the intended organisms, while the remaining results in polluting the environment and food products. Acute or chronic exposure to CPF can cause varying levels of toxicity in humans, animals, and plants. The continuous exposure to CPF in agricultural lands (pesticide applicators) and the intake of CPF-contaminated food causes bioaccumulation in the body, which leads to cancer development and reproductive damage in humans and animals. Bioaccumulation of CPF and its improper metabolites also causes genetic and epigenetic alterations, which cause DNA modifications that eventually contribute to altered gene expression and progression of diseases such as ageing and cancer. To address the potential health danger posed by

these toxicants particularly CPF, it is vital to understand the molecular basis of these prolonged effects and the epigenetic modifications in particular. The exact bioaccumulation concentration especially, the minimum permissible limit of CPF in the human system remains elusive which made us investigate the effects of chronic exposure to CPF and its epigenetic effects on the human liver cells. The current study is the first of its kind to assess global epigenome-wide associations between chronic exposure to CPF and epigenetic alterations in liver cells. The present study utilizes, "whole genome bisulfite sequencing" for the mechanistic understanding of the differentially methylated regions (DMGs), altered pathways, and hub genes that underlie the neoplastic transformation of the normal liver cells. This preclinical rationalistic approach aims to develop early-stage biomarkers for the diagnosis of CPF exposed Indian agricultural population as early detection of diseases and precise stratification of risk groups can efficiently reduce the disease burden of society.

Invited Talk-24

Dr. Jasmine M. Shah
Department of Plant Science, Central University of Kerala, Kasaragod, India. Email:jasmine@cukerala.ac.in

Dr. Jasmine M. Shah did her M.Sc. in Genetics and Plant Breeding from the University of Kerala, Ph.D. in Biotechnology from Madurai Kamaraj University, and Post-Doctorate from the Indian Institute of Technology - Madras (IIT-M). In 2012, she joined the Central University of Kerala as a DST-INSPIRE faculty. Subsequently, from 2013 till date, she has been serving the same institute as an Assistant Professor. Dr. Shah is a 'Fellow' of the 'Kerala Academy of Sciences and the 'Young Academy of India'. She is also the 'Executive Council Member' of the 'Kerala Academy of Sciences and the 'Society of Cytologists and Geneticists'. Dr. Jasmine has received many awards/fellowships like the prestigious DST INSPIRE Faculty fellowship, Women Achiever Award 2023, Young Scientist Award, DBT Research Associateship, IIT-M post-doctoral fellowship, and CSIR Junior Research Fellowship. She has published many research articles in peer-reviewed international Journals. She is the handling editor for the Journal 'Frontiers in genome editing'. She is also a reviewer for many national/international journals including Scientific Reports, PlosOne, Critical Reviews in Biotechnology, and Scientific Reports. Her lab is into research on plant molecular biology, epigenetics, and functional genomics, trying to understand the biotic/abiotic stress-induced transgenerational epigenetic signatures.

Transgenerational memory, mutagenic, and epimutagenic

Transgenerational memory (TM) is the non-communicable and non-genetic transfer of information from the parent to the progeny via gametes, evident in the progeny as a physiological/behavioral/or any other change. Heritable epigenetic changes in the genomes is recently discovered as the molecular reason behind TM. Various biotic/abiotic/social stresses and even the lifestyle of organisms can leave heritable epigenetic imprints in organisms. The epigenetic changes in the genome are caused by DNA/histone chemical modifications and small RNA interference. Epigenetic changes do not change the DNA sequence, and yet are capable of resulting in altered information, via altered gene expressions. The chemical modifications are reversible, and include DNA/histone methylation, and histone acetylation/phosphorylation/sumoylation. The majority of reports of TM are on stress-induced heritable physiological changes in organisms. Mutagens are known to alter somatic mutation rates (SMRs) in organisms. Recently, there were reports that UV radiations can behave like a trigger of increasing SMRs in plants such that, even their un-exposed progeny/grand progeny showed enhanced SMRs. Pesticides are one of the major anthropogenic mutagens released in the environment. Our study revealed that certain pesticides increased frame-shift mutation rates and demethylated selected DNA repair gene promoters in the model plant *Arabidopsis thaliana*, the memory of which lingered even in the grand progeny. It could be possible that the TM of altered SMRs could be a resultant phenotype due to some unknown epigenetic changes induced by the pesticides. Reports on epimutation-induced transgenerational mutations are scarce. This pesticide-induced transgenerational mutagenic/epimutagenic impact on the non-target eukaryote indicates that more research needs to be done in this area to understand the unwanted accelerated genetic diversity.

Poster Presentations

PP-21

Characterization of epileptic seizures like behavior in *Drosophila melanogaster*

Deepa Mugudthi Venugopal[1], Raifa Abdul Aziz[1]and Shamprasad Varija Raghu[1, 2]

[1]Neurogenetics lab, Dept of Applied Zoology, Mangalore University, Mangalagangothri, Karnataka, India 574199. Email:deepavenugopalbvr@gmail.com

[2]Division of Neuroscience, Yenepoya Research Centre (YRC), Yenepoya (Deemed to be University), Mangalore, Karnataka, India 575018

Epilepsy, a neurological disorder affecting over 60 million people globally, is characterized by abnormal brain electrical signaling leading to atypical motor actions. Despite the use of effective anti-epileptic drugs, the physiology and treatment management of epileptic conditions remain unclear. *Drosophila*, an invertebrate fly mutant model, has been used to study epileptic seizures due to its homogeneous gene expression in humans. Currently, the fly model consists of 12 paralytic, bang-sensitive (*BS*) gene mutants, with the bang senseless (*bss*) mutant being more relevant to the study of epileptic seizures. Moreover, seizure-like activity can also be chemically induced using the proconvulsant pentylenetetrazole (PTZ). Vortex and heat shock assays are techniques to study seizure behavior and susceptibility in flies using mechanical shock and heat shock.

In our investigations, adult flies were employed to mechanical shock and heat shock which leads to paralysis, wing flapping, proboscis extension, and tonic-clonic phases in flies such behaviours are analogous to human idiopathic epileptic seizures. The seizure recovery rate is measured as the time required by each fly to regain its normal posture and activity. *bss* mutant flies being susceptible to mechanical shock exhibit the longest seizure threshold when compared to normal wild-type flies. Similarly, chemically kindled flies also showed subsequently increased seizure threshold. Our study clearly shows that *Drosophila melanogaster* is a useful tool in comprehending the molecular pathophysiology of epileptic disorders.

PP-22

Unveiling persistence in the environmental and health impacts of endosulfan

Shivangi Sharma, Anju Sharma, and Sathees C. Raghavan

Department of Biochemistry, Indian Institute of Science, Bangalore 560012, India

Endosulfan, a highly potent and widely used organochlorine pesticide, has attracted global concern due to its classification as moderately hazardous by the World Health Organization (WHO) and highly acutely toxic by the U.S. Environmental Protection Agency (US EPA) and the European Union (EU). Despite a ban on its use and manufacture since the 2011 Stockholm Convention, Endosulfan's persistent presence in specific regions, especially parts of Asia, highlights the complexities in

enforcing regulatory measures. We have investigated its environmental impact in the laboratory setup, and results from the HPLC in conjunction with the LC-MS study reveal the presence of ES over 100 days in various water sources, unveiling the persistent nature of Endosulfan and its metabolite, Endosulfan sulphate. This endurance, in environments, underscores its environmental resilience and raises questions about its presumed shorter half-life. Furthermore, our research suggests broader consequences of Endosulfan exposure, revealing developmental defects, compromised immune systems, and adverse effects on vital organs in progeny. Transcriptome analysis identified gene deregulation in critical pathways, including apoptosis and eye development, for both exposed mice and their progeny. Mice exposed to endosulfan exhibit modifications in their general biology, revealing both immediate changes and long-term effects such as spontaneous tumour development. Our study emphasizes the potential threats Endosulfan poses to human health in regions where exposure persists, emphasizing the need for sustained efforts in environmental management.

PP-23

Neuroprotective potential of curcumin C3 complex in Alzheimer's disease *Drosophila m*odel

Reshma Ramarajan, Aswathi E, Induja D, and H.P. Gurushankara
Department of Zoology, School of Biological Sciences,
Central University of Kerala, Periye-671320 Kasaragod, India

Alzheimer's disease (AD) is a multifactorial progressive neurodegenerative disorder characterized by cognitive deficits leading to dementia. Curcumin derived from *Curcuma longa* has been proposed for treating AD cases. Studies suggest that curcuminoid formulations can enhance the curcumin's bioavailability and efficacy. Using an Aβ42 ad Tau protein expressed *Drosophila* model of Alzheimer's disease, the current work examines the neuroprotective potential of curcumin C3 Complex, a formulation of curcuminoids with curcumin as the major component and bisdemethoxycurcumin and demethoxycurcumin as minor components. Locomotor activity, reproductive fitness, rough eye phenotype, and protein levels in wild-type (Oregon-K) and AD flies were analyzed after they were raised in the regular and curcumin C3 complex-supplemented food media. The curcumin C3 complex improves locomotor deficits, increases fertility and fecundity rates, reduces Aβ42 and Tau protein levels, and ameliorates eye degeneration. This study evidences the neuroprotective role of curcumin C3 complex against Aβ42 and Tau protein-induced neurotoxicity in the AD Drosophila model suggesting its therapeutic potential in treating AD.

PP-24

A social cost-benefit analysis for assessing the adverse effects of microplastics in shrimp aquaculture sector in Kerala

Anakha S Menon and Shaharban

Department of Economics, Kannur University,
Janaki Ammal Campus, Palayad- 670661, Kerala. Email: anakhathanal@gmail.com

Microplastics are abundant in the marine environment due to plastic pollution, a global concern. When cultured shrimp are regularly fed microplastic-contaminated feeds, the accumulation of Microplastics in various marine organisms—tiny fish species, which are the primary source of artificial feeds for aquaculture—makes it easier for microplastic to enter aquaculture systems. As a result, Microplastics may build up in the edible parts of cultivated shrimp, which could seriously impair fish consumers' physiological systems. Kerala is a top producer of shrimp raised in aquaculture due to its abundant backwater and estuary water bodies. There are claims that the amount of shrimp consumed domestically is also rising. Exposure to Micro-plastics poses a severe risk to the health and well-being of regular shrimp users. Using soy meal, a reasonably priced and sustainable substitute for artificial fish feed becomes necessary. In light of this, this paper conducts a social cost-benefit analysis of the feeding practices currently used by the shrimp aquaculture industry in Kerala. These practices include the use of artificial fish meal, the conversion of 33% of soy meal to regular fish meal, the substitution of 67% of soy meal for regular fish meal, and finally, the complete replacement of artificial fish meal with soy meal. In light of the blue economy, the study assesses the aforementioned farming methods in light of sustainable development objectives. The results of the social cost-benefit analysis indicate that while using artificial fish-meal in shrimp aquaculture is advantageous for farmers, the practice is not sustainable due to the expenses associated with society's health. As a result, it can be changed to a considerably more sustainable farming method (Alternative 2, which replaces 33% of the soy meal), and society might make up for the decrease in the agricultural community's profit. Farmers who choose a less sustainable alternative must be paid for their lost opportunities, and society must make appropriate policy adjustments to compensate for this. If not, society will incur enormous health and environmental costs, the devastation of which will last for eons on our planet.

Keywords: Micro-plastic, Sustainable Development Goals, Shrimp aquaculture, Social cost-benefit analysis

Highlights:

- The soy-meal application (0%) in shrimp aquaculture may be altered to that of a much more sustainable option, and society may compensate for the reduction in the farming community's profit.
- A gap in private returns (benefits) between the practice that is advisable from society's point of view and from the current practice (alternative 1), which is profitable to the farmers. it has to be compensated by society by adopting suitable policy measures.
- 33% conversion rate is suitable for the Kerala economy as it is a better sustainable option.

PP-25

A preliminary *in-silico* analysis on the toxicity of mefenamic acid

Kizhakke Purayil Anupama and Arun Kumar G.

Department of Molecular Biology, Dr. Janaki Ammal Campus, Kannur University, Palayad,Thalassery, Kannur- 670661

Mefenamic Acid, a nonsteroidal anti-inflammatory drug (NSAID), has therapeutic properties in alleviating pain and inflammation. This compound belongs to the anthranilic acid derivativesand is widely used to manage conditions such as menstrual pain, arthritis, and other inflammatory disorders. With its mechanism of action involving the inhibition of prostaglandin synthesis, Mefenamic Acid plays a pivotal role in modulating pain and inflammation pathways. Recently Indian pharmacopoeia gave an alert in using mefenamic acid. It says that it can even lead to potential adverse reactions causing eosinophilia and systemic symptoms (DRESS) syndrome. This alert panics common people, because it is one of the painkillers used in common.So, here a preliminary *in-silico* analysis was conducted to assess the toxicity of Mefenamic Acid. The study used computational methods to predict possible toxicological effects of this compound. The analysis aimed at using structure-activity relationships (SARs) and in-silico models to estimate various toxicity endpoints. Several online tools such as Toxtree and Pro- Tox 2 were used to predict the toxicity of Mefenamic Acid based on its chemical structure. These tools use algorithms and databases to provide information on potential hazards associated with the compound. From the results, it is evident that mefenamic acid is hepatotoxic and induces stress in the mitochondria. So, the results from in silico analysis must be interpreted cautiously due to the limitations inherent in computationalmodels. Experimental validation is necessary for confirmation of its toxicity.

Key words: Mefenamic Acid- computational study- structure-activity relationships- Toxicity

Highlights:

- Mefenamic Acid is a nonsteroidal anti-inflammatory drug.
- Indian pharmacopeia gave an alert in using mefenamic acid.
- This research work is a preliminary *in-silico* analysis to assess the toxicity of Mefenamic Acid.
- Mefenamic acid is hepatotoxic and induces stress in the mitochondria.

PP-26

The genetic landscape of leukemia and Down syndrome in the Kerala State, India

Shilpa L.S. and H.P. Gurushankara

Department of Zoology, School of Biological Sciences,
Central University of Kerala, Periya - 671 320, Kasaragod, India

Cancer ranks as a leading cause of death and an important barrier to increasing life expectancy in the world. Among cancers, leukemia is the most prevalent malignancy in children. Leukemia risk factors include trisomy 21, which causes Down syndrome (DS), the most common genetic disorder. It is often referred to as leukemia predisposition syndrome since leukemia is more common in DS cases than in people without the disorder. However, the exact mechanism leading to this high incidence of leukemia is not understood. In India, Kerala has the highest rate of leukemia and cancer. According to WHO, the incidence of DS is one in every 1000 births worldwide and one in 850 births in India. High incidences of DS have also been documented in Kerala but, there are no in-depth studies on the mechanisms that lead to leukemia in DS cases in the Kerala state population. Hence, understanding the genetic mechanism that is responsible for leukemogenesis in DS is essential for developing new therapeutic inventions.

PP-27

Population density of Indian flying fox (*Pteropus giganteus*) in different roosting sites in and around Shivamogga, Karnataka.

Dayananda, G.Y, Nasrath Fathe Ali and Sindhu B S Jois

Department of P G Studies and Research in Zoology, Kuvempu University, Jnana Sahyadri, Shankaraghatta 577451. dayanandagy21@gmail.com

The Indian Flying Fox *Pteropus giganteus* fox is nocturnal. During day sleeping hours, they have been observed hanging their head down from the branches of roosting trees, and at that time patagiums were wrapped around themselves. This study has been conducted to know the population and its fluctuation in the six different roosting sites around Shivamogga from June 2023 to November 2023. Direct roost count method by naked eyes and binoculars was followed to estimate the population size of the colony. A Bushnell laser range finder to estimate the average height of the roosting tree and Garmin GPS 64S device were used to record the location of the sites. The highest population was recorded at site 6 (17,679) and the lowest population was recorded at site 5 (774). Out of nine different host plants, *Ficus benghalensis* was the most favored roost tree hosting the majority of colonies. The population at six different roosting sites was more or less stable during pre-monsoon and increased in the breeding season (i.e. June-November). The fluctuation in population size, roosting patterns, and habitat preferences emphasizes the need for conservation efforts, particularly in protecting larger trees that serve as rooting sites.

Key words: Indian flying fox, *Pteropus giganteus*, population, roosting sites, Shivamogga.

PP-28

Responses of carp melanophores to oral contraceptive pill (Mala-D)

Somashekar D.S, Nayak K L* and Shashikath H Majagi **

Dept. of Zoology, Government First Grade College, Shivamogga, Karnataka.
** Dept. of Zoology, Sahyadri Science College Shivamogga, Karnataka.*
*** DOS in Zoology, VSK University, Ballari, Karnataka. Email:**drsomashekar7@gmail.com***

Aquatic toxicologists acknowledge effects of drugs on chromatophores are effectively used as indicators of pollution. The movement of melanophores within the skin cells is responsible for pigmentation, which involves the nervous system as well as the endocrine system. An attempt is made to evaluate the impact of the oral contraceptive pill (OCP: MALA-D) on melanophores of some freshwater fishes viz., Common carp(*Cyprinus carpio*), *Catla catla*, and *Labeo rohita*. The present results reveal that the OCP (Mala-D) has an action on the melanophores and is disturbing in their structure. In all the above-mentioned fish species three types of melanophores were observed (Punctate, Stellate, and Reticulostellate). The number and shape of each type of melanophore significantly altered with the increase of time of exposure. In *L. rohita* the initiation of the disappearance of melanophores was observed in 96h of exposure. This study indicates that OCP (MALA-D) affects the external surface area and also the endocrine system, it affects melanophores which indicate stress conditions.

Key words: Melanophores, Oral contraceptive pill, Fresh water fishes, Punctate, and endocrine system

PP-29

A health assessment of soil, water and flora: A case study of Kolar gold fields (KGF) Kolar, Karnataka, India

Jobi Xavier and **Jojo Paulose**
Department of Life Sciences, Christ University, Bengaluru
Email:jojopaulose89@gmail.com

Environmental deterioration is a serious health concern in developing countries. Exposure to environmental pollutants has created a huge negative impact on the plant and animal systems. Bio-transferred and bioaccumulated metals are influenced both by natural and anthropogenic sources. Among various anthropogenic activities, mining is an important activity that has led to severe environmental degradation. Kolar gold fields are one of the major mining areas of India which has given name and fame to India in the yester years and the mining has stopped by the central government because of economic reasons. The tailings of waste cause a threat to the ecosystem and the living of humans there in that area because of the health hazards that pose. The study from our research assessed the impact of waste from gold mining on the soil, water, plants, and human health in the KGF. The disposed mine waste was characterized by its mineral content and elemental analysis. The water and soil samples collected from the study site indicated the presence of heavy metals. The collected samples from the study site significantly retarded the growth of the plants in pot experiments. The present study highlighted the impact of the huge mining mill tailing dumps, locally called cyanide dumps, on the biosphere. The study further aims to explore the effect of environmental mutagens on human health among the residents of Kolar gold fields (KGF).

PP-30

The harmful effects of pesticides on grasshopper diversity in croplands

Deepthy T and Sheik Mohammed Shamsudeen R.
Department of Zoology, Kannur University Campus, Mananthavady-670645. Email:deepthydileep1991@gmail.com

Grasshoppers play a crucial role as herbivores in every ecosystem, accelerating nutrient cycling. They also serve as a vital food source for other fauna in the grassland ecosystem. Factors influencing the survival of any species can impact the system equilibrium, resulting in the loss of several associated species. In the Indian agroecosystem, grasshopper is still considered as pest, but their functional role in the natural ecosystem is yet to be recognized. Control measures and restrictions on the grasshoppers in cropland may reduce the ecosystem productivity. Pesticides used for grasshopper control are considered broad-spectrum. The most commonly used pesticides are carbaryl and Malathion. In recent years diflubenzuron and Nosema locustae have been recommended. They are more target-specific but slower-acting than carbaryl and malathion. These pesticides not only kill pests but also harm beneficial grasshoppers and the economic impact of losing important pollinators like bees. Grasshopper control programs also affect next-level consumers in the food chain like bird populations. Orthopterans are highly susceptible to environmental changes, including those resulting from anthropogenic activities. In protected areas, proper information on these taxa is essential for suggesting effective management strategies. Furthermore, their distribution patterns in different types are crucial, in addition to examining their diversity. This study will enhance our understanding of orthopteran diversity, including endangered and newly discovered species in agricultural land.

Key words: Ecosystem, Grasshopper, Herbivore, Pesticide, Diversity.

PP-31

Molecular mechanism in teflon induced genotoxicity and structural alteration in Dolphin: *In silico*-analysis

Arun Kumar and Ashok Kumar
Department of Zoology, University of Lucknow, Lucknow, Uttar Pradesh, India. Email:arunkumar02071997@gmail.com

Point and non-point sources are major concerns of pollution received by fresh and marine waters. These pollutants alter the biochemical, ecological, and physiological characteristics of living beings continuously. In previous decades, the use of synthetic polymeric materials, composed of Teflon, increased and accumulated in aquatic environments through direct and indirect transportation. These accumulations in aquatic environments cause harmful effects on aquatic species due to their potential toxicological characteristics. There is no specific study that has been conducted to study the biochemical and physiological study to check changes at the molecular level earlier. In this study, Polytetrafluoroethylene known as Teflon binds to the electromobility protein Prestin to determine molecular evidence for its interaction in the Ear protein, Prestin, of the Bottlenose Dolphin (*Tursiops trancatus*). With the help of a computational approach, this study determines the molecular interaction pattern and structure of the docked protein. Vander Waals, Halogen, carbon-hydrogen, and pi alkyl bonds are produced at the time of 2D interaction. This interaction produces genotoxicity and structural changes in the Prestin protein present in Bottlenose Dolphin.

PP-32

Exposure to polypropylene microplastic promotes EMT and leads to renal fibrosis

Samiya Baby [1,3#], Vineeta Sharma [3*], Vikas Srivastava [1,2*]

1 Systems Toxicology Group FEST division, CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Vishvigyan Bhawan, 31 Mahatma Gandhi Marg, Lucknow, 226001, Uttar Pradesh, India.
2 Academy of Scientific and Innovative Research (AcSIR), Ghaziabad, Uttar Pradesh-201002 India
3 Manav Rachna International Institute of Research and Studies, School of Engineering and Technology, Department of Biotechnology, Faridabad-1210 04, Haryana.

Microplastics are a significant global environmental concern due to their widespread presence in various ecosystems. One common type of microplastic, polypropylene microplastics (PP-MPs), is frequently found in everyday products 20% contribution of microplastic pollution in the Mediterranean Sea and has been detected in multiple human tissues including Lungs, liver, and kidney but the mechanism of its toxicity is not known. In this work, we have investigated the role of Epithelial-Mesenchymal Transition (EMT) as a potential mechanism that connects exposure to PP-MPs with renal fibrosis using kidney cells NRK52E. In our research, we have successfully prepared PP-MPs with an average diameter of around 400 ± 70 nm, achieving a high yield of over 80%, and used them to treat NRK52E kidney cells for 24 to 96 hours. Our experiments show that kidney cells (NRK-52E) can internalize these PP-MPs using Nile red straining. We found significant changes in the RNA expression and protein levels of E-cadherin, alpha SMA, Fibronectin, and Snail, which are associated with EMT in the exposed cells. Furthermore, exposure to PP-MPs promoted inflammation, oxidative stress, apoptosis, and mitochondrial damage and accelerated the process of fibrosis. Overall, this research reveals that exposure to PP-MPs promotes EMT in renal cells, providing a potential mechanistic link between microplastic exposure and the development of renal fibrosis.

Keywords: Microplastic, Nanoplastic, kidney Toxicity, Exposure

Highlights:

- Polypropylene microplastics (PP), with an average size of around 400 ± 70 nm, exhibited cytotoxicity to epithelial cell lines.
- PP was observed to enter kidney cells (NRK) and accumulate after 72 hours.
- These microplastics induced epithelial-to-mesenchymal transition (EMT) in the kidney cells and promoted renal fibrosis.

PP-33

Toxicity of pesticides to natural enemies of walnut green aphid, *Chromaphis juglandicola*

Shabeer A. Wani[1*], Raziya Nizam[2], Tariq Ahmad Shosha[3]

[1]Zoological Research Laboratory, Department of Zoology, Government College for Women, Cluster University of Kashmir, Srinagar
[2] Post-Graduate Department of Environmental Sciences, Indra Gandhi National Open University (IGNOU)
[3]Division of Entomology, Department of Zoology, University of Kashmir, Srinagar
**Corresponding author e-mail: wanishabeerr@gmail.com*

Walnut green aphid, *Chromaphis juglandicola* (Kaltenbach, 1843), a prominent pest of walnuts, is effectively controlled below economic thresholds by its key natural enemies; however, the use of pesticides, which are more detrimental to natural enemies, can negatively impact the success of biological control. A study was carried out to ascertain the toxicity of selected pesticides to the natural enemies including *Trioxys pallidus*, *Coccinella* sp., *Metasyrphus* sp., and *Hemerobius* sp. The efficacy of four insecticidal treatments comprising Chlorpyriphos, Carbaryl, Dichlorvos, and Phosalone was determined against key natural enemies under laboratory conditions. There were significant differences ($P<0.05$) among four pesticides in causing mortality to natural enemies. Carbaryl and chlorpyriphos proved to be the most disruptive. Carbaryl caused >75 % reduction in the adults of *T. pallidus*, the larva of *Coccinella* sp., and the larva of *Hemerobbius* sp., while it had the greatest impact on *Metasyrphus* sp. as it proved to be disruptive for both the stages- larval as well as adult. Chlorpyriphos caused substantial mortality to adult *T. pallidus* while it proved to be disruptive for *Coccinella* sp. and *Metasyrphus* sp. only in larval stages. Dichlorvos was disruptive against larval stages of *Coccinella* sp., *Hemerobbius* sp., and adult *T. pallidus*. In contrast, Phosalone showed less effect either in the larval or adult stages.

Key Words: Walnut aphids, Natural enemies, Pesticides, Toxicity, Chemical control

PP-34

Evaluation of mutagenicity of *Vitex peduncularis* Wall. Ex aqueous leaf extracts on *Allium cepa* L plant assay.

Vishnu Shankar Sinha and Nandjee Kumar[1]
Department of Botany, Kolhan University, Chaibasa, Jharkhand – 833202, India.
[1] Department of Botany, Magadh University, Bodhgaya, Bihar- 824234, India.

The present study aims to evaluate the Mutagenicity of *Vitex peduncularis* Wall. Ex (Lamiaceae) aqueous leaf extracts on the mitotic index (MI) and chromosomal anomalies (CA) in the meristematic root tip cells of *Allium cepa* L plant assay. 50 g of fresh leaves of *Vitex peduncularis* were ground in 100 ml water to get the mother solution which was further diluted to different concentrations (10%.25%, 50%, 75%, and 100%). The root tips of *Allium cepa* were treated with different concentrations of extracts along with double distilled water for control for two hours, four hours, and six hours at room temperature and were fixed in freshly prepared 1:3 aceto-butanol then squashed in 2% aceto-carmine solution. Our results

revealed that the aqueous leaf extract depressed the mitotic index from 18.34 ± 0.12 (control) to 7.24 ±0.21, however, induced a significant variation of chromosomal abnormalities (CA) ranging from 3.76% to 41.56% in linear correlation with the doses of the leaf extracts. The frequency of Chromosomal abnormalities was recorded as stickiness > fragment > disturbed-metaphase/anaphase/telophase> bridge > laggards > micronuclei >binucleate. The ANOVA test confirmed a significant variation of mitotic depression ($P<0.01$) and induction of chromosomal aberrations ($P<0.01$) due to the action of leaf extracts. The mutagenic potential of the leaf extracts might have been due to the phytochemicals, however, the exact mechanism of their action can be explored through an extensive molecular analysis of the plant extracts that may be applicable for induction of apoptosis or may be considered as a potential antitumor promoting agent or may be used as a bio-mutagen.

Key words: Mutagenicity, *Vitex peduncularis*, leaf extracts, MI, chromosomal abnormalities.

PP-35

Qualitative phytochemical analysis of *Byttneria herbacea* Roxb. leaf extracts.

Jagdish Prasad and Vishnu Shankar Sinha[1]

P.G. Department of Chemistry, Tata College, Chaibasa, Jharkhand, India-833202.
Department of Botany, Kolhan University, Chaibasa, Jharkhand, India-833202.

The present paper deals with the study of qualitative phytochemical analysis of fresh leaf extract of *Byttneria herbacea* Roxb. (Sterculiaceae). The fresh Plant leaves were collected from Kolhan University, Chaibasa campus. For qualitative phytochemical analysis, the plant leaf extract solutions were prepared in different solvents *i.e.*, double distilled water (DDW), Ethanol, methanol, and n-butanol and Standard protocols (Ahmad and Beg 1998, Kassa et. al. 2014, Sofowra 1993, Harborne 1973) were adopted for the detection of major classes of phytochemicals and 2,6 di-chlorophenolindophenol (DCPIP) used for detection of Vitamin C in the plant leaf extract solutions. *Byttneria herbacea* Roxb. is used to cure / treatment of various disorders like dysentery, leprosy, asthma, limb fracture, leucorrhoea, and also as an antioxidant. Our result confirmed the presence of major classes of Phytochemicals *i.e.*, Protein, Carbohydrate, Phenols, Tannin, Flavonoids, Saponins, Glycosides, Steroids, Alkaloids, and Terpenoids as well as vitamin C in the leaf extract solutions. The phenolic component of the plant represents the antioxidant potency. These phytochemicals have nutritive, anti-pyretic, muscle cramps, anti-diabetic, anti-oxidant, anti-inflammatory effects, anti-allergic, anti-viral, anti-microbia, repair damaged tissue, and immunomodulatory effects (T and B cells development), production of certain neurotransmitters. Hence intensive molecular / Pharmacognosy studies may be carried out and these plant species may be developed as antiviral herbal medicine in the interest of mankind.

Key Words: Qualitative, *Phytochemical, Byttneria herbacea* Roxb, *etc.*

PP-36

Elevational effects on black fly distribution (Simulidae: Diptera) in Palani hills of Southern Western Ghats, India

Basil Mohamedu, S., Ramar, M. and Anbalagan, S.
Department of Zoology, Sri Meenakshi Government Arts College for Women (A), (Affiliated to Madurai Kamaraj University), Madurai – 625002 Tamil Nadu, India.
Email:fazil3316@gmail.com

Black flies (Simulidae) are very small flies distributed in small streams to large rivers, which complete their larval stages in aquatic and adult stages in terrestrial. The robust adult black flies are annoying biting pests of wildlife, livestock, poultry, and humans and their bloodsucking habits also raise concerns about the possible transmission of disease agents. The larval black fly plays an important role in the stream ecosystem and it helps to regulate the nutrient dynamics of the stream and they influenced by various environmental factors. Therefore, the present study aimed to study the elevational effects on black fly distribution in Palani Hills. We surveyed five major streams from uphill (2000m) to downhill (300m) of Palani Hills. In total, four black fly species (*Simulium* (*S.*) *gravelyi*, *Simulium* (*S.*) *gurneyae*, *Simulium* (*S.*) *palniense*, *Simulium* (*G.*) *kumbakkaraiense*) were collected under two subgenera (*Simulium* and *Gomphostilbia*) in the genus *Simulium*. The larval and adult black fly species varied with elevation. The elevation ranged from 2000m to 1000 had high diversity and abundance of black flies whereas low abundance and diversity occurred below 1000m of elevation. The environmental factors of pH, conductivity, and total dissolved solids also influenced the distribution of larval black flies in streams. Overall, elevation and also environmental factors play an important role in the distribution of black flies in the Palani hills of Southern Western Ghats. The present study suggests that more attention is needed on the impact of black flies in Palani Hills, as a popular tourist spot of Kodaikanal is located uphill.

Keywords: *Simulium*, diversity, distribution, elevation, Palani hills

PP-37

Effect of environmental factors on the larval distribution of black flies (Diptera: Insecta) in Munnar hills of Western Ghats, India

Ramar, M., Mohamedu, S.B. and Anbalagan, S.
Department of Zoology, Sri Meenakshi Government Arts College for Women (A), (Affiliated to Madurai Kamaraj University), Madurai – 625002 Tamil Nadu, India.

The insect, black fly larvae are tiny and prefer running water habitats. The larval black flies are used as excellent bioindicators in streams and rivers due to their colonization and abundance of distribution. Also, black fly larvae play an important role in the food chain of stream ecosystems. Many studies on the ecology and taxonomy of larval black flies have

been done in India but has no evidence been found in Munnar Hills. Hence, the present study concerned the effect of environmental factors on the distribution in Munnar hills of Western Ghats. We surveyed the stream during the monsoon and post-monsoonal periods. Results of the present study show that water flow and stream width are highly influenced by the distribution of black fly larvae revealed by statistical analysis. Followed by other environmental factors of elevation and total dissolved solids were also significant factors for the larval distribution. The present study highlights that water flow and stream width are significant factors in natural streams than the other environmental factors, while total dissolved solids and conductivity are major factors in human-impacted streams. Hence, natural streams should be preserved and human-impacted streams may be restored in turn to conserve aquatic fauna in the lotic ecosystem, as indicated by the present study.

Keywords: Black fly, *Simulium*, environmental factors, Munnar hills, stream

PP-38

Assessment of genotoxic and cytostatic potential of indole-3-carbinol in K562 cell line

Kavya V Anilkumar[1], Athira M Menon[1] Alex George[1]*

[1]*Cell and Molecular Biology Facility, Jubilee Centre for Medical Research, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India*

***Corresponding author** Email:alexgeorge@jmmc.ac.in*

Plants and their derived products have been used to inhibit the progression and development of cancer. Indole-3-carbinol (I3C) is a naturally occurring phytochemical and can be found in cruciferous vegetables including cabbage, broccoli, brussels sprouts, and cauliflower. Many reports showed that Indole-3-carbinol has potent anti-tumor activity in both *in vitro* and *in vivo* for multiple types of cancers, but few studies focused on its potential anti-leukemia actions. In this study, the anti-proliferative effect of Indole-3-carbinol is studied in the myelogenous leukemia cell line, K562. The initial stage involved a study on K562 cell exposure to a wide range of Indole-3-carbinol concentrations (10 µM, 20 µM, 40 µM, 80 µM, 160 µM, 320 µM, and 640 µM) which may reveal the toxicity-induced cell death or genotoxicity in the K562 cancer cells. Interaction of Indole-3-carbinol with K562 cells, from a genotoxic point of view, has been studied using Cytokinesis Block Micronucleus Assay, and resulting cytostatic and genotoxic endpoint from different concentrations of Indole-3-carbinol is noted. The results show that Indole-3-carbinol has the highest genotoxic potential at 40 µM concentration in K562 cell lines. Cytostatic Markers (Apoptotic and necrotic cells) increased at 160 µM - 640 µM concentrations of Indole-3-carbinol. This study provides a piece of information on the genotoxic and cytostatic potential of Indole-3-carbinol in the cultured K562 cell line.

Keywords: Indole-3-carbinol; Cytokinesis Block Micronucleus Assay; Genotoxicity; Cytotoxicity; Micronuclei; DNA damage

Highlights:

- A pilot study to understand the nature of damage that a higher dose of Indole-3-carbinol can cause.

- Provides insights into the genotoxic and cytostatic potential of Indole-3-carbinol specifically in K562 cell lines.
- Offers valuable information for further research on Indole-3-carbinol as a potential anti-leukemia agent.
- Genotoxicity at certain concentrations warrants careful consideration for therapeutic application, emphasizing the need for dose optimization.

PP-39

Genotoxic and cytotoxic events in buccal epithelial cells among students exposed to formaldehyde

Ashwija Shetty[1,3], **Reema Rose Alappat[2]**, Lalu Krishna[3], Alex George[2*]

*[1]Department of Anatomy, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, Manipal, India. [2]Cell and Molecular Biology Facility, Jubilee Centre for Medical Research, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India. [3]Department of Anatomy, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India. *Corresponding author Email:alexgeorge@jmmc.ac.in*

First-year medical students are constantly exposed to formaldehyde during their routine dissection schedule which is considered as a toxic agent. The present study aimed to evaluate the extent of genotoxicity and cytotoxicity caused by to exposure formaldehyde. Hundred first-year medical students exposed to formaldehyde during their routine dissection hours were employed in this study. Thirty students without a recent history of X-ray exposure, medications, smoking, and alcohol consumption were selected for the Buccal Micronucleus Cytome (BMCyt) assay from a hundred students. The frequency of genotoxic and cytotoxic end markers (micronucleated cells, nuclear buds, binucleate cells, karyorrhectic cells, pyknotic cells, and karyolytic cells) was higher in the samples procured post-exposure when compared to pre-exposure. All these parameters were increased significantly ($p<0.001$) which represented chromosomal damage, nuclear disintegration, and increased cell death.

Keywords: Formaldehyde; Genotoxicity; Cytotoxicity; Micronuclei; Biomarkers; DNA damage

Highlights:

- Exposure to formaldehyde causes a higher risk for health-related symptoms and genomic damage.
- The air contaminated with formaldehyde may result in problems such as coughing, wheezing, and irritation of the eyes, throat, and nasal cavities.
- First-year medical students are exposed to formaldehyde during their course of study and an elevated genotoxic and cytotoxic marker observed in the present study indicates genomic damage.
- This suggests the importance of protective measures to be taken during the dissection hours to prevent or minimize exposure to formaldehyde.

PP-40

Evaluation of oxide nanoparticles induced genotoxicity in human peripheral blood lymphocytes using CBMN assay and comet assay: An *in vitro* study

P.V. Vidya[1] and Alex George[1]*

[1]*Cell and molecular biology facility, Jubilee Centre for Medical Research, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India*
***Corresponding author** Email:alexgeorge@jmmc.ac.in*

The emerging use of nanotechnology has escalated the exposure of organisms, including humans, to nanoparticles, triggering concerns regarding their genotoxic potential. Genotoxicity encompasses various forms of genetic damage, including cytotoxicity, genetic mutations, and chromosomal abnormalities. While substantial data on nanotoxicology exist, a comprehensive understanding of the risks, mechanisms of action, and interactions of diverse nanoparticles with biomolecules and tissues across different organisms remains elusive. To address this knowledge gap, our study investigates the genotoxicity of two different nanoparticles- silicon dioxide (SiO_2NPs) and titanium dioxide (TiO_2NPs). The genotoxic potential of these nanoparticles was evaluated in human peripheral blood lymphocyte culture using Cytokinesis Block Micronucleus assay (CBMN) and comet assay. In the CBMN assay, binucleated cells with micronuclei, nucleoplasmic bridges, and nuclear buds were scored along with mono and multinucleated cells. The results showed a moderate to highly significant frequency of genotoxic events when compared with untreated negative control. The comet assay also resulted in positive genotoxicity in nanoparticle-treated samples with a significant increase in comet tail length and percentage of tail DNA compared to the untreated control groups. The study observes that nanoparticles have a dose-dependent adverse effect on human peripheral blood lymphocytes. The study will be useful in elucidating the mechanism of action by closely analyzing the endpoints.

Key words: nanoparticles, peripheral blood culture, genotoxicity, CBMN assay, comet assay.

Highlights:

- Nanoparticles induced micronuclei, nuclear buds, and nucleoplasmic bridges in human peripheral blood lymphocyte culture.
- In the comet assay, the tail length and percentage of tail DNA showed a significant increase in nanoparticles-treated peripheral blood cells.
- Nanoparticles induced dose-dependent genotoxic events in blood cells.
- Demanding the need for the establishment of standard test protocols and comprehensive toxicity data of nanoparticles and nano-based products.

PP-41
Analysis of dose-dependent cytotoxic and genotoxic potential of thymoquinone in SK-MES-1 lung cancer cell line

Eby Joy[1,2], Hafiza Padinharayil[1], Raghavendra Kumar Mishra[2], and Alex George[1]*

[1]Cell and Molecular Biology Facility, Jubilee Centre for Medical Research, Jubilee Mission Medical College and Research Institute, Thrissur, Kerala, India.
[2]Amity Institute of Biotechnology, Amity University Madhya Pradesh
**Corresponding author Email:alexgeorge@jmmc.ac.in*

As per World Health Organization (WHO) estimates of fatalities and factors of death from 2016-2020, cancer will surpass ischemic heart disease (IHD), being a major contributing factor to mortality over the forty years that follow, resulting in 2.08-fold rise, wherein lung cancer will be the leading. This denotes the need for innovative, cutting-edge early diagnostic techniques and therapeutic approaches. Thymoquinone (TQ) is a major lipid component found in *Nigella sativa* and *Monarda fistulosa*, which are well-known and widely used in herbal medicine. Numerous studies have demonstrated the strong anti-tumor activity of thymoquinone both *in vitro* and *in vivo* against various types of cancers. However, there is limited research focusing on its potential in lung cancer. Furthermore, the molecular mechanisms underlying the genotoxic effects of thymoquinone and the methods for determining its genotoxic potential in the SK- MES-1 cell system have not been extensively explored. The current study evaluates the cytotoxic and genotoxic effects of thymoquinone in the SK-MES-1 cell line, considering the dosage as a determining factor. The cell viability and cytotoxicity of thymoquinone were assessed using resazurin assay and IC_{50} of thymoquinone was determined. The genotoxic potential of thymoquinone was evaluated using the Cytokinesis Block Micronucleus assay as a means of assessment. The study showed significant genotoxic potential especially in micronuclei frequency at 60µM thymoquinone concentration in SK-MES-1 cell lines. Higher Frequencies of Micronuclei, an indication of chromosome breakage, whole chromosome loss, kinetochore dysfunction ($p<0.0001$), and Nuclear Buds ($p=0.0023$) at higher concentrations show the potential of thymoquinone to induce DNA damage and genomic instability. The observed sudden decrease in the nuclear proliferation index; 40 µM, $p=0.0051$; 60µM, $p=0.0002$ indicated the significant cytotoxic effect of thymoquinone in cancer cells. This suggests that thymoquinone might exert its effects on cancer cells through mechanisms that go beyond mere cytotoxicity, potentially influencing cell growth, proliferation, and other related processes.

Keywords: Thymoquinone; Anti-cancer drug; Cytokinesis Block Micronucleus assay; SK- MES-1; lung cancer; IC_{50}; micronuclei.

Highlights:

- Thymoquinone has the highest genotoxic potential (micronuclei frequency) at 60µM concentration in SK-MES-1 Cell lines.
- Higher frequencies of micronuclei (chromosome breakage, whole chromosome loss, kinetochore dysfunction) with $p<0.0001$ can be considered as an indication of DNA damage.

- Higher nuclear buds which is an indication of gene amplification were significant upon thymoquinone treatment (p=0.0023).
- The observed sudden decrease in the cytokinesis block proliferation index indicated a potential reduction in cell growth, proliferation, and adhesion.

PP-42
Sensitization of drug resistance cells using ebselen by disturbing the cellular redox status

Sugumar Baskar and N. Rajendra Prasad[1*,]

[1]Department of Biochemistry and Biotechnology, Annamalai University, Annamalainagar, Tamil Nadu- 608002, India. Email:sugubas11@gmail.com

Overcoming multidrug resistance poses a significant challenge in cancer treatment, especially during chemotherapy. Ebselen, a synthetic organoselenium molecule known for its anti-inflammatory and antioxidant properties, was investigated in this study. Treatment of parental KB 3-1 and KB Ch^R 8-5 cells with ebselen, doxorubicin, or their combination exhibited enhanced cytotoxicity compared to the untreated control cells. The ebselen and doxorubicin combination increased intracellular reactive oxygen species and reduced thioredoxin reductase activity and levels of antioxidant enzymes in the drug-resistant cells. Additionally, the combination treatment demonstrated chemosensitizing effects, including apoptotic cell death, G2/M-mediated cell cycle arrest, and decreased cell proliferation. Immunocytochemistry results revealed upregulation of p53 and p21 expression in combination with ebselen and doxorubicin alone treated cells. Notably, the anti-apoptotic protein Bcl-2 was downregulated, while Bax, Caspase 3, Caspase 9, and cytochrome c were upregulated. Furthermore, inflammatory markers such as NF-κB and TNF-α exhibited decreased expression in combination with ebselen and doxorubicin-treated cells. Thus, ebselen exhibits as a potent candidate for overcoming MDR in cancer cells by regulating cellular redox homeostasis.

Keywords: Chemosensitizing, Multidrug resistance, Antioxidant, Redox status, Apoptosis

Highlights:

- Ebselen effectively enhances the chemosensitivity of colchicine-selected KB Ch^R 8-5 cells to doxorubicin treatment
- Ebselen inhibits the thioredoxin reductase activity and degreases cellular redox homeostasis and antioxidant enzymes
- Combination of ebselen and doxorubicin significantly increases cell cycle arrest and apoptosis
- Ebselen also has significant upregulation of apoptotic markers in the resistant KB Ch^R 8-5 cells.

PP-43

Synthesized β-cyclodextrin polymer loaded quercetin and doxorubicin reverses P-glycoprotein mediated multidrug resistance in KB ChR 8-5 cancer cells

Charan Singh Pawar[1], N. Rajendra Prasad[1]
[1]*Department of Biochemistry and Biotechnology, Annamalai University, Annamalainagar, 608002, Tamil Nadu, India*
Email:charansingh.bsc@gmail.com

The challenge of combating drug resistance in cancer chemotherapy, specifically due to the overexpression of ATP-binding cassette drug efflux transporters like P-glycoprotein (P-gp) or ATP-binding cassette subfamily B member 1 (ABCB1), remains significant. This research aimed to explore the potential of beta-cyclodextrin polymer-loaded nanocarriers containing quercetin and doxorubicin (*β*-CDP/QD NCs) to overcome P-gp-mediated multidrug resistance in KB ChR 8-5 cancer cells. In vitro experiments on drug, efflux demonstrated that quercetin disrupts the transport function of P-gp in the drug-resistant KB ChR 8-5 cancer cells. However, when administered through *β*-CDP/QD NCs, quercetin significantly downregulates the expression of ABCB1 by preventing the nuclear translocation of the p-50 subunit of the NF-κB compared to quercetin treatment alone. Clonogenic cell survival and migration assays further support that *β*-cyclodextrin polymer improves quercetin's ability to render drug-resistant cancer cells sensitive to doxorubicin by blocking P-gp drug efflux pumps. The doxorubicin-mediated cell cycle arrest-induced apoptotic signaling in resistant cancer cells are both enhanced by *β*-CDP/QD NCs compared to other treatments. As a result, it has been determined that *β*-CDP/QD NCs downregulate ABCB1, NF-κB, and Akt pathways, consequently enhancing doxorubicin-induced cell cycle arrest and apoptotic signaling, thereby increasing the susceptibility of KB ChR 8-5 cell lines to chemotherapy. Pharmacokinetic analysis revealed that *β*-CDP/QD NCs exhibited increased bioavailability and an extended half-life when compared to free QCT and DOX. Moreover, analysis of biochemical serum parameters indicated that synthesized *β*-CDP/QD NCs mitigated the toxic effects of DOX on liver and kidney function.

Keywords: Multidrug-resistant; P-glycoprotein; ABCB1; Cell cycle arrest; Quercetin; Doxorubicin

Highlights:

- *β*-CDP/QD NCs downregulate ABCB1, NF-κB, and Akt expression in KB ChR 8-5 cells
- *β*-CDP/QD NCs induce DOX-mediated G2/M phase cell cycle arrest in KB ChR 8-5 cells
- *β*-CDP/QD NCs inhibit cellular migration and clonogenic formation in KB ChR 8-5 cells
- *β*-CDP/QD NCs upregulate proapoptotic protein markers with clear γH2AX foci formation in KB ChR 8-5 cancer cells
- *β*-CDP/QD NCs increased the bioavailability of QCT and DOX in Swiss albino mice versus free QCT and DOX.

PP-44

Andrographolide mediated reversal of multidrug resistance by targeting P-glycoprotein

Deepa Swati Lakra[a], Pradhapsingh Bharathiraja[a], T. Dhanalakshmia,[b]*, N. Rajendra Prasad[a]*

[a]Department of Biochemistry and Biotechnology, Annamalai University, Annamalainagar 608002, Tamil Nadu, India.

[b]Department of Biochemistry, Dharmapuram Gnanambigai Government Arts College for Women, Mayiladuthurai, Tamil Nadu, India.

P-glycoprotein (P-gp) mediated multidrug resistance (MDR) hinders cancer treatment. Phytochemicals and chemotherapeutics combinations overcome resistance. Andrographolide (Andro) sensitizes paclitaxel (PTX) and doxorubicin (DOX) anticancer effects. Andro, PTX, and DOX were tested in colchicine-selected $KBCh^R$ 8-5 cells. Molecular docking studies revealed Andro exhibited higher binding interaction with P-gp. Further, Andro inhibits P-gp transport function in a concentration-dependent manner. Moreover, Andro downregulates P-gp over expression in the resistant $KBCh^R$ 8-5 cells. MTT cell-based assay showed that Andro treatment augments the PTX and DOX effects in the resistant cells. Hence, Andro showed synergism with PTX and DOX treatment. Andro also decreased colony formation in the resistant $KBCh^R$ 8-5 cells. Interestingly, the PI/DAPI staining results revealed a loss of cell integrity in the combinational treatment groups of Andro + PTX and Andro + DOX. Cell cycle analysis demonstrated PTX-mediated G2/M cell cycle arrest. Andro increased caspase 3 and caspase 9 protein expression in resistant $KBCh^R$ 8-5 cells. Therefore, considering all cellular and molecular studies demonstrated that Andro plays a significant role in the reversal of MDR-resistant $KBCh^R$ 8-5 cells.

Keywords: Andrographolide, P-glycoprotein, multidrug resistance, caspase, chemosensitization.

Highlights:

- P-glycoprotein, an ABC transporter contributes to multidrug resistance by efflux of chemotherapeutics, causing low availability and decreased efficacy of chemotherapeutic drugs.
- Andrographolide inhibited the efflux function of P-glycoprotein and decreased ABCB1, NF-κB, and AKT expression in a concentration-dependent manner.
- Andrographolide sensitized $KBCh^R$ 8-5 to paclitaxel and doxorubicin treatment and enhanced cell cytotoxicity.
- The caspase 3 and caspase 9 protein expression was enhanced on co-treatment of andrographolide with paclitaxel and doxorubicin.

PP-45

Unraveling growth traits: Comparative transcriptome analysis of *Penaeus monodon* and tissue-specific expression profiling of growth-associated genes

Preety Sweta Hembrom[1], Tony Grace [1]*

1Department of Genomic Science, School of Biological Sciences, Central University of Kerala, Kasaragod, Kerala- 671316, India.
**Corresponding author*

The black tiger shrimp, *Penaeus monodon*, plays a crucial role in the marine industry, constituting approximately 9% of total crustacean production and serving as a major component of aquaculture for human consumption. Within this species, a population of rapidly growing individuals with a larger body mass exists, and cultivating these large-sized (shooter) shrimp can yield higher productivity and profitability in the aquaculture sector. This study addresses the variation in growth observed in *P. monodon* through comparative transcriptome sequencing, focusing on individuals from the same age group and culture conditions but with varying sizes. The analysis, based on a cumulative dataset of 43.05 Gb, resulted in 28,071 unigenes, providing valuable insights into the molecular factors regulating growth. Functional enrichment analysis revealed differences in metabolic pathways, particularly in shooter *P. monodon*, suggesting varied genetic regulation. Furthermore, differential gene expression analysis unveiled a varied array of transcript sequences exhibiting similarities to genes correlated with growth and development in the shooter *P. monodon*. Among these genes, such as cuticle protein AMP4, tubulin alpha-1 chain, and myosin heavy chain, may be associated with muscle growth. These identified genes were categorized into 31 KEGG pathways, with the top pathways encompassing carbohydrate metabolism, energy metabolism, and amino acid metabolism. The validation of transcriptome data through qPCR and exploration of tissue-specific gene expression patterns further contribute to understanding the intricate processes governing growth in *Penaeus monodon*. This research enhances our knowledge of growth-associated genes in shrimp and lays the groundwork for selective breeding strategies, potentially improving economic value and environmental sustainability in shrimp aquaculture.

Keywords: *Penaeus monodon*, Transcriptomics, Growth traits, qPCR, Shrimp aquaculture, Sustainability

Session 7: High-throughput approaches in mutagenesis/ Pharmacogenomics/Public health

Plenary Lecture-7

Prof. Stefano Bonassi

Department of Human Sciences and Quality of Life Promotion San Raffaele University, Rome, Italy, and Unit of Clinical and Molecular Epidemiology IRCCS San Raffaele Roma, Rome, Italy. Email:stefano.bonassi@sanraffaele.it

Stefano BONASSI was born in Genoa, Italy, on January 3, 1956. He has been married to Angela Calvi since 1983 with four children He received his degree in Biological Sciences at the University of Genova (1981), and his specialty in Medical Statistics and Epidemiology at the University of Pavia in 1987. Stefano BONASSI is currently a full professor of Hygiene and Preventive Medicine at the San Raffaele University and is the Head of the Unit of Clinical and Molecular Epidemiology at the IRCCS San Raffaele Pisana in Rome, Italy. He worked previously in Genoa as Director of the Unit of Molecular Epidemiology at the National Research Cancer Institute in Genoa, Italy. Since 2006 he has been an adjunct Professor of Molecular Epidemiology at the University of Genoa. In October 2023 received the appointment as a national expert at OCSE (Organizzazione per la cooperazione e lo sviluppo economico).

His main scientific interest is focused on the use of biomarkers in the human population and clinical studies. In particular, he has been actively involved in assessing the role of DNA damage in the early stages of carcinogenesis and other chronic diseases. He has been largely involved in the coordination of international collaborative projects, such as ESCH on chromosomal damage, HUMN and HUMNxl on the micronucleus assay, and ComNet on DNA damage. He is active in designing and coordinating epidemiological studies, often based on high throughput techniques, such as gene expression profiling and genotype. His appointment in Rome includes research on neurodegenerative disorders, COPD, aging, pharmacoepidemiology, frailty, nutrition, and rehabilitation. More recently he started a collaborative project on the validation of a systems medicine approach for the collection and evaluation of clinical and biological information of patients affected by non-communicable diseases.

Teacher of Epidemiological Methods in several international courses for postgraduate students Dr. Bonassi has supervised many specialization theses and postgraduate research projects in Italy and Europe. His research has been funded by several national and international agencies. From 2009 to 2013 Prof. Bonassi has served as President of the *International Association of Environmental Mutagenesis and Genomics Societies* (IAEMGS)

an international association with 6.000 members all over the world. He is a member of the editorial board of several journals in the field of epidemiology and genetics. Prof Bonassi has been appointed as National representative to OECD.

Stefano Bonassi is often invited to speak at international meetings, courses, and seminars. Overall he has published 333 papers and has been cited 18500 times with a *h* index of 65 (Scopus).

Association of buccal MN cytome assay biomarkers with disease and their relevance for clinical studies

Micronucleus (MN) test in exfoliated buccal cells is widely applied for different purposes, mostly to assess the genotoxic impact of environmental and occupational exposure to genotoxic agents. In the last years the investigations on a potential clinical application of the assay, mainly in patients with oral cancer and oral premalignant lesions, substantially increased. Given the limited extent of clinical data concerning MN frequency in buccal cells, results on buccal cells were compared with MN frequency in lymphocytes in cancer and non-cancer diseases, and will be discussed extensively. In all diseases examined, MN in lymphocytes and exfoliated cells were higher than in controls, with the exception of prostate cancer. The ratio of MN frequency in subjects with disease vs controls in lymphocytes (2.3 and 2.0 for non-cancer diseases and cancer, respectively) was significantly lower than the corresponding estimates observed in exfoliated cells (3.6 and 6.1). The best association was found for those cases in which MN was measured in cells from the same tissue in which cancer was diagnosed (i.e., oral cancer). How to validate and translate the application of MN assays into clinical practice will be discussed, and a possible roadmap driving this process will be illustrated. Critical steps are the following: a) differentiate disease patients from unaffected individuals and identify important variables that can modify the MN biomarker in healthy and disease subjects; b) drive the transition from the use of MN assays at the group level to the individual level; and 3) run prospective cohort studies and randomised controlled trials to verify that MN assays are predictive of disease and that MN frequency modification alters disease outcomes. Pragmatic trials will also be required before inclusion in routine clinical practice, to provide the decisive evidence to support their adoption by the medical and public health community.

Invited Talk-25

Prof. Subha Bhassu
Animal Genetics and Genome Evolutionary Biology Lab,
Microbiology and Molecular Genetics program, Institute of Biological Sciences,
Faculty of Science, 50300 Kuala Lumpur, Malaysia.
Email:subhabhassu@um.edu.my

Prof Dr. Subha Bhassu is currently an academician at the Institute of Biological Sciences and has 23 years of experience in teaching in various programs and has developed many course structures that are aligned to the Malaysian MQF programmes for University Malaya (2008-2015) and Inti University College (2000 -2004) and also serve as moderator for Biotechnology courses for INTI University College (2008-2015) She is also a Head of Section of Aquatic Molecular Biology and Biotechnology of CEBAR(2014-current) and an associate member of IOES and MRC research centers within University Malaya (2014-current). She also serves as a committee member for the International Biosafety Committee Member (IBC) of the University Malaya and also an auditor for the Enforcement Committee for Biosafety at the Ministry of Environment and Natural Resources (2014 current).

In spirit, her research inclination and interest grew since she was in the second year of her degree program when she felt that research is very challenging and has kept her going since then. Since 1996, when she joined her Ph.D. Program, her research collaboration, friends, teachers, and networks were established from all over the world and her exposure as a student led to the belief that you need to think out of the box when it comes to research. Of course, knowledge and research grants are important for one to do research but the two more important things are even more important than the former which are love and selfless service in research that caters to the students, university, community, industry, country, and global needs.

Thus in short, she has so far 8 Ph.D. students and 25 masters students who have graduated and currently has 15 PhD students who have supervised to completion 20 undergraduate students and have published more than 60 ISI publications, two book chapters, and has three National patents and 9 International patents. She serves currently as a reviewer for PLOS One, GENE, META GENE, Aquaculture, Aquaculture Research, and Genomics journal.

Her future steps are always to embark on research with ethics and integrity as her research progresses in the aquatic world that involves multidisciplinary approaches and hopes to

instigate the scientific world on thought-provoking ideas that can shift people's minds, hearts and souls to be more aligned to the world's needs and happiness.

Direction selection is the transformative force in the 21st Century versus natural selection, adaptation, or mutation in the current global challenges

Natural selection, adaptation, and mutation a changes in evolutionary biology which has been an interest when you deal with species and their habitats when they experience population shortfall, expansion, or extinction. Climatic change is the driver for external change in biodiversity, conservation management issues, food security, and safety which eventually affects human health. Current genetic manipulation and the emergence of synthetic peptides which are administered as potential vaccine candidates show potential to address new emerging disease threats to global health. This introduction of biotechnological and innovative products will give rise to biosafety and biosecurity questions about the safety of humans and the environment. Thus, we would like to explore the role of research in molecular genetics in diagnostics and therapeutics used for human health. The question posed here new introduction of peptides and vaccines, will be considered a threat to human health as it is widely used globally in animal and environmental problems.

Keywords: Selection, force of transformation, climatic change, genetics, and biotechnology.

Invited Talk-26

Dr. Divya Lekha,
Associate Professor, Dept of Zoology,
University of Calicut, Kerala
Email: dr_divya_l@uoc.ac.in, divyacuk@gmail.com

Dr. L. Divya started her career serving the Central University of Kerala, CUK as an assistant professor, in the Dept of Animal Science, in 2011. She joined the University of Calicut in March 2022 as Associate Professor, Dept of Zoology. The University of Calicut. She has received several national and international laurels, such as the Indian National Science Academy (INSA) medal for Young Scientist, the National Academy of Sciences, India (NASI) 'Swarna Jayanti Puraskar', Young Scientist Award in Life Sciences by Kerala State Council for Science Technology & Environment (KSCSTE), Govt of Kerala, Young Investigator Travel Award by International Neuroendocrine Federation, Rouen, France, Prof. N.J. Chinoy Award by Society for Reproductive Biology & Comparative Endocrinology,

Jawaharlal Nehru University, New Delhi, CSIR travel grant to attend the 7th International Congress on neuroendocrinology, France, Dr. P. Daisy Endowment Gold Medal by Society for Endocrinology & Reproductive Biology, 2022, Indian National Science Academy (INSA) Visiting Scientist -Dept of Biology, IISER, Pune, 2022, Vice Chancellor's Excellence Award, Central University of Kerala, 2021. Episkin – L'oreal Research and Innovation travel award by Society for Alternatives to Animal Experiments (SAAE), INSA -Royal Society of Edinburgh University of Glasgow, Institute of Cardiovascular & Medical Sciences, Scotland, SERB-DST Women Excellence Award. Dr. L. Divya has completed three extra mural projects sanctioned by SERB, DBT, and Kerala State Biodiversity Board. Four students have been awarded Ph.D. and post-doctoral fellowships. She also has guided 3 M.Phil and 47 postgraduate dissertation students. Dr. L. Divya also serves as the Joint Secretary, & executive council member of the Kerala Academy of Sciences and Society for Reproductive Biology and Endocrinology. Her research addresses developmental disruptions across model organisms like Zebra fish, amphibians, and ants. Dr. Divya has over 38 research articles in peer-reviewed journals and 8 book chapters.

Exploring Nature's allies: From ants to zebrafishes: Alternative models to assessing environmental mutagens

The last few years have witnessed a slew of advances in research animal models across multiple areas of disease research, safety, pharmacology, and toxicology. On the other hand, there has been a concomitant increase in the push for alternatives to animals especially by regulatory agencies. As lab animal scientists/zoologists the Concept of "3R"– "Alternatives" – Replacement, Reduction, and Refinement - of the use of animals in education, research, and testing is increasing. Platforms employing model organisms enable the discovery of novel gene-disease relationships, help establish variant pathogenicity, and often lead to the exploration of underlying mechanisms of pathophysiology that suggest new therapies. One of the main objectives of environmental toxicant screening is to predict human toxicity via fast and accurate testing of many substances based on model systems and different routes of drug delivery systems.

The Asian Weaver ant, *Oecophylla smaragdina* is undoubtedly one of the most fascinating and advanced among the hymenopteran social insects. We have used the highly eusocial foragers of the weaver ants as a powerful *in vivo* model system from ecotoxicological perspective to investigate the potential risks and hazards to assess the adverse effects of 2-dimensional molybdenum disulfide (MoS_2) nanoparticles at the organismal, cellular and molecular levels. The zebrafsh (*Danio rerio*), have been successfully used as a model for human disease as well as a means to define key aspects of vertebrate evolution. Employing both embryo and larval zebrafish as a critical system model system we have evaluated the various developmental milestones in response to yet another potential environmental hazard nanoparticles of tin disulphide. Utilizing informatics and functional studies in the above organisms, including the ant (*O. smaragdina*), and fish (*D. rerio*), we see both the opportunity and the challenges and are convinced that there is a great need for a platform for intense discussions and debates for a healthy exchange and adoption of the most suitable ideas. The essence is to understand the current research animal models, seek and evaluate

relevant alternatives, and follow up on these discussions with actionable steps over the coming years.

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Invited Talk-27

Prof. Puthen Veetil Jithesh,
Hamad Bin Khalifa University (HBKU),
Doha, Qatar.
Email: JVeettil@hbku.edu.qa

Dr. Puthen Veettil Jithesh, FRSB is the Associate Dean for Education & Student Affairs and an Associate Professor at the College of Health and Life Sciences (CHLS) at Hamad Bin Khalifa University (HBKU), Qatar. He is also the Program Coordinator of the Genomics & Precision Medicine (GPM) MS/PhD programs. Dr. Jithesh holds a Master's degree in microbiology, and an Advanced Diploma in bioinformatics, and received his Ph.D. in bioinformatics from Queen's University Belfast, United Kingdom. He has over 20 years of research and development experience in Bioinformatics and Computational Biology at several prestigious institutes in India, Qatar, and Russell Group research universities in the United Kingdom. He has over 70 peer-reviewed publications in Bioinformatics and/or its translational applications. He also has experience in curriculum development and coordination of Bioinformatics/Precision Medicine courses. Dr. Jithesh's research focuses on bioinformatics and computational biology tool development and applications in translational research, pharmacogenomics for the prediction of response and toxicity to drugs, identification of causal variants in rare genetic diseases, and machine learning and data science toward the implementation of precision medicine. He leads the pharmacogenomics stream of the Qatar Genome Program Research Consortium and recently published the actionable pharmacogenomic landscape of the Qatari population. Before moving to Qatar, he was the Head of Bioinformatics for the Oxford Translational Molecular Diagnostic Centre at the University of Oxford and held honorary appointments with the Wellcome Centre for Human Genetics and the Oxford University Hospitals NHS Trust.

Precision medicine through pharmacogenomics

Pharmacogenomics (PGx) studies the influence of genetic variants on drug response so that efficacy can be maximized and toxicity can be minimized. PGx provides one of the best opportunities for precision medicine and its implementation in the clinic can improve health outcomes and reduce costs. We developed a bioinformatics tool for the analysis of population genomics data to identify clinically important pharmacogenetic variants and predict phenotypes such as response and adverse reactions to drugs. We analyzed the actionable PGx landscape of the Qatari population from 6218 whole genome sequencing data generated by the Qatar Genome Program, and compared these frequencies with other world populations, revealing important differences in distribution. For example, the actionable frequency of SLCO1B1 was twice as compared to other populations, suggesting a higher risk of myopathy when taking simvastatin. We further predicted the distribution of CYP2B6, CYP2C19, CYP2D6, and CYP3A4 metabolizer phenotypes in 14,354 Qatari individuals from multiple variants in each of these genes, including copy number changes and based on the latest guidelines for modifying the prescriptions of antidepressants and antipsychotics, identified the distribution of actionable frequencies in the Qatari population. For example, more than half of the population may need alteration in the prescription of escitalopram and amitriptyline. Since both these drugs are among the most commonly prescribed antidepressants in Qatari patients, our results highlight the importance of assessing the role of these variants, and their implementation into clinical practice to improve patient outcomes.

Invited Talk-28

Prof. M. Rasool
Director -Sponsored Research and Industrial Consultancy
Vellore Institute of Technology (VIT)
Vellore-632014, Tamil Nadu, India.
Email: mkr474@gmail.com; rasool.m@vit.ac.in

Dr. M. Rasool, a distinguished professor of Immunology is serving as a Director, Sponsored Research and Industrial Consultancy at Vellore Institute of Technology (VIT), Vellore, India. His research focuses on unraveling the molecular pathogenesis of autoimmune-mediated arthrodial disorder - Rheumatoid arthritis (RA) while integrating potent novel therapeutics into RA disease management. He has authored/co-authored more than 100 research articles in reputed International Journals (Google Scholar h-index: 38; i10 index: 81; total number of citations: 3950). To this date, he has completed seven research projects worth above 2.5

crores of Indian rupees funded by National agencies. He has filed two patents (1 International (South Korea) and 1 National) to date towards inflammatory disorders including rheumatoid arthritis and psoriasis. Dr. Rasool was graciously awarded with “Best Research Paper Award” title from Ministry of AYUSH, Govt. of India by Honorable Union Defense Minister of India, Shri. Rajnath Singh, for his significant contribution to Drug Research in Unani Medicine. He has delivered invited talks at various National and International forums including South Korea, Australia, Hong Kong, Indonesia, Bangladesh, and Malaysia. Hong Kong Society of Rheumatology awarded Best Oral Presentation award and Travel award for his invited talk at the International Conference of Chinese Rheumatologists 2019 in Hong Kong. He received the Travel Award and Best Poster Presentation Award from the Korean Society of Rheumatology for his presentation at the 39th Korean College of Rheumatology Annual Scientific Meeting 2019 in Seoul, South Korea. He has been recognized among the World Top 2% scientist by Stanford University consecutively the year 2021 and 2022. To date, he has mentored 14 research scholars who have completed their doctoral studies and are placed in good positions abroad and in their home countries. He is currently heading a research team who are working on topics related to alternative therapeutic options in inflammatory disorders. A par of being an active researcher, he is also an active member of the Indian Immunology Society and a reviewer for several internationally reputed journals.

Majoon chobchini restrains dendritic cell activation via increased PD-L1 expression and reinvigorates Th17/Treg balance in the treatment of rheumatoid arthritis

Dendritic cells (DCs) are the critical elements in the promotion and maintenance of autoimmune responses in rheumatoid arthritis (RA) disease settings. Targeting DCs to inhibit the loading and subsequent presentation of self-antigens to CD4+ T cells is a promising strategy in the treatment of RA. Here, for the first time, we provided proof that majoon chobchini, an unani compound, influences PI3K/FOXO3/PD-L1 signaling axis and abolishes DC maturation that ultimately impedes CD4 + Th17 differentiation in favour of Treg cells in RA. CD 11c + DCs were isolated from spleen of experimental animals after in vivo treatment and subjected to flow cytometry for analyzing CD86, MHC Class II and PD-L1 positive DCs in AIA rats. Also, CD4 + T cells were isolated to determine the Th17 and Treg populations and the expression of their effector cytokines (IL-17 and IL-10) at the protein and mRNA levels. Next, to determine the therapeutic mechanism of majoon chobchini on altered DC activation, the PI3K/FOXO3/PD-L1 axis was evaluated *in-vitro*. Majoon chobchini restricted MHC II, CD86 expression and, subsequently, increased PDL-1 levels in DCs in-vivo. Consequently, Th17 cell differentiation was hindered while escalating the Treg population in AIA rats. Remarkably, majoon chobchini curtailed the destructive effects of IL-17 (a Th17-associated cytokine) via a reciprocal increase in IL-10 (Treg associated cytokine) levels in AIA rats. Mechanistically, majoon chobchini reinstated FoxO1 nuclear stabilization and PD-L1 levels through dampened PI3K/AKT phosphorylation. In conclusion, these findings define that modulation of PI3K/FOXO-3 signaling ablates DC-Th17 cell pathogenicity via increased PD-L1 expression, which provides a therapeutic framework for the robust efficacy of majoon chobchini against RA in clinical settings.

Session 8: Best Young Scientist Paper Award Competition

OP-1

Expressional ratio of human GADD45α and aurora kinase A in Indian cervical cancer patient cohort: Implications in predicting radiotherapeutic success

Salini Das[1*], Dilip Kumar Ray[2], Manisha Vernekar[3], Debarshi Lahiri[4], Sutapa Mukherjee[1]
[1]Department of Environmental Carcinogenesis & Toxicology
[2]Department of Medical Physics; [3]Department of Gynaecological Oncology
[4] Department of Radiation Oncology; Chittaranjan National Cancer Institute
37, S. P. Mukherjee Road, Kolkata 700026, India. Email: salinidas1992@gmail.com

Therapeutic modality of cervical cancer relies predominantly on radiotherapy, particularly at the advanced stages. However chronic exposure to fractionated doses of ionizing radiation can lead to poor radiation response. Therefore, it is necessary to find predictive biomarkers for better treatment outcomes. The extent of radiotherapeutic success depends on DNA damage response and cell cycle progression. The primary objective of the study is to analyze the expressional extent of a DNA damage inducer GADD45α and a cell cycle regulator Aurora Kinase A in the cervical cancer patient biopsy samples. The cervical tumor biopsy samples were collected from patients of CNCI before and after the completion of radiotherapy. The expressional status of these two molecules at the RNA and Protein levels were examined by RT-PCR, Western Blot, Flow cytometry, and ELISA methods. *In Silico* Meta Data analysis was also performed from global cervical cancer records. Interestingly the patients with high expression of Aurora Kinase A but significantly lower expression of GADD45α showed inferior response towards radiotherapy in terms of poor overall survival. Contrarily, patients with high GADD45α and low Aurora Kinase A expression showed improved overall survival and better radiation response as observed in terms of tumor regression and survival analysis data. All these observations were further validated with clinicopathological correlations. This study evidentially emphasized that determining the expressional status of Aurora Kinase A and GADD45α in the pre-treatment biopsy samples would be a rational approach to predict the radiotherapy response and hence, can be prescribed accordingly.

Keywords: Cervical Cancer, Radiotherapy response, Aurora Kinase A, GADD45α, Predictive Marker

Highlights:

- Expressional status of proteins in pre-treatment biopsy samples can be used as markers of radiotherapy response.
- Overexpression of Aurora Kinase A is associated with poor radiation response.
- Downregulation of GADD45α imparts compromised radiotherapeutic effect.
- A standard expressional ratio of human GADD45α and AURKA in the Indian Cervical cancer patient cohort implies predictivity against radiotherapeutic success**.**

OP-2

Association of NOS3 gene polymorphism and nitric oxide levels in asthma patients –A case-control study

Aswathi Pootheri[1] Narmada Ashok[3] Wilner Martinez Lopez[2] Radha Saraswathy*****

1. Dept of Biomedical Sciences, Biomedical Genetics Research Lab, School of Biosciences & Technology, Vellore Institute of Technology, Vellore-632014, Tamil Nadu, India
2. Genetics Department, Instituto de Investigaciones Biológicas Clemente Estable, Avenida Italia 3318, 11600, Montevideo, Uruguay
3. Department of Pediatrics, Nalam Medical Centre and Hospital, Vellore, Tamil Nadu, India
****Corresponding Author** Email:radhasaraswathy@vit.ac.in*

Asthma is a multifactorial chronic inflammatory disease the symptoms of asthma include wheezing, coughing, and shortness of breath. The global prevalence of asthma ranges from 1% to 22% of the population in different countries with an estimated 358 million people suffering from asthma. Occupation, socio-economic status, family history, climate change, and pollution are the major risk factors for asthma. The single nucleotide polymorphisms in asthma-associated genes are considered as one of the important biomarkers. The study aims to identify the genetic predisposition of *NOS3 rs207044* gene polymorphism and nitric oxide levels in asthma patients and controls. Out of n=500 subjects recruited, asthma patients were n=250, and age-matched controls were also n=250. Amplification Refractory Mutation System-PCR analysis of *rs207044* polymorphism showed a significant association with asthma patients ($P<0.05$). Using nitric oxide assay, the nitric oxide levels in asthma patients were higher than in the control group ($P<0.05$). Results confirm the imbalance of nitric oxide levels in asthma patients supporting the concept of systemic oxidative stress in asthma disease. This research will pave the way for the early care of asthma patients, who are impacted by a variety of risk factors.

Keywords: Asthma, Genetics, Nitric oxide, and Oxidative stress

OP-3

Morphological and molecular implications of cadmium hormesis in *Solanum lycopersicum* L.

Risha Ravi, Manish Yadav, Santosh R. Kanade*
Department of Plant Sciences, School of Life Sciences,
University of Hyderabad, Gachibowli, Hyderabad Telangana 500046
Email:san@uohyd.ac.in

Hormesis is a dose-response relationship, where a low dose of stress or a toxic compound exhibits a stimulatory effect opposite to the inhibitory response exhibited by a high dose of the same. The recent developments in hormetic studies are of paramount importance in plant research, which helps in risk assessment of environmental contaminants, protects the vegetation against pollution, and improves crop productivity. As one of the most toxic contaminants, cadmium was considered to have detrimental effects on the growth and

development of plants. However, recent studies have revealed the beneficial effects of cadmium in plants at low levels where the exact mechanism is poorly deciphered. In this study, we found out that low cadmium exposure resulted in improved growth, higher biomass, and higher photosynthetic rate in tomato plants. To get a more comprehensive understanding of the phenomenon, comparative transcriptomic profiling of the roots and leaves of 15-day-old tomato plants treated with low (1µM) and high (50 µM) doses of cadmium for 5 days was performed against control. Pathway enrichment analysis of the Differentially Expressed Genes (DEGs) showed that in low doses, they are mainly involved in important molecular events like oxidative phosphorylation, taurine metabolism, vitamin B6, and glucosinate biosynthesis, etc. Among the pathways enriched, we found the taurine pathway to be more interesting and important to be studied in cadmium hormesis. Taurine an amino acid rarely encountered in plants is proven to improve growth, nutrient uptake, and photosynthetic pigments by regulating ROS scavenging, secondary metabolism, and ion homeostasis under stress. Thus, understanding the molecular mechanisms of taurine metabolism will help us to get a wide understanding of hormesis and the identification of molecular targets that benefit the growth and development of plants can be used to improve plant health and productivity.

Keywords: cadmium hormesis; oxidative phosphorylation; taurine; tomato; ROS; transcriptomic analysis.

OP-4

Association of circadian disruption and its effects on the quality of sleep among diet-induced obese *Drosophila melanogaster*

Damini, C. S and V. Shakunthala
DOS in Zoology, Manasagangotri, University of Mysore, Mysore, Karnataka, India. Email:damini.c.s@gmail.com

Circadian rhythm is a natural phenomenon that oscillates over 24 hours of light and dark phases, controlled by external cues such as food, body temperature, and sleep/wake cycles via SCN (suprachaismatic nuclei). Disruptions in the circadian cycle might arise because of shift work, artificial light, and diet, which can lead to sleep disturbances and cause metabolic disorders followed by obesity. Studies on rodent models fed high-fat diets showed chronic circadian disruption leads to sleep disruption, metabolic disorders, sleep apnea, cardiovascular disease, and neurological disorders with behavioral and biochemical alteration. These symptoms have been tried to ameliorate using a TRF (time-restricted feeding) regime. The use of TRF in the food consumption diet regime is promising and shows a positive effect on animal models by improving cardiac health and sleep in overweight individuals. The present study aims to decipher the sleep quality of the flies in different feeding regimes, with 1) a high-fat diet (HFD), 2) HFD + TRF, and 3) ND (normal diet), and 4) ND + TRF as a positive control among the flies. The locomotor activity assay was used to identify behavior in the *Drosophila melanogaster* control and treated groups using the Tri-Kinetics Drosophila Activity Monitoring (DAM) System. A normal run at 25°C is 5 days of 12 h light and 12 h dark (5LD), followed by 7 days of 24 h dark (7DD). Thus, assays

simultaneously assess both circadian and sleep behavior, allowing for high-throughput data analyses using ShinyR-Dam software. The day and night activity was compared among flies and showed more activity during the day in ND and ND+TRF, whereas HFD and HFD+TRF had less activity during the day and more activity during the night. The quality of sleep under different diet regimes was observed, and the sleep quality of the HFD group was found to be dampened when compared to other diet regime groups. Improving sleep quality is crucial for fixing the circadian rhythm, which in turn, aids in addressing the issue of obesity.

Key words: circadian rhythm, Time-Restricted feeding, Obesity, sleep, *Drosophila melanogaster*

OP-5

Methyl parathion-induced oxidative stress causes genotoxicity and expression of cancer-linked genes in human lymphocytes

Anet Antony[a,b], O. Shilpa[a,b], K.P. Anupama[a,c], M. Shanthala[d], H. P. Gurushankara[a*]

[a]*Department of Zoology, School of Biological Sciences, Central University of Kerala, Periya - 671 320, Kasaragod, India*

[b]*Department of Zoology, University of Calicut, Malappuram- 673 635, Kerala, India.*

[c]*Department of Molecular Biology, Kannur University, Dr. Janakiammal Campus, Thalasserry, Palayad- 670 661, Kerala, India.*

[d]*Center for Applied Genetics, Department of Studies in Zoology, Bangalore University, Jnana Bharathi, Bengaluru- 560 056, Karnataka, India*

**Email:hpgurushankara@gmail.com*

Methyl parathion (MPT) is an extensively used organophosphate pesticide in agriculture and public health programs. MPT residues were detected in agricultural-intensive areas, groundwater, surface water, river water, and rainwater. The International Agency for Research on Cancer (IARC) has classified Parathion as "possibly carcinogenic to humans" (Group 2B). However, there is no evidence to prove its carcinogenicity in humans. This study investigates the MPT-induced oxidative stress that causes genotoxicity and expression of the cancer-linked genes in human lymphocytes. MPT is lymphotoxic and genotoxic and induces oxidative stress in human lymphocytes. MPT exposure induces differential gene expression of which 5605 genes (97.36%) were up regulated and 152 genes (2.64%) were down regulated. Among them, 63 cancer-related genes were associated with the growth and proliferation of B and T cells, immunoglobulin production, hematopoiesis, MAPK, and RAS signal transduction pathways and oncogene expressions. Thus, this study evidences MPT carcinogenicity in human lymphocytes.

Key words: Methyl parathion, organophosphate pesticide, oxidative stress, cancer, gene expression, microarray.

OP-6

Plant regeneration from hypocotyl explants of *Turnera subulata* Sm., a key medicinal and ornamental herb.

Ananthu TR* and Dennis Thomas T
Department of Plant Science, Central University, Kerala, Tejaswini Hills, Periye, Kasargod (DT), 671320, Kerala, India. Email: ananthutr95@gmail.com

A quick and easy method has been developed for the rapid regeneration of plantlets from hypocotyl explants of *Turnera subulata* Sm. a medicinally and ornamentally important herb. Mature fruits were collected from field-growing plants and seeds were excised from them. Seeds were washed in running water containing a few drops of teepol. These were then surface sterilized with 0.1 % mercuric chloride for 3 minutes and finally washed with autoclaved water. Seeds were cultured on ½ MS (Murashige and Skoog 1962) basal medium. Hypocotyls were isolated from two-week-old seedlings and cultured in the Murashige and Skoog (MS) medium supplemented with different concentrations of 6-benzylaminopurine (BAP, 0.2 to 1.0 mg/L) alone or in combinations with α-Naphthalene acetic acid (NAA, 0.1 to 1.0 mg/l) for shoot induction. The highest frequency of response (85%) and the mean number of shoots 9.4 ± 0.1 were observed in an MS medium supplemented with 0.8 mg/l BAP and 0.2 mg/l NAA. Optimal rooting was obtained from the isolated hypocotyl-derived shoots on ½ MS medium supplemented with 0.5 mg/L Indole-3-acetic acid (IAA). The rooted plants were transferred to the soil with 90% success.

Keywords: Micropropagation, BAP, NAA, IAA,MS.

OP-7

Pre-natal and lactationale exposure to environmental contaminants: DEHP and cadmium-induced changes in serum biochemistry and tissue histopathology of liver and brain

Lubna Jasmine & P.Mahaboob Basha
Department of Zoology, Bangalore University, Jnana Bharathi Campus, Bangalore, Karnataka, India.

The research delves into the repercussions of di(2-ethylhexyl) phthalate (DEHP), a plasticizer widely used in various products, and cadmium, a heavy metal's exposure during gestation and weaning on the hepatic and neurological parameters of offspring in rats. Dams were divided into four groups, water control olive oil control, DEHP-exposed, and cadmium-exposed. Dosing commenced from gestational day 1 and continued until the weaning period. Post-weaning, blood samples were collected from pups for serum biochemistry analysis, encompassing markers such as SGOT, GGT, ALT, Serum Albumin, Alkaline Phosphatase, Total Bilirubin, Direct Bilirubin, Indirect Bilirubin, Total Serum Protein, Urea, Glucose, CBC, LDH, Cholesterol, and Triglyceride. Subsequently, histopathological examination of the cortex and hippocampus regions was performed. Experimental groups exhibited remarkable changes compared to control groups. Histopathological findings included pyknosis, multinucleated cells, hyperemia, vacuolation, and necrosis in various layers of the

cortex and regions CA1, CA2, CA3, and DG of the hippocampus. These results underscore the neurohepatic implications of DEHP and cadmium exposure during gestation and weaning, emphasizing the need for further investigation into the lasting impact on offspring health in the context of these prevalent environmental contaminants.

Keywords: DEHP, Cadmium, Cortex, Hippocampus, Serum-biochemistry, Histopathology.

OP-8

Consequences of cold stress on neuronal health-A comprehensive study on biochemical indices of oxidative origin & cognitive ability

Tilak D.M & P Mahaboob Basha
Department of Zoology, Bangalore University, Jnana Bharathi Campus, Bangalore, Karnataka, India.

Cold exposure being an environmental stressor, plays a pivotal role in shaping the intricate responses observed in humans & animal subjects however to health in aging animals thereby this study was conducted. Conjugating its role several studies have been made highlighting the core function of cold stress in the modulation of neuronal activity, several aspects need to be addressed in detail to understand the role of cold stress in neuronal health. Aging Male albino rats were exposed to < 5 °C for 6 hours per day for 15 days to mimic environmental cold exposure, and their oxidative status was measured by measuring key markers, such as serum cortisol levels followed by tissue lipid peroxidation, and antioxidant enzyme activities in discrete brain regions. Behavioural responses were evaluated using a reward alternation in the T maze to assess spatial working memory. The study reveals increased cortisol and lipid peroxidation in cold-exposed aging rats. Changes in the antioxidant enzyme suggest an adaptive response to counteract the damage highlighting the plasticity. The intricate balance of the defence system during cold stress exhibited lower scores and diminished memory retention in the reward alternation task. **In summary**, the findings illuminate a deficient ability to tackle the toxic state of cold stress. The observed decline in cognitive function and memory retention in cold-stressed subjects underscores the potential effects of environmental factors on behavioural performance.

Keywords: Oxidative stress, Histology, Cold stress, Behavioural studies

OP-9

Water quality assessment and genotoxicity in fishes of Karamana River, Kerala., India: An insight of microplastic pollution

Ammu C.U. and H.P. Gurushankara
Department of Zoology, School of Biological Sciences,
Central University of Kerala, Periye-671320 Kasaragod, Kerala

Microplastics are emerging pollutants of global concern with widespread presence posing a serious threat to aquatic and terrestrial ecosystems. However, studies on the toxic impacts of microplastic pollution on the environment are very sparse particularly, in the freshwater ecosystem. In this context, the current study assessed water quality and the presence of microplastics in the water and fish samples of the Karamana River, Kerala, India. Also analyzed was whether microplastics present in the river could cause any genotoxicity in fish inhabitants of the said river. The water quality assessment revealed that heavy metals in water were within the acceptable limit, reduced dissolved oxygen (DO), increased biochemical oxygen demand (BOD), and chemical oxygen demand (COD), which indicated river water ecosystem in hypoxic conditions, and the higher level of MPN index confirms the presence of coliforms in this river. The microplastics isolated from the water and fish samples were in fibers, fragments, film, pellets, and foam in nature. The FT-IR spectroscopic analysis confirmed the presence of microplastic polymers such as polyethylene, polypropylene, polystyrene, polyamide, polyoxymethylene, and polyester in the water and fish samples of the Karamana river. The DNA damage was observed in the form of increased length of comet tails in the liver and gill cells of the fish inhabitants of the Karamana river compared with the control fish; this could be due to the microplastic present in that aquatic ecosystem.

Keywords: Microplastics, Water quality, DNA damage, Karamana river

Highlights:

- Karamana river water has coliforms and its condition is hypoxic.
- Microplastics are present in this river water.
- Fibers, fragments, film, pellets, and foams were the types of microplastics.
- Identified microplastics are polyethylene, polypropylene, polystyrene, polyamide, polyoxymethylene, and polyester.
- Fish inhabited in the Karamana river showed DNA damage.
- Genotoxicity in the fish could be caused by the presence of microplastics in the river.

OP-10

Investigating carboplatin-induced neurotoxicity in *Drosophila melanogaster*.

Raifa Abdul Aziz[1], Deepa Mugudthi Venugopal[1] and Shamprasad Varija Raghu[1, 2]

[1]*Neurogenetics lab, Dept of Applied Zoology, Mangalore University, Mangalagangothri, Karnataka, India-574199. Email:raifaazeez@gmail.com*
[2]*Division of Neuroscience, Yenepoya Research Centre (YRC), Yenepoya (Deemed to be University),Mangalore, Karnataka, India-575018.*
Email:shamprasadvarijaraghu@gmail.com

Cancer poses a significant global health challenge and is characterized by a complex interplay of controllable and uncontrollable risk factors. While surgery, radiation therapy, and chemotherapy are the mainstays of cancer treatment, chemotherapy stands out due to its ability to target recurrent tumors throughout the body. However, this approach is often accompanied by severe side effects, including 'chemo brain', a term used to describe cognitive impairments experienced by cancer survivors. The neurotoxic effects of chemotherapy drugs are largely attributed to their chemical composition. To better understand these effects, the present study investigates the neurotoxic potential of carboplatin, a widely used chemotherapeutic agent, using *Drosophila* as an animal model. *Drosophila melanogaster* (fruit fly), a well-established model organism, offers valuable insights into the study toxic effects of carboplatin, a prevalent chemotherapeutic agent. In this study, flies are treated with different concentrations of carboplatin and assessed for their survival, motor, and cognitive behaviours. Additionally, biochemical assays are performed to measure the levels of antioxidant enzymes and gene expression analysis is conducted to investigate the molecular mechanisms of carboplatin toxicity. The highest concentration of carboplatin caused a significant increase in fly mortality. Carboplatin also had a severe impact on fly motor activity, as evidenced by the negative geotaxis assay. Neurotransmitter levels were altered in carboplatin-treated flies compared to untreated flies. Antioxidant enzyme levels also showed significant changes in carboplatin-treated flies. Fluorescent imaging revealed a significant increase in reactive oxygen species (ROS) production in the brains of carboplatin-treated flies. Our findings indicate that *Drosophila*, a model organism, can be used to effectively study the toxic effects of various chemotherapeutic drugs and can be considered a valuable chemo brain model.

Keywords: Chemobrain, *Drosophila*, Carboplatin, CIPN

OP-11

Curcumin, a natural phytochemical by targeting aurora A/B signaling axis compromises acquired doxorubicin resistance in breast cancer cells

Souvick Biswas, Madhumita Roy & Sutapa Mukherjee

Dept. of Environmental Carcinogenesis & Toxicology,
Chittaranjan National Cancer Institute,
37, S. P. Mukherjee Road, Kolkata 700 026, INDIA
Email:biswasouvick@gmail.com

Acquired chemoresistance is the major obstacle to therapy failure in breast cancer. Deregulated preponderance of Aurora-A/B has been suggested to be involved in tumor cell invasion, metastasis, and drug resistance. Therefore targeting the Aurora-A/B signaling axis by curcumin might help reverse resistance to chemotherapy. The study aimed to elucidate the role of Aurora-A/B signaling axis in imparting chemoresistance in breast cancer. Subsequent attempts were undertaken to reverse the phenomena of chemoresistance by curcumin-mediated targeting of Aurora-A/B. Parental MCF-7 was chronically treated with doxorubicin to develop a drug-resistant cell line MCF-$7^{Dox/R}$. Isolated sublines were furthermore characterized by determining the expressional status of Pgp1, MRP1, ABCG2, SLC22A16, Ki-67, and Aurora-A/B. Ectopic overexpression of Aurora-A/B, Clonogenic viability, and Rhodamine 123 accumulation assay were also performed to ascertain their entanglement with developed doxorubicin resistance. The effect of curcumin on the Aurora-A/B signaling axis to reverse chemoresistance was assessed further. Finally, cell cycle analysis and certain apoptotic parameters (TUNEL assay, pro-apoptotic and anti-apoptotic markers) were examined to establish curcumin-mediated reversal of chemoresistance. Overexpression of drug export pumps during doxorubicin resistance is a result of Aurora-A upregulation. Ectopic Aurora-A overexpression and MTT assay furthermore re-confirmed multidrug resistance in addition to doxorubicin. Aurora-B imparts a significant role in the maintenance of chemoresistance. Curcumin (by targeting Auroras) acts as a resistance modifying agent and sensitizes resistant subline towards doxorubicin-mediated G2-M arrest and subsequent apoptosis. Curcumin by regulating Aurora-A/B enhances the efficacy of doxorubicin responsiveness and subsequent apoptosis.

Keywords: Acquired chemoresistance, MCF-7, Aurora-A/B, Curcumin, Apoptosis

Highlights:

- Aurora-A helps in the development of acquired chemoresistance in breast cancer cells *in Vitro*.
- Aurora-B supports the maintenance of acquired doxorubicin resistance.
- Curcumin acts as a resistance-modifying agent.
- Curcumin targets the Aurora-A/B signaling axis & enhances the efficacy of doxorubicin responsiveness.

OP-12

Targeting YBX1 protein interaction network using flavonoid-based drugs: A computational analysis

Sreelekshmi Presanna Kumar1 and Thejaswini Venkatesh1#
1Department of Biochemistry and Molecular Biology,
Central University of Kerala, Periye, Kasargod, Kerala, India
 # corresponding author

Flavonoids are natural polyphenolic compounds that show anti-cancer properties and they are shown to target YBX1. YBX1 (Y box binding protein) is a member of the cold shock domain protein superfamily and regulates transcription, translation, and splicing. Its localisation to the nucleus confers chemo-resistance in breast cancer. Few research studies have revealed that chemoresistance could be overcome by using kinase inhibitors to prevent S102 phosphorylation or siRNA delivery against YBX1. These studies do not take the protein-protein interaction of YBX1 into account to overcome chemo-resistance. We elucidated the PPI network for YBX1 and examined the docking of four flavonoids Quercetin, Fisetin, Rutin, Myricitrin with 7 proteins of YBX1 PPI. STRING network analysis retrieved 20 proteins that interacted with YBX1 and seven cancer proteins such as HSPA1A/HSP70, IGF2BP1, MECP2, G3BP1, EWSR1, PURA, and SYNCRIP were selected for further analysis. SWISS modelling and Ramachandran plot analysis were done to obtain 3D structures for PURA and SYNCRIP. More than 150 research papers were screened for flavonoid drug preparation and Quercetin, Fisetin, Rutin, and Myricitrin were chosen. Docking analysis were performed on all 7 proteins including YBX1 with 4 flavonoids using Autodock Vina. In total, 26 docking sessions were done and HSPA1A and SYNCRIP showed maximum binding energy ranging from -9.9 to -5.9 Kcal/mol. Absorption, Distribution, Metabolism, Excretion, and Toxicity (ADMET) analysis revealed that only Quercetin and Fisetin followed Lipinski's rule of five. Our results indicate that Quercetin and Fisetin can target YBX1 PPI and can serve as good candidates to overcome YBX1-mediated chemo-resistance.

Abbreviations: YBX1: Y box binding protein; IGF2BP1- Insulin-like growth factor 2 mRNA-binding protein 1; EWSR1: RNA-binding protein EWS**.**

Highlights:

- STRING analysis showed 7 cancer proteins to interact with YBX1
- Flavonoids such as Quercetin, Fisetin, Rutin, Myricitrin were chosen for docking after ligand selectivity
- Auto dock analysis showed significant binding energy for HSPA1A and SYNCRIP with all four flavonoids
- Insights are gained for a novel strategy to target YBX1 interactome

OP-13

Solasodine overcomes P-glycoprotein-mediated multidrug resistance in drug-resistant cancer cells and tumor xenografts

Pradhapsingh Bharathiraja and N. Rajendra Prasad *,
[1]*Department of Biochemistry and Biotechnology, Annamalai University, Annamalainagar, Tamil Nadu- 608002, India.*

P-glycoprotein (P-gp) mediated multidrug resistance (MDR) is the leading cause of chemotherapy failure since it causes the efflux of chemotherapeutic drugs from the cancer cells. In this study, we investigated the effect of steroidal glycoalkaloid solasodine as an effective P-gp inhibitor as well as a regulator of their protein expression. *In silico* results revealed that solasodine strongly binds to the active sites of the TMD region of P-gp and further demonstrated to inhibit the transport activity of P-gp by calcein-AM and Rh-123 drug efflux assays. When combined with doxorubicin, solasodine drastically inhibits doxorubicin efflux and mediates its accumulation inside the cells. Furthermore, the chemosensitizing function of solasodine and doxorubicin was investigated, and it was discovered that solasodine reduced the fold resistance of drug-resistant KBChR-8-5 cells and synergistically sensitised doxorubicin. The combination of solasodine and doxorubicin was also observed to increase the apoptotic population, and DNA double-strand breaks, and promote G2/M phase cell cycle arrest in KBChR-8-5 cells. The *in vivo* KBChR-8-5 tumor xenograft investigations revealed that the combination of solasodine and doxorubicin exhibits tumor-suppressing characteristics. In addition, solasodine reduces P-gp expression by reducing NF-κB nuclear translocation in KBChR-8-5 drug-resistant cancer cells. Therefore, we are suggesting that solasodine may be used as a fourth-generation P-gp inhibitor to reverse P-gp mediates MDR in cancer.

Keywords: Chemoresistance, NF-κB, Natural Products, Cancer, P-glycoprotein

Highlights:

- Solasodine reverses P-gp-mediated MDR by inhibiting the transport function of P-gp and modulating its expression
- Solasodine synergistically sensitized doxorubicin to KBChR-8-5 MDR cells
- The combination of solasodine and doxorubicin significantly increased the DNA damage, cell cycle arrest, and apoptosis
- Further, the combination reduced the tumor growth of tumor-bearing nude mice and sensitized the MDR cancer cells

OP-14

Evaluation of liquid biopsies for the detection of circulating tumor cells by using magnetic nanoparticles

Priya Yadav[1] and N. Rajendra Prasad[1]

[1]*Department of Biochemistry and Biotechnology, Annamalai University, Annamalai Nagar-608002, Tamil Nadu, India. Email:priyayadav87@gmail.com*

Circulating tumor cells (CTCs) are the hallmark of the invasive behavior of cancer and are responsible for the development of an aggressive form of cancer and metastasis. The detection of CTCs is extremely crucial for the detection of early tumors in cancer patients. Detection and isolation of CTCs in peripheral blood remain a challenge because of their low abundance. To overcome this challenge nanotechnology provides the platform for sensitive detection and enrichment of CTCs from liquid biopsy samples of cancer patients. The magnetic nanoparticles (MNPs) were synthesized and coated with silica for the efficient tagging of CTCs-specific antibodies. The synthesized MNPs and silica-coated MNPs (MNPs@SiO_x) were analyzed by different techniques to characterize their physicochemical properties. The toxicity of coated and uncoated nanoparticles was evaluated on different cell lines. The cell viability data corroborate that the nanoparticles are biocompatible and have a negligible effect on cell toxicity. Antibody-conjugated MNPs showed significant efficacies for circulating tumor cell capturing and analysis. Therefore, the synthesized MNPs have significant applications in the early detection of CTCs for improved cancer management.

Keywords: Liquid biopsy; Circulating tumor cells; Nanomaterials; Breast cancer; Early detection; Prognostic marker

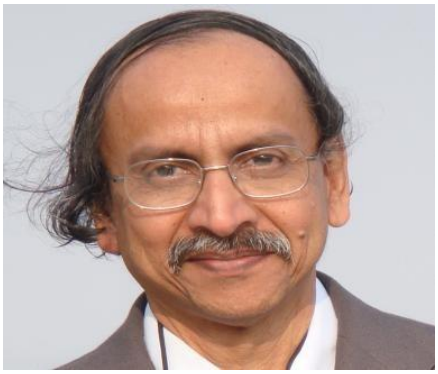
Highlights:

- Circulating tumor cells are secreted in body fluids during cancer metastases and progression
- Liquid biopsies provide enhanced sensitivity in diagnosis and ease of repeated sampling throughout treatment
- Captured CTCs by using nanoparticles can be used for predictive diagnostic markers, cell expansion, and phenotype identification.
- Circulating tumor cells provide detailed insights into tumor molecular and genetic landscape

January 31, 2024, Wednesday

Session 9: DNA damage, free radicals, antioxidants, repair, and food-borne mutagens

Plenary Lecture-8



Prof. Iddya Karunasagar
Advisor, FAO Reference Center for Antimicrobial Resistance and Aquaculture Biosecurity
Nitte University, Mangalore 575018
Email: iddya.karunasagar@gmail.com

Iddya Karunasagar obtained his Masters and Ph.D. degrees in Microbiology from Mysore University. He carried out postdoctoral research at the University of Maryland, USA, University of Sendai, Japan, Natural Resources Institute, UK, and University of Wuerzburg, Germany, where he was a Humboldt Scholar (1991-92) and visiting Professor (1993-2005). He joined the University of Agricultural Sciences (UAS), College of Fisheries, Mangalore as an Assistant Professor, and rose to become Professor and Head of the Division of Fisheries Science. When Karnataka Veterinary, Animal, and Fisheries Sciences University was carved out of UAS, he became the first Director of Research. Indian Council of Agricultural Research (ICAR) awarded him a National Professorship in 2005.

During his academic career, Dr. Iddya Karunasagar worked on food safety, pathogens and toxins associated with seafood, risk assessment, aquatic animal health, molecular diagnostics, and vaccine development. He has served as a member of the Joint FAO/WHO Expert Meeting on Microbiological Risk Assessment (JEMRA). He joined the Food and Agriculture Organisation (FAO) of the United Nations and was based in Rome as a Senior Fishery Officer, where led a Team on fish safety and quality and was based at FAO Headquarters in Rome. He played a key role in several FAO/WHO food safety risk assessments which led to the development of international food standards at the Codex Alimentarius Commission. Following his retirement from FAO, he has been working as an International Consultant to organizations like FAO, WHO, the International Trade Center, and the Asian Development Bank. He continues to be a Member of FAO/WHO JEMRA and a Technical Advisor in FAO projects. He was Senior Director (International Relations) at Nitte University during 2017-2020 and is currently the Advisor (Research and Patents).

Role of environment in dissemination of antimicrobial resistance

Antimicrobial resistance (AMR) is a major problem in human medicine, veterinary, and agriculture sectors. According to estimates from the World Health Organisation, AMR was directly responsible for 1.27 million global deaths in 2019 and contributed to 4.95 million deaths. Antimicrobial resistance evolves naturally through gene mutations or the horizontal transfer of genes between bacteria, but overuse and misuse of antimicrobials in various sectors have led to the selection and proliferation of bacteria carrying AMR determinants. Antimicrobial resistance can be intrinsic in certain bacteria due to their structural features or physiology. When bacteria that are naturally sensitive to antimicrobial resistance become resistant due to the acquisition of certain mobile genetic elements, the resistance is said to be acquired.

Antimicrobial resistance selected in various sectors reaches the aquatic environment through waste water from hospitals, animal farms, and storm water. Hence aquatic environment becomes a reservoir for antimicrobial resistance. The beta-lactamase encoding CTX-M gene responsible for extended-spectrum beta-lactamase activity in many clinical bacteria like *Escherichia coli* is thought to have originated from the aquatic bacterium *Kluyvera*. This gene is chromosomally encoded in *Kluyvera* and is borne on the mobile genetic element, plasmid in most clinical bacteria.

Thus it is important to have a surveillance programme for antimicrobial resistance in different sectors. Codex Alimentarius Commission, the Joint FAO/WHO body setting up international standards for food safety has come up with Guidelines for carrying out integrated surveillance of AMR in different sectors. The Codex Guidelines for risk assessment of foodborne antimicrobial resistance would be a very useful tool to assess the importance of AMR in public health management.

Invited Talk-29

Prof. Asamanja Chattoraj,
Biological Rhythm Laboratory, Kazi Nazrul University,
Paschim Bardhaman, Asansol, West Bengal-713340, INDIA
Email:asamanja.chattoraj@knu.ac.in

Prof Asamanja Chattoraj of the Department of Animal Science, Kazi Nazrul University, West Bengal, is a Fellow of the Society for Reproductive Biology and Comparative Endocrinology (SRBCEFRE-2021) obtained his Ph.D. degree from Visva-Bharati, a central University in West Bengal, India, under the supervision of Prof Saumen Kumar Maitra. His research is mainly focused on the synchronization between environmental stimuli and body physiology

concerning chronobiology. The findings of his group supported the "orchestra" phenomenon in establishing a relationship with the central (brain) and peripheral (gonad/gut) systems about the environmental photo-thermal conditions. Starting from his doctoral study he is engaged in unraveling the mechanism of chronobiological signals (through melatonin) and body response. His doctoral research added a new dimension to the meiotic cell cycle of oocytes where melatonin modulates the action of maturation-inducing hormone (MIH) by activating cyclin-dependent kinase Cdk1 through its complex with cyclin B during the G to M transition. The novelty of his science is the first demonstration of melatonin receptors in any fish gonad. During his post-doctoral studies at the University of Michigan, USA, he emphasized the molecular regulation of the production of indoleamines, which includes studies on the enzymes tryptophan hydroxylase and Arylalkylamine N-acetyltransferase (AANAT) in mammals. Finally, he has been able to set up Octodon degus as a diurnal animal model for chronobiological studies. He served as Assistant Professor at Guru Ghasidas Vishwavidyalay, a central University in Bilaspur, then moved to Imphal, Manipur as Scientist D of the Animal Resources Programme in the Institute of Bioresources and Sustainable Development, an Institute of DBT GoI. His research group first time showed the effect of Artificial Light at Night (ALAN) on central and peripheral regulation and the influence of photic signals on the pineal and extra-pineal melatonin bio-synthesizing enzyme genes in Indian Major Carp. He has produced Ph.D. students, publications in internationally and nationally recognized and reputed journals, and completed several research grants. He received the "Prof MA Akbarsha Oration Award" and "MRE" for his contribution to endocrinology from the SRBCE in 2015 and 2016 respectively. Prof Chattoraj received KNU Best Faculty (Senior), 2022 [in Faculty of Science and Technology] from the IQAC, Kazi Nazrul University, Asansol, West Bengal, India. At present, he is the elected Vice President of SRBCE, India. He is the receiver of the "Prof Saumen Kumar Maitra Best Paper Award" from SRBCE, 2023.

The artificial light at night (ALAN): An agent for the desynchronization of biological rhythm in Zebrafish (*Danio rerio*)

Zeeshan Ahmad Khan, Gopinath Mondal, Sijagurumayum Dharmajyoti Devi, Rajendra Kumar Labala, Subhajit Hazra, Bidisha Banerjee, Abhijit Dan and **Asamanja Chattoraj**[$]

Biological Rhythm Laboratory, Kazi Nazrul University,
Paschim Bardhaman, Asansol, West Bengal-713340, INDIA

[$]*Corresponding & Presenting Author Email:asamanja.chattoraj@knu.ac.in*

The ALAN is a major area for researchers for its ever-increasing evidence on the disruption of the biological rhythm of the organisms. Reproduction and feeding are two physiological processes that have a direct influence on the brain. Moreover, the clock-associated genes are expressed in all the cells and it has a tremendous oscillation to the exposure of light. In the brain, after 72 hours of exposure, the daily expression profile of leptin and enzyme ghrelin o-acyltransferase (goat) show changes in photic conditions that lead to desynchronization of circadian rhythm, and level of melatonin, and ultimately changes Ga-SI. The mRNA expression of appetite-regulating hormones [leptin, nesfatin-1, orexin, ghrelin, goat] in the gut and daily variations of gut melatonin under various photic conditions revealed an overall desynchronization in appetite regulation (after 48 hr). Photoperiod and circadian rhythm influence reproduction. Zebrafish were exposed to continuous light for one week, one month, and one year, revealing a clear desynchronization of clock-associated genes in the ovary. The level of melatonin in the whole brain, retina, ovary, and serum becomes low. RNA-Seq data revealed the upregulation of Mid2, Tfg, Irak1, Pim2, Tradd, Tmem101, and Nfkbib genes that ultimately increase the expression of NF-κB, and facilitate tumorigenesis. 1791

upregulated genes were explored, of which 438 genes are associated with other physiological disorders. Our study indicates anthropogenic sources of ALAN are increasing day by day and this leads to the desynchronization of circadian rhythm and leading towards several lifestyle diseases.

Invited Talk-30

Dr. Sathees C Raghavan
Professor, Department of Biochemistry
Indian Institute of Science, Bangalore 560012, India.
Email:sathees@iisc.ac.in

Prof. Sathees C. Raghavan obtained his PhD from Banaras Hindu University, India, and then went on to do his postdoctoral research at the University of Southern California, Los Angeles, USA. His research group at the Indian Institute of Science (IISc), Bangalore focuses on deciphering the mechanism of genomic instability in leukemia and lymphoma. Besides, his group also explores the role of the immune system in the genesis of chromosomal abnormalities, DNA repair, and cancer therapeutics. He has published over 170 research articles in internationally peer-reviewed journals and has obtained several patents. Dr. Raghavan is the recipient of several awards including the Shanti Swarup Bhatnagar Prize (2013), Leukemia Research Foundation (USA) 2010, Kobayashi Foundation Award (KFA), 2016, NASI-Reliance Industries Platinum Jubilee Award (2015). He is also a "Fellow" of the National Academy of Sciences, Allahabad, and the Indian Academy of Sciences, Bangalore. He is currently an Editor of FEBS Journal, UK.

Understanding the Impact and Mechanism of Action of Endosulfan, a Pesticide, on Fertility, Development, and Growth of Mice

Pesticides are chemical formulations applied deliberately in the environment primarily for pest control and to increase yield in agriculture. In recent years, pesticide residues are often detected in agricultural products, threatening the environment and human health. Organochlorine pesticides are one of the earliest pesticides introduced in the world. Due to their persistence and the long range of transport in nature, the residues of organochlorine pesticides are still detected in the environment. Because of the adverse effects observed, most of them are banned in developed countries, however still used in the majority of Asian countries. Therefore, the study of the health and environmental effects of these pesticides is relevant and warranted. Endosulfan (ES) is one of the major broad-spectrum organochlorine

pesticides categorized as class II (moderately hazardous) by WHO and Class I (highly acutely toxic) by US Environment Protection Agency. Various epidemiological and animal studies have reported ES and its metabolites as neurotoxic, genotoxic, and toxic to reproductive organs. Previous studies from our laboratory have shown that exposure to Endosulfan can cause infertility in male mice due to testicular atrophy and reduced sperm count. Endosulfan (ES) treatment induced DNA damage, altered DNA damage response, and promoted the error-prone DNA repair pathway called microhomology-mediated end joining (MMEJ). Various studies from the literature showed that the serum concentration of ES in the affected human population is 2 to 547.6 µg/L and up to 700 µg/L (2 h after exposure), which is much higher than that was used in our previous study (20-25 µg/L). Therefore, to study the effect of ES in environmentally relevant concentrations, we have exposed mice with 5 mg/kg body weight. Bioavailability analysis in mice serum revealed a ~53 µg/L concentration. Results revealed that ES affected the normal physiology of mice. Hematological analysis, liver function test, and kidney function test showed a decrease in the bilirubin total, creatinine, and BUN in the treated mice. Besides, an increase in neutrophils, monocytes, total leukocyte count, and decreased lymphocyte percentage were observed in treated mice. Furthermore, our results showed that ES treatment resulted in infertility in most female and male mice upon treatment with ES. While treatment with Endosulfan resulted in infertility in 55% of male mice, it was 62% in females. Besides compromised fertility, exposure to Endosulfan in mice resulted in abnormal growth and development. The progenies of the ES-treated mice were born with multiple developmental defects like delayed fur development, delayed eye-opening, abnormal walking patterns, difficulty in parturition, etc were evident. A significant reduction in body weight of new-born from treated mice was also observed, which was more prominent when both parents were exposed to ES. Histopathological analysis of testis from postnatal day 12 mice showed a reduction in the size and number of seminiferous tubules. Further detailed analyses through TUNEL assay revealed long-term testicular cell death, indicative of persistent damage. Evaluation of DNA breaks using 53BP1 staining in mice testis from postnatal day 12 showed several 53BP1 positive cells in seminiferous tubules, unlike control animals. Consistent with the observed increase in DNA breaks in cells from reproductive tissues, an increase in expression of DNA ligase III was also observed, which was consistent with previously reported elevated levels of MMEJ-mediated repair. Furthermore, RNA-seq analysis of tissues from treated, control, and progeny mice revealed the deregulation of several genes associated with gametogenesis and DNA repair pathways in the testis and ovary. Thus, using the mice model system, we could recapitulate several developmental defects observed in people living in Endosulfan-exposed areas. In conclusion, our study is relevant to the present Indian scenario and highlights the relevance of tight regulation when it is used.

Invited Talk-31

Dr. Devashish Rath
Applied Genomics Section, Bhabha Atomic Research Centre,
Mumbai-400085, India. Email:devrath@barc.gov.in

Investigation of biodegradation of the organopollutant tributyl phosphate by *Sphingobium* sp. RSMS

Industrial use of tributyl phosphate (TBP), generates large volumes of TBP-containing waste. This phosphotriester compound is used for extracting uranium and plutonium in nuclear fuel reprocessing facilities. In addition, TBP is used in defoamers, plasticizers, herbicides, and hydraulic fluids. Previous studies have shown the toxic effect of TBP on marine life in aquatic habitats and developmental toxicity in animals upon ingestion of TBP. In view of the drawbacks associated with physical and chemical methods of degradation, there is an interest in finding microbes that can degrade TBP. *Sphingobium* sp. RSMS (RSMS strain) isolated from BARC, Mumbai, can utilize TBP as the sole source of carbon and phosphorous and has shown good promise for biodegradation. Our earlier work in the RSMS strain elucidated the biochemical pathway of TBP degradation in this bacterium. However, nothing is known about the genes and enzymes involved in TBP biodegradation. To identify the genetic determinants of the TBP degradation pathway we took a comparative genomics approach. A mutant that had completely lost the ability to utilize TBP was generated and characterized. The whole genome sequencing of the RSMS strain and the mutant was carried out and a high-quality assembly of the genomes was generated. As the genome had high GC content and was rich in repeat elements, the gaps were closed by targeted sequencing of clones from a genomic library of RSMS created in a fosmid vector. Comparative analysis of the mutant and the wildtype identified an approximately 38 Kb region missing from one of the plasmids of the mutant. Analysis of this region, identification of some of the genetic determinants of TBP degradation pathway, and further characterization of the gene products will be discussed.

Invited Talk-32

Ramendra Pati Pandey
School of Health Science and Technology
UPES, Dehradun, 248007, Uttarakhand, India
Email: ramendra.pandey@gmail.com

Dr. Ramendra Pati Pandey is an Associate Professor at the School of Health Science and Technology, UPES, Dehradun, India. He was a FAPESP Post-Doctoral Fellow (from September 2015- January 2019), a very prestigious fellowship of Latin America at the Department of Medicine-InCor/HC- FMUSP, University of Sao Paulo, School of Medicine, Brazil. He was working on new therapies for Chagas disease: Using repurposing of drugs acting on the Cell invasion and Autophagy progression of host cells and Potentiation of drug effect using Biopolymeric nanoparticulate Drug Delivery Systems against *Trypanosoma cruzi*. He was a Research Associate (from September 2013 to August 2015) at the Translational Health Science and Technology Institute, Faridabad-Gurgaon Expressway, Faridabad Gurgaon, India. Where he and his group have identified Transcription factor Foxo1 as essential for IL-9 induction in T helper cells, and this work has been published in Nature Communications Journal. And, there was one patent (Application Number-(E-5/1022/2016) on Therapeutic evaluation of Compound 1. Before joining as a research scholar for his Ph. D., he got a fellowship from the National Science Council of Taiwan to work at Chang Gung University for two years from March 2007 to March 2009, where he along with the Taiwan group was able to conclude that the Phenotype of Tolerized Auto reactive $CD8^{+}$T Cells is Context-Dependent in murine model. He has written a book chapter on Liver Transplantation during that time. He did his Doctorate Degree (2014) from the University of Delhi and TACF (Tuberculosis Aerosol Challenge Facility) at the International Centre for Genetic Engineering and Biotechnology), New Delhi, India. During his Ph.D., he developed nanoparticles carrying two secretory proteins of Mycobacterium tuberculosis - CFP-10 and CFP-21 and evaluated their potential to invoke an immune response coupled with oxidative stress when encapsulated in nanoparticles. He did his M.Sc. in Biotechnology (2006)- from the School of Biotechnology, Jawaharlal Nehru University (JNU), New Delhi, India. He was an executive council member of the Indian Immunology Society (2014-2016). He is an editorial board member of more than 10 journals and Editor-In-Chief of the Indian Journal of Hospital Infection. He has been awarded the Department of Science and Technology, Government of India Young Scientist Award (2010), Senior Research Fellowship from the Indian Council of Medical Research (2010), Indian Immunology Society Young Scientist Award (2013), European Federation of Immunological Societies (EFIS) Travel Award (2012), British Society of Immunology

Travel Award (2012), Federation of Immunological Societies of Asia Oceania Young Scientist Award (2012 and 2015), American Association of Immunologists Travel Award (2013), International Union of Immunological Societies Travel Award (2013), and, The Federation of Clinical Immunology Societies Travel Award (2017). He has published more than 20 research articles and reviews in both international and national journals. He is a member of various International and National Scientific Societies. He has been selected and received the Early Career Scientist Award from the British Council and the Newton Fund (2019), Member of the Royal Society of Tropical Medicine and Hygiene, Admitted to membership of the Royal Society of Chemistry, and International Scientist Award (2020). Recently he was elected as a member of the National Academy of Sciences, India (2021), and selected as an Associate Member of the esteemed Academy "International Academy of Physical Sciences, Prayagraj (2022), Elected as a member of the National Academy of Medical Sciences (2022), Elected as a member of the National Academy of Biological Sciences (2023), National Environmental Science Academy (2023), Sigma Xi the Scientific Research Honor Society (2023), Universal Scientific Education and Research Network (2023). Recently he has been appointed as an Ambassador of the Royal Society of Biology, UK, London (2023).

One health approach: Heightening the fight against antimicrobial resistance

Excessive use of antibiotics has increased antimicrobial resistance (AMR) worldwide, which is a major public concern among the countries. To control this threat proper monitoring of antimicrobial usage with a n increasing rate of AMR is required. Moreover, alternatives forantibiotics are surveyed and are being researched for quick use in the future. Thus, multisectorintervention is highly encouraged for better outcomes. In this research article, six differentEuropean countries are discussed in terms of antimicrobial usage and AMR in human and livestocksectors with the help of a literature study and various reports published by different organizations. A data study has been conducted to collect data for comparison study. Data sources of AMR and antimicrobial usage are analyzed and both antimicrobial use and AMR are compared. This article provides surveillance systems that are formed to keep track of the upcomingsituation of AMR and the consumption of antimicrobials by humans as well as animals. The articlefirmly allows the readers to get broad information about the AMR across six countries of Europe.These annual reports have hugely helped the government to decide on alternatives and have focused on many training activities to combat the AMR situation globally. As antibiotic resistance genes persist on an interface between environment and animal and animal health, an approach is required in all three areas that stress the concept of “One Approach to Health.” AMR prevention is linked to the One Health concept. As antibiotic resistance genes persist on an interface between environment and animal health, an approach is required in all three areas that stresses the concept of “One Approach to Health.”

Keywords: Alternative antibiotics, AMR, Comparative medicine, One Health Approach, Surveillance

Invited Talk-33

Sinosh Skariyachan
Department of Microbiology, St. Pius X College Rajapuram,
Kannur University, Kerala, India
Email:sinoshmicro@stpius.ac.in, sinoshskariya@gmail.com

Dr. Sinosh Skariyachan is working as an Assistant Professor in the Department of Microbiology, St. Pius X College Rajapuarm (Aided by Govt. of Kerala)-Kannur University, Kerala, India. He has pursued his post-graduation in Microbiology (M. Sc) and Bioinformatics (M. Sc) (Bharathiar University, Coimbatore, Tamil Nadu) and obtained his Ph. D in Biotechnology (Visvesvaraya Technological University, Belagavi, Karnataka). He has 19 years of experience in teaching and research. His key research areas are Computational Biology and Bioinformatics, Molecular Modelling and Computational Drug Discovery, *In-silico* bioprospecting, Chemoinformatics, Medicinal Chemistry, Medical Microbiology, and Environmental and Food Microbiology. He has computationally developed interaction models of potential lead molecules and prospective targets of several microbial pathogens by *in silico* bioprospecting and chemoinformatic approaches. He screened novel chromophoric and fluorophoric therapeutic metabolites from symbiotic bacteria associated with marine sponges toward drug-resistant bacteria. He has isolated several thermophilic bacterial consortia from extreme environments and formulated novel microbial consortia that showed enhanced degradation to low and high-density polyethylene and polypropylene. He published 77 International papers (*h* index-22, *i10* index-36), 87 conference papers, one textbook, 15 invited book chapters and several scientific periodicals to date. He has received several awards such Best Microbiology Teacher Award (National Level) from the Microbiologists Society, India (MBSI), the Young Scientist Award by the Association of Microbiologists of India, the Young Investigator Award from India and South East Asia by the International Society of Infectious Disease and many more. He has received best paper awards from more than 25 conferences and symposiums. He has received several grants for his research. He is a life member of more than 20 scientific and professional societies (including EMSI). He serves as editor and editorial board member for premier international journals and reviewer for more than 130 SCI-international journals. He has deposited more than 45 novel molecular sequences in public databases and served as a plenary speaker and resource person for more than 40 National and International conferences, symposiums, and workshop/training programs.

In silico bioprospecting of novel natural lead molecules as potential inhibitors against multi-drug resistant *Acinetobacter baumanii* and *Pseudomonas aeruginosa*

Multidrug-resistant *Acinetobacter baumannii* (MDRAb) and *Pseudomonas aeruginosa* (MDRPa) were declared as priority-I & II pathogens, respectively by WHO (2019) and screening of potential therapeutic agents have profound scope and applications. This study aimed to identify natural lead molecules as potential inhibitors against MDRAb and MDRPa by *in silico* bioprospecting. Based on the metabolic pathway analysis, protein RecA (RecA) and orotate phosphoribosyltransferase (PyrE) were identified as potential drug targets for MDRAb. The three-dimensional structure of RecA and PyrE were computationally predicted. A library of natural molecules was constructed and subjected to virtual screening, molecular docking, and molecular dynamic simulation. The therapeutic potential of computationally predicted molecules was validated by *in vitro* studies. Computational screening suggested that out of 236 molecules selected from the library, 06 leads were qualified for drug likeliness and pharmacokinetic features, and one molecule-natural epiesteriol exhibited significant binding towards RecA and PyrE in comparison with the binding of faropenem and polymyxin E towards their usual targets. MD simulations suggested that epiesteriol-receptor complexes demonstrated stability throughout the simulation. The *in vitro* assay substantiated the finding. Similarly, Celastrol in *Celastrus paniculatus* and Rotiorinol in *Chaetomium cupreum* showed better binding with GacA (binding energy -7.2 kcal/mol) and RhlR (binding energy -8.0 kcal/mol) of MDRPa, respectively, when compared to the binding of Meropenem and its target. MD simulation studies and the *in vitro* studies confirmed the inhibitory potential of these molecules ($p \leq 0.05$). The present study suggested that natural molecules screened by *in silico* bioprospecting can be used as potential binders toward the identified targets of MDRAb and MDRPa.

Session 10: Tools in Biology and Lifestyle Diseases (Parallel)

Plenary lecture-9

Dr. G. Umapathy
Chief Scientist and Group Leader
Laboratory for the Conservation of Endangered Species (LaCONES)
CSIR-Centre for Cellular and Molecular Biology (CCMB)
Hyderabad 500048 INDIA. Email:guma.ccmb@nic.in

Prof. Umapathy after doing M.Sc. Wildlife Science (Gold medalist) from Bharathidasan University, Tiruchirappalli, he got his Ph.D. from Salim Ali Centre for Ornithology and Natural History, Coimbatore (1998). After 2 yrs of post-doctoral studies, he joined CCMB in 2000 and was involved in setting up the Laboratory for Conservation of Endangered Species (LaCONES) at CSIR-CCMB. He is Chief Scientist and Group Leader at LaCONES, CSIR-Centre for Cellular and Molecular Biology (CCMB, Hyderabad), Department of Science and Technology, Govt. of India. He is also a Professor at the Faculty of Biological Sciences, Academy of Scientific and Innovative Research (AcSIR), New Delhi, and an Adjunct Faculty member at the National Institute of Advanced Studies, IISc Campus, Bangalore, India. His research interests include Biodiversity Conservation and Conservation Genomics. Publications: Peer-reviewed research papers (SCI journals) – 95 including two papers in Science and two papers in Nature journals, Book chapters – 7; Co-Authored book -1; Manuals – 6; Reports- 18; Patents: Patents-2 Non-invasive pregnancy detection in cattle and Buffaloes. Member /Fellowship in National and International Organizations / Society: International Union for Conservation of Nature (I*UCN)* – Species Survival Commission, Gland, Switzerland; IUCN - Conservation Planning Specialist Group, IUCN – Primate Specialist Group; IUCN- Reintroduction Specialist Group – South Asia (*RSG-SA);* Editorial board of PLOS ONE; PLos Biodiversity and Conservation, Frontiers in Ecology and Environment. Associate Editor in the Journal of Endocrinology and Reproduction and Frontiers in Conservation Science. Expert Committee member in Andhra Pradesh and Telangana Biodiversity Boards; Board member of Osmania University, Hyderabad and Forest Research Institute Telangana; Expert member for Hyderabad Central University. Fellow of Telangana Academy of Sciences, Telangana. Fellow of the Society for Reproduction and Comparative Endocrinology. Research projects are undertaken as Principal investigator: 22 externally funded research projects (grants) from DST, DBT, CSIR, NTCA, CZA (MoEF), MoES, US, and Fish Wildlife Service have been undertaken so far.

Biotechnological tools in biodiversity conservation

Approximately one-quarter of the world's mammal species, one-eighth of the birds, and one-third of the amphibians are considered to be threatened with extinction. About one thousand species have been listed as critically endangered, and these need immediate attention. Conservation responses in the field can be directed towards habitats or localities or can work directly with species by management interventions (in situ) or captive breeding (ex-situ). The CSIR-CCMB established the Laboratory for Conservation of Endangered Species (LaCONES) in collaboration with the Central Zoo Authority of India and the Department of Biotechnology to cater to the needs for the conservation of endangered species in India using modern biotechnological tools. LaCONES-CCMB has been involved during the last 24 years in the field of conservation of endangered animals to develop molecular markers for ascertaining their genetic status and to develop assisted reproductive technologies. Over the years, many genetic and reproductive techniques that have been developed and standardized for the conservation of endangered animals will be discussed in the meeting.

Invited Talk-34

Dr. Swaminathan Sethu
Scientist-Immunology | GROW Research Laboratory
Narayana Netralaya Foundation | India
Adjunct Faculty | MAHE | India.

Principal investigator in basic and translational research interfacing Ophthalmology and Immunobiology. He graduated with a Bachelors in Dental Surgery (BDS) from The TN Dr MGR Medical University, Chennai, India. He then went on to do his graduate studies at National University of Singapore (NUS). He worked on dental biomaterials for his Masters (MSc) in Restorative Dentistry and in "Cellular and Molecular Immunology" for his doctoral degree (PhD) at the National University of Singapore (NUS). He continued his research career as a research fellow at NUS and at the University of Liverpool, UK where he was working on immunological perspectives of tumour biology, radiation biology, and adverse drug reactions. Currently, he is pursuing his academic/research career path primarily investigating immune-mediated pathologies of the eye including infectious and non-infectious conditions. In addition, his work involves biocompatibility and immunotoxicity studies of novel biomaterials. He is also involved in the development of non-invasive biological sampling methods for population-based screening. He has co-authored over 75

research articles in peer-reviewed national and international journals. He is an enthusiastic teacher and is actively involved in lecturing and mentoring students. He supports evidence-based learning & preventive approaches in medical sciences, and public engagement of science.

Tear fluid in personalized medicine and public health screening – eyeing beyond

Biomarkers have revolutionized personalized care in various fields of medicine and in improving public health. The effectiveness and sustainable application of a biomarker in patients and population at large is primarily dependent on the source of the biological sample. The sample should be collected with ease, preferably with limited technical skill requirements, potential to quantify multiple makers, integration to other health parameters, and economically feasible. Blood remains a biological sample source for biomarker screening in personalized medicine and public health screening. Despite it being a minimally invasive procedure, collection of blood requires skilled personnel and specialized collection kits. It also involves risk of injury and needle stick associated discomfort. Tear fluid on the other hand, has emerged as the most non-invasive, economical, quick, and easy to collect biological sample that satisfies all the requirements for a biomarker sample source. Tear fluid produced by the lacrimal gland has been used to measure the levels of proteins, ions, and metabolites that were distinctly altered in patients compared to healthy subjects. A positive association between the levels of various secreted proteins and nutrients were observed between serum and tear fluid. Tear fluid-based biomarkers have helped stratify patients and prognosticate disease progression in various eye diseases (including dry eye disease, keratoconus, Steven Johnson Syndrome, retinopathies), neurological conditions, autoimmune conditions, cancers, and metabolic disorders. In addition to host proteins, tear fluid-based screening has enabled non-invasive ways to determine foreign substances including pharmaceutical agents, environmental toxicants and mutagens including trace elements and heavy metals. Exfoliated lacrimal gland duct cells and ocular surface epithelial cells in the tear fluid has also been used to assess genotoxic status and host response signatures to various toxicants in a non-invasive manner. Hence, tear fluid has emerged as an alternative sample source in biomarker assisted personalized medicine and public health screening initiatives.

Invited Talk-35

Dr. K G Raghu
(Former Chief Scientist CSIR NIIST)
Jubilee Centre for Medical Research
Jubilee Mission Medical College & Research Institute, Trichur, India

Dr.K G Raghu former chief scientist from CSIR NIIST, Thiruvananthapuram is an established molecular pharmacologist, known for his contribution to metabolic syndromes and reverse pharmacology. His finding on the role of mitochondrial injury and ER stress in the genesis of insulin resistance has been a landmark in the drug discovery research of diabetes. Research on traditional knowledge via reverse pharmacology has led to the generation of many effective leads for metabolic syndromes. His finding on the role of altered mitochondrial function associated genesis of cardiac hypertrophy and ischemia has opened new areas for research in cardiovascular science. He has also extensively contributed in the areas of mitochondrial antioxidants, phytomedicine, nutraceuticals against toxicity of anticancer drugs, and glycation-associated toxicity. In addition, Dr.Raghu has immensely contributed in the area of safety pharmacology in the early phase of drug discovery through his expertise in electrophysiology. He has published more than 115 original research papers, 5 review articles, 1 book, 10 book chapters, and filed 2 patents. He has mentored 18 Ph.D. students and 5 post-docs and executed 18 projects of various funding agencies like CSIR, DBT, ICMR, SERB, DST, etc. He is also a fellow of the Indian Academy of Biomedical Sciences and the Kerala Academy of Sciences.

Methylglyoxal alters redox status and promotes cancer development in HepG2 cells via multiple signalling pathways

Methylglyoxal (MGO), a toxic, highly reactive metabolite derived mainly from glucose and amino acids degradation is one of the prime precursors for advanced glycation end product formation in living systems. Glycation is found to be a risk-amplifying factor in many diseases including diabetes and CVDs. This work was performed to examine and elucidate how MGO induces toxicity at the cellular level. Emphasis was given to see its interaction on the redox status of cells (HepG2 cells) and cancer formation-promoting property. For this, HepG2 cells were incubated with MGO (50 µM) for 24 h and subjected to various analyses. Aminoguanidine (200 µM) was positive control. The various biochemical and protein expression studies, relevant to oxidative stress, mitochondrial biology, and glycolysis were performed. MGO caused the reduction of expression of GLO 1 (27%) and GLO 2 (11%) causing a weakening of the innate detoxification system. This is followed by an increase of RAGE (95%), AGEs, or methylglyoxal adducts. Significant hypoxia and surplus reactive

oxygen species (ROS) (24%) were observed with MGO exposure. Glucose uptake was found to increase (15%) significantly with overexpression of GLUT 1 (35%). We also found a significant increase in glycolytic enzymes such as hexokinase II, phosphofructokinase 1, and lactate dehydrogenase along with lactate production. Observation of surplus ROS and enhanced glycolysis led us to check the expression of HIF 1α which is their downstream signaling pathway. Interestingly HIF 1α was found to increase significantly (35%). It is known that enhanced glycolysis and oxidative stress are catalysts for the overexpression of HIF 1α which in turn creates an ambiance for the promotion of cancer. Aminoguanidine was able to prevent the adverse effect of MGO partially. This is the first study to show the potential of MGO for the promotion of cancer in the non-tumorigenic HepG2 cells via the Warburg effect and oxidative stress-mediated glycation.

Invited Talk-36

Prof. CKK Nair
Adjunct Professor,
Amrita Vishwa Vidyapeetham Amrita Institute of Medical Sciences
Kochi - 682 041, Kerala, India.
Email: drckknair@gmail.com

Dr. CKK Nair, formerly, 1)Scientific Officer (H) Head, Radiation Biochemistry Section, Radiation Biology & Health Sciences Division, BARC, Mumbai; 2)Professor, Amala Cancer Research Center, Thrissur, Kerala, India; 3)Dean of Research, Pushpagiri Institute of Medical Sciences and Research Centre, Tiruvalla, Kerala, India. 4)Director of Research, St.Gregorios Dental College, Kothamangalam, Kerala, India.

Tumor-specific targeted therapy with nanoparticles: preclinical experience

[1]C.K.K.Nair and [2]S. Sreeja
[1]AIMS, Amrita Viswavidyapeeth, Kochi, Kerala, India and [2]Dept. of Physiology School of Medicine, University College Cork, Ireland.

The treatment modalities for cancer are beset with a number of detrimental side effects and complications due to the inherent toxicities of the drugs and the deleterious consequences of radiation exposure. Most chemotherapeutic agents possess poor selectivity toward the target tissue and can harm normal cells as well as cancer cells. One of the most elegant applications of nanotechnology in cancer treatment is the possibility of tumor-targeted drug delivery. Specific targeting of nanoparticles to tumor has been accomplished by physical and

chemical agents. Magnetic iron oxide nanoparticles are physiologically well tolerated *in vivo* and can be deposited on tumor tissues by an external magnetic field (1). Also, tumor hypoxia, one of the major characteristics of tumor, and the Enhanced Permeability and Retention Effect of nanoparticles can be exploited to target drugs to tumor. DOX was complexed with Iron-oxide nanoparticles (NP) and a hypoxic cell sensitizer Sanazole (SAN). *Methodology:* Magnetic iron oxide nanoparticles were complexed with tumor therapeutic agents. Following the administration of these, the application of an external magnetic field locally, enabled magnetic targeting, due to the magnetic responsiveness of the iron oxide core (1). By exploiting tumor hypoxia, one of the major characteristics of tumor, and the Enhanced Permeability and Retention Effect of nanoparticles, drugs complexed with nanoparticles (NP) and a hypoxic cell sensitizer Sanazole (SAN) were targeted specifically to tumors, and their therapeutic efficiency was evaluated under *in vitro* and *in vivo* conditions (2-5). *Findings:* Our studies revealed the effectiveness of doxorubicin- Fe3O4 nanoparticles in preventing tumor growth. We have also shown the effectiveness of oxidative therapy with the complex of enzyme-iron oxide nanoparticles in controlling tumor in an animal model (6). Recently, the chemotherapeutic doxorubicin was complexed with iron oxide nanoparticles together with a hypoxic cell radiosensitizer Sanazole for chemo-directed specific targeting of tumor sites(2). Oral administration of these complexes increased apoptosis in tumors and reduced significantly the tumor volume in tumor-bearing mice. In tumor tissues, studies by quantitative Real-Time- PCR revealed significant down regulation of *hif- 1α* and up regulation of *bax* and *caspases*. *Conclusions:* The studies revealed the potential application of physical and chemical agents to direct and specifically target nano-complexes of antineoplastic drugs to the cells of solid tumors, to cause tumor regression.

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Invited Talk-37

Prof. Ranjitsinh Devkar
Chronobiology and Molecular Endocrinology lab,
Department of Zoology, Faculty of Science,
The M.S. University of Baroda, Vadodara, INDIA.
Email: rv.devkar-zoo@msubaroda.ac.in

Research Area: Circadian Biology of Lifestyle Disorders; Current research interest: Clock-associated miRNAs and Epigenetic regulation. **Teaching and Research Experience**: Professor with over 15 Years of research experience. He guided 12 PhD students, M.Sc. Dissertations: 29. Research papers: 120; Total Citation: 3152; h-Index: 34; i10-index: 78; delivered 38 invited talks. Some of the key papers published in PLoS One, FASEB, Redox Biology, Free Radical Biology and Medicine, Nature Scientific Reports, etc. **Research Funding:** DST SERB, DBT, GSBTM, ICMR,. **Awards:** Paul-dudlee white Award, American Heart Association, USA; MRE of the SRBCE, Chennai, India; International travel award, SERB, India; M.A. Akbarsha Oration Award, SRBCE, Chennai, India; SRBCE Best Research paper award, SRBCE, Chennai, India. **Positions held:** EC member and Joint secretary SRBCE; University Coordinator Office of International Affairs MSU Baroda; Member, Board of Studies in Zoology, MSU Baroda, HNGU Patan, MKBU Bhavnagar; Secretary, AOZ Association of Zoologists, Gujarat; Former Head, Department of Zoology, Govt College, Junagadh

Photoperiodic shifts and Behavioural perturbations: Role of melatonin

The circadian clocks of the body are synchronized by external cues from the environment, otherwise known as Zeitgebers (or “time-givers”). The tissue clocks regulate an array of pathophysiological and behavioural processes in mammals wherein; decoupling of the central clocks in the brain from the peripheral tissue clocks has implications of circadian misalignment. The same is reported in shift workers, artificial light at night, or transcontinental travel. Metabolic disorders can often have multi-pronged implications including that on brain and behaviour and continue to remain a vast unexplored area of research. We investigate chronic photoperiodic shifts culminating in circadian desynchrony as a possible cause of anxiety, depression, lack of cognition, and learning. Melatonin; a circadian neurohormone is produced by the pineal gland and at night time and is known to pleiotropically regulate sleep and various physiological events. In our study, C57BL/6J mice were subjected to photoperiodic shifts prompted by chronodisruption (CD) by phase advance (lights off at ZT 04) or phase delay (lights on at ZT 20; with 0700h as ZT 0) for 18 weeks. CD was confirmed by studying transcripts of core clock genes (CLOCK and BMAL-1). Further, Behavioural tests for depression (force-swim and tail suspension tests), anxiety

(elevated plus maze and hole-board test), locomotion (actimeter), and cognition (Morris water maze and novel object recognition tests) were performed. Varying degrees of depression, along with impaired learning, high levels of anxiety, and locomotor deficits were recorded in the experimental group. Timed administration of exogenous melatonin showed moderate to significant improvement in anxiety, learning, and memory. However, behavioural parameters on melatonin-mediated improvement in depression showed a mixed set of results. Melatonin receptors are present in hippocampal neurons and; melatonin corrective changes in the hippocampal BDNF-TrkB pathway were observed in our study. Microscopic observations of hippocampal tissue revealed gross neuronal loss that was supported by results obtained in mRNA (*Bdnf*, *TrkB*, *Synapsin-1*, *Gdnf*, and *Ngf*) and immunoblots analysis (BDNF, TrkB, Synapsin-1, and ERK 1/2) of CD mice. Melatonin treatment appeared to reverse the said changes suggesting an improvement in BDNF-TrkB downstream signalling supported by corrective changes in behavioural parameters. The study highlights the role of melatonin as an important hormone in the management of neurobehavioral changes occurring due to lifestyle/occupational circadian desynchrony.

Invited Talk-38

Prof. Rajasekhar Moka
Professor, Manipal School of Life Sciences (MSLS),
MAHE, Manipal, Karnataka, India.
Email:rs.moka3@manipal.edu/ rsmoka@gmail.com

Prof. Rajasekhar did his Ph.D. (1997) in Cytogenetics from the Institute of Genetics, Osmania University, Hyderabad. M.Sc (1990) in Genetics from the Department of Genetics, College of Science, Osmania University. He has more than 25 years of teaching and research experience. Areas of specialization are Human Cytogenetics & Genetic disorders; Intellectual disabilities Cardiomyopathy & Cardiac diseases.

Evaluation of the genotype-phenotype correlation in idiopathic dilated cardiomyopathy (iDCM) in an Indian cohort

Rajasekhar Moka[1] and Prabodh Kumar and Tom Devasia[1]

1. *Department of Cell and Molecular Biology, Manipal School of Life Sciences, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India*
2. *Department of Cardiology, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, Manipal, Karnataka 576104, India*

Dilated cardiomyopathy is a common form of cardiomyopathy, characterized by left ventricle dilation and hypokinesia, resulting in systolic dysfunction and decreased end-organ perfusion. This leads to heart failure, fibrosis, and thinning of ventricular valves. Causes include inflammatory cardiomyopathy, toxins, drug-induced, and genetics. Mutations in titin and genes encoding sarcomere, Z-Disc, and cardiomyocyte cytoskeletons are the most common genetic factors. All clinical studies for about 100 patients were carried out according to the established procedure. A customized Qiagen NGS panel was created, with the majority of the genes found to be causative in cardiomyopathies. The Qiagen GeneGlobe tool was used to identify the variations. Sanger sequencing was also used to confirm several of the variations. MYH7p.Phe540Leu, the patient was a 62yr. old lady with Left ventricular non-compaction associated dilated cardiomyopathy. Severe heart failure leading to muscle wasting, Ejection Fraction 22%, and Multiple hospitalizations due to pulmonary edema. Based on the molecular diagnosis, her treatment regimen was changed to include Levosimendan which is a potent Inodilator/Calcium sensitizer. She was also prescribed Olmesartan an ARB which is proven to reduce mortality in heart failure with reduced EF. The Filamin-C splice acceptor mutation has been seen in 2 separate families with a history of sudden cardiac death. Filamin-C truncating mutations are reported to be highly malignant and therefore the patients were given the choice of Implantable Cardioverter De-fibrillator to reduce the risk of sudden cardiac death. The Troponin mutation identified was in a patient admitted with acute heart failure post-partum. It was later discovered that the father of the patient also had DCM. The Titin truncating mutations have been identified in 2 separate individuals which leads to truncation of the Titin protein and the pathophysiology is due to Titin haplo-insufficiency. We also identified a non-sense mutation in Ankyridin1 which causes DCM due to Z-Disk impairment. Understanding the underlying genetic origins of cardiomyopathies can facilitate the development of improved treatment strategies and the identification of patients with mutations who are at risk of sudden death. Cascade genetic screening may also help identify relatives who are genotype-positive but phenotype-negative and in urgent need of medical intervention. The presentation would include case studies on an individual basis.

Key Words: Dilated cardiomyopathy, Systolic dysfunction, Sudden cardiac death, Gene mutation, Next Generation Sequencing, Medical intervention.

Acknowledgment: We would like to thank the Director of MSLS, MAHE, Manipal, who helped us choose the project and assisted in its completion by providing the required facilities and infrastructure. We are deeply appreciative of the financial support provided by the SERB, Department of Science, New Delhi.

Session 11: Endocrine Disrupting Chemicals (EDCs) and Human Reproductive Health

Plenary lecture-10

Prof. Guruprasad Kalthur
Professor, Head, Department of Reproductive Science
Head, Division of Reproductive Biology
Kasturba Medical College, Manipal, Manipal Academy of Higher Education,
Manipal- 576 104, Karnataka, India. Email:guru.kalthur@manipal.edu

Dr. Guruprasad Kalthur is currently serving as Professor and Head of the Department of Reproductive Science at Kasturba Medical College, Manipal. He obtained his PhD in Radiation Biology in 2004, and since then, he has been actively involved in cutting-edge research in the field of Reproductive Biology.

Dr. Kalthur's research focus is on understanding the impact of environmental toxicants on reproductive health. His research also focuses on optimizing cryopreservation techniques for gametes and gonadal tissues, elucidating the paternal contribution to early embryo development, and enhancing sperm functional competence using pharmacological approaches. He has completed several funded research projects from the Indian Council of Medical Research (ICMR), the Science and Engineering Research Board (SERB), and the Department of Biotechnology (DBT).

He has received several prestigious awards such as the ICMR International Fellowship, Yamagiwa-Yoshida Memorial International fellowship, and Award for Research Publication by Vision Group of Science and Technology, DST, Govt. of Karnataka. He was the recipient of the Dr. T.M.A. Pai Gold Medal for Excellence in Medical Research in both 2009 and 2013. With over 100 research articles published in renowned international peer-reviewed journals, Dr. Kalthur's work has contributed significantly to the field of reproductive science. Additionally, he actively serves as a reviewer for many esteemed journals in the reproductive biology field. Dr. Kalthur holds the position of visiting research scientist at Mayo Clinic, Rochester, MN, USA. Since 2018, he has been serving as an associate editor of the Journal of Reproductive Sciences.

Crisis in the male gamete world: Unraveling the impact of male reproductive health and environment

Spermatozoa, the male gamete, is unique in structure, function, and physiology. Post-puberty, spermatogenesis unfolds continuously for the rest of the life. However, in recent decades, a sharp decline in male fertility potential has been documented, characterized by diminished sperm quality and quantity, compromised motility, aberrant morphology, and heightened DNA damage. This plenary lecture will address the strong association between environmental factors and with steep decline in male reproductive health, highlighting the alarming decline in sperm parameters and a parallel rise in infertility. The current research focus is on reducing the reproductive health hazard from environmental exposures and thereby improving the male fertility potential. While the approaches to enhance sperm output and sperm quality have faced several challenges, sperm motility enhancement by exposing spermatozoa to various pharmacological agents under in vitro conditions has shown promising results. Current approaches and their translational value in infertility management will be discussed.
Key words: Environmental toxicants; Spermatozoa; Motility; Infertility.

Invited Talk-39

Dr. Ravi Ram Kristipati
Senior Principal Scientist, CSIR-Indian Institute of Toxicology Research, Lucknow
Professor, Academy of Scientific & Innovative Research
Adjunct Professor, Kasturba Medical College, MAHE, Manipal
Email: raviram@iitr.res.in

Dr. Ravi Ram Kristipati obtained his Ph.D. in Zoology from the University of Mysore in 2002. Subsequently, he did his postdoc at one of the famous IVY league universities, Cornell University, USA, until 2008. In 2008, he joined the Council of Scientific and Industrial Research (CSIR), the premier research organization in the Country, as a Scientist. He is currently working as a Senior Principal Scientist at CSIR-Indian Institute of Toxicology Research, Lucknow. He is also a Professor at the Academy of Scientific and Innovative Research, an Institution of national importance. Dr. Ravi Ram's lab is focused on understanding the genetic basis of environmental chemical-mediated endocrine toxicity and associated complications, including fertility and diabetes by using a versatile Drosophila as a model. Dr. Ravi Ram has more than 50 research publications in highly reputed international journals, including Nature. His research work has been included in the guideline documents of regulatory agencies, such as the OECD and EPA, as evidence for the toxic impact of chemicals, even in lower organisms. His research is funded by grants from CSIR, ICMR, SERB, DHR, and DST. He is also an expert member of the toxicology task force of ICMR, New Delhi.

Xenobiotics adversely affect female fertility by modulating a mismatch repair gene (mlh1)

An estimated 1 in 6 people globally are affected by infertility, according to the latest infertility prevalence estimates of the World Health Organization (WHO, 2023). Female factors alone account for at least 35% of all infertility cases. India is also part of this global trend and faces a high burden of infertility, with 22-33 million couples of reproductive age suffering from lifetime infertility, of which the female factor accounts for 40%-50% of the cases. Interestingly, epidemiological studies have proposed that exposure to environmental contaminants may be a potential contributor to female reproductive disorders which can negatively affect female fertility. The impact of environmental chemical exposure on the female reproductive system is less well-known than that on the male reproductive system because germ-cell production in a woman is difficult to monitor. In this context, by exploiting the conservation of molecules/processes underlying oogenesis and egg activation between Drosophila and mammals, my lab focuses on understanding the effect of chemicals on female fertility. One such study has shown that xenobiotics significantly downregulate a mismatch repair gene (mlh1), which hampers egg production and early embryonic development leading to reduced female fertility. These findings will be discussed in the context of xenobiotic-mediated modulation of mismatch repair genes and female reproductive toxicity.

Invited Talk-40

Dr. Arnab Banerjee
Associate Professor
Department of Biological Sciences
BITS Pilani KK Birla Goa Campus, Goa-403726
Email:arnabb@goa.bits-pilani.ac.in

Dr. Arnab Banerjee is an Associate Professor; in the Department of Biological Sciences, BITS-Pilani, K. K. Birla Goa Campus. He received a Ph.D. degree in 2011 from the Banaras Hindu University, Varanasi. He did his postdoctoral research from January 2012 to February 2013 at CRRA (Animal Reproduction Research Centre) of the Faculty of Veterinary Medicine, University of Montreal, Canada. He is an elected member of the National Science Academy of India (NASI). He is a Review Editor on the Editorial Board of the Frontiers in Endocrinology. His research interest in the last 10 years has been regulatory pathways in

neuroendocrinology and metabolic disorders in females. He has authored more than 30+ articles in international peer-reviewed journals. His current research interest lies in the area of neuroendocrine regulation of GnRH by polyamines and polycystic ovarian syndrome (PCOS), with special emphasis on the involvement of polyamines, sirtuins, and adiponectin in such pathophysiology. His research group is also interested in investigating the alternative splicing scenario in the hypothalamus with particular emphasis on the alternative splicing of GnRH. His group presently has started looking into the crosstalk of adipocytes with endometrial cancer cells in uterine cancer with special emphasis on sirtuin isoforms.

Polyamines can induce early onset of puberty

Nayan Mate and **Arnab Banerjee**
Department of Biological Sciences, BITS Pilani KK Birla Goa Campus, India

Gonadotropin-releasing hormone, GnRH, governs mammalian reproduction by driving the downstream hypothalamic-pituitary-gonadal (HPG) axis. Polyamines are biogenic amines reported to regulate GnRH. The current study demonstrates that as mice age, their ovarian expression of polyamines and their biosynthetic enzyme ornithine decarboxylase (ODC1) vary. Our group has reported earlier that polyamines can rescue GnRH in hypothalamic neurons in the presence of senescence markers. However, till date, no information has been available on whether polyamines can impact hypothalamic neurons of young mice. Our results showed that the level of spermine (SPM), spermidine (SPD), and ODC1 decreased with age. Adult mice ovaries are larger in size and have more follicles in various stages when compared to young and older mice ovaries exhibit atresia along with an increase in stromal cells. Ovaries of immature mice treated with polyamine resemble prepubertal mice ovaries. These polyamine-treated mice show an increase in serum levels of GnRH and progesterone. The expression of several important markers linked to the onset of puberty and folliculogenesis is significantly increased upon polyamine treatment. The findings concluded that polyamines upregulate GnRH expression and induce early onset of puberty. This can account for the early onset of puberty in young boys and girls noticed now.

Highlights:

- Putrescine, a polyamine, an important class of biogenic amines, can initiate an early onset of folliculogenesis in young mice.
- Putrescine can trigger a set of hypothalamic genes associated with early onset of puberty.
- Putrescine can regulate GnRH in young mice.

Acknowledgment: DBT

Invited Talk-41

Dr. Souvik Dey
Manipal Centre for Biotherapeutics Research,
Manipal Academy of Higher Education,
Manipal, Karnataka, India. Email:souvik.dey@manipal.edu

Dr. Souvik Dey is an Assistant Professor and DBT-Ramalingaswami Fellow at the Manipal Centre for Biotherapeutics Research in Manipal Academy of Higher Education, Manipal. He received a Ph.D. degree in 2015 from Jadavpur University, Kolkata. He did his postdoctoral research from 2015 to 2020 at Kent State University, Kent, Ohio, USA. He is an elected member of the Royal Society of Biology (RSB), London. He is a Review Editor on the Editorial Board of Molecular and Cellular Reproduction (specialty section of Frontiers in Cell and Developmental Biology). His research interest in the last 15 years has been regulatory pathways in male reproductive physiology in mammals. He has authored 20+ articles in international peer-reviewed journals. His current research interest lies in the area of male contraceptive development and better understanding of the biochemistry of the gamete functions in mammalian systems, with special emphasis on the interrelation between (glycogen synthase kinase 3) GSK3 and FTO/ALKBH5 (RNA-specific demethylases) in the regulation of mammalian spermatogenesis and fertility. His research group is also trying to develop therapeutic approaches to target the GSK3, isoform-selectively, to mitigate cancer and neurodegenerative disease phenotypes in human acute lymphoblastic leukemia (ALL) and Alzheimer's disease, respectively using in vitro and knockout mouse models.

Influence of Environmental Mutagens in m6A Level in Testis

The significance of chemical alterations in RNA molecules has been increasingly recognized due to their substantial involvement in various biological processes, including the stability and translation of mRNA transcripts. Over 100 alterations have been discovered in various organisms thus far, generally referred to as the 'epitranscriptome'. Among these, the most thoroughly studied modifications include 6-methyladenosine (m6A); more than 80% of m6A modification takes place in mRNA and thereby regulates the downstream gene expression process. The biological impacts of RNA m6A modification are actively and reversibly controlled by methyltransferases (writers), demethylases (erasers), and m6A binding proteins (readers). This presentation provides a concise overview of the current discoveries about the

regulators of RNA m6A modification in male infertility and genital system malignancies. It also explores the role and potential therapeutic implications of RNA m6A modification in spermatogenesis and male genital system tumors. While we are still in the early stages of understanding the activities of these changes in cells, there is already evidence indicating their abnormal regulation in diseases including cancer and neurodevelopmental disorders. Currently, our understanding of how environmental exposures impact the epitranscriptome and its role in disease risk is limited, however, emerging data suggest that benzo(a)pyrene and bisphenol A can significantly alter m6A level. Our research indicates that m6A modification is crucial for spermatogenesis. Other studies show that in seminoma, the m6A RNA level is found elevated. In prostate cancer and testicular germ cell tumors, ‘writers’ like METTL3 and ‘erasers’ like FTO have been found to turn into oncogenes.

Keywords: epitranscriptome, m6A, male infertility, seminoma, prostate cancer, FTO.

Highlights:

- 80% of m6A modification takes place in mRNA
- Benzo(a)pyrene and bisphenol A can significantly alter m6A level
- m6A modification is crucial for spermatogenesis
- M6A levels in mRNA are significantly altered in seminoma and testicular germ cell tumors

Invited Talk-42

Dr. Raghavendra Prasad
Director of Infertility & Fetomaternal Unit,
Sunrise Hospital, Kanhanghad, India.
rpogdoc@yahoo.co.in

Changing scenarios in infertility.

Infertility is defined as failure to achieve pregnancy after 12 months or more of regular unprotected sexual intercourse. As per the latest estimate of WHO, 17.5% of adults (roughly 1 in 6) worldwide experience infertility. The cause of infertility can range from male to female factors to be unexplained. There has been a trend noted with the decrease in semen quality parameters as well as female parameters compared to the last decade. WHO standards for a normal semen analysis have been reduced in 2022 compared to 2010 standards. This global decline in fertility can be attributed to male & female as well as environmental influences & lifestyle modifications (sedentary lifestyle, alcoholism, smoking & obesity). Current modalities for infertility depend on the correction of existing defects present in males & females &also modification of lifestyle patterns & lifestyle diseases.

Session 12: Career Development/Opportunities/Challenges/Communication/ Environmental regulatory/policies/legislation.

Invited Talk-43

Sri. Kollegala Sharma
Former Chief Scientist, CSIR-CFTRI, Mysore, and
Science Writer, and Communicator, India.

Sri Kollegala Sharma is a senior science communicator and popular science writer in Kannada. Shri Sharma, who retired as Chief Scientist at CSIR-Central Food Technological Research Institute Mysore, has been writing science in Kannada and has contributed more than 3500 popular science articles through his columns and independent writeups. He has scripted 200 science radio dramas in Kannada for broadcast on All India Radio and various community radios. During the past five years he has pioneered and steered the production of Jaanasuddi, a Kannada Science podcast, the first of its kind in India, that was a finalist entry in the famous Breaking Wall competition of Germany. Nearing around 900 episodes, the podcasts reach 3000 audiences directly through WhatsApp and a larger audience through ten community radios spread across Karnataka. Shri Sharma has also been a trainer, and resource person, in the translation of S&T texts, and science writing and has spearheaded the scripting and production of Science Plays in Kannada. At present, Sri Sharma is the state coordinator for Kutuhali, the Science Communication, Popularization, and Extension programme of Vigyan Prasar. He is also editing a monthly Kannada science magazine called **Kutuhali** for the project. He has spearheaded along with a group of amateur theatre groups a Kannada Science Theatre Movement that takes Kannada Science Plays to various audiences. Incidentally, the science theatre festival starts on 6th July 2023. Shri Sharma has 10 popular science books and several children's science books to his credit. Two of these are translations from English. His translations of a column on science appeared in The Wire Science along with his podcasts as a series. Sri Sharma has been awarded the Best Science Communicator award of Vision Group on S&T, Government of Karnataka, in 2011 and the Best Writer award (for his book Marala Melina Hejjegalu) by Karnataka Science and Technology Academy in 2008. He has also received the Katha Best Translator Award.

Risks of Communicating risks

Uncertainties and probabilistic understandings are thus inevitable in research. Our understanding of toxicology and environmental mutagenesis or genetic toxicology rests on studies based on statistical analysis. Such analysis accompanies a level of uncertainty in the

form of probability range or standard deviations. Sample-based clinical studies where the effectiveness of a new drug is analysed vis-à-vis drugs already in use show different levels of uncertainty. While this may not be a problem for communication of results among the peers, communicating the same to the public risks many dangers. The risks could be either overemphasized on the one extreme or maybe underplayed on the other end. How do we communicate the risks involved with any action, be it taking a drug, using a pesticide, the effect of our behaviour on climate, and so on. Or the probability of harm due to the action? Or the extent of the harm to an individual vis-à-vis the public? For a Science communicator, these questions pose challenges at multiple levels. Imprecise and sometimes non-uniform usage of risk terms, differences in the meaning of the same terms by scientists and the common man, the immediacy or chronic nature of risk, and whether the risk is individual or common risk pose challenges to a scientist while speaking to the public. The talk explores the current thoughts on risk communication, and the challenges facing science communicators.

Invited Talk-44

Educational Dialogue in public perception of nuclear radiation

Varsha Hande [a,b] and M Prakash Hande[a]

[a]National University of Singapore, Singapore and [b]Department of Global Health, Medicine and Welfare, Atomic Bomb Disease Institute, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan

Public perception of nuclear radiation depends on how risk is measured and managed, and how this is communicated. During nuclear accidents and radiation leaks, concerns and panic among the public have emphasized the importance of incorporating aspects of science-technology-society (STS) emergency preparedness. Educational dialogues and appropriate communication tools may help in explaining the low-dose risks to the public. Keeping this in mind, a seminar-style educational module was designed for undergraduate students at Tembusu College, National University of Singapore. Radiation and Society module comprised of weekly 3-hour interactive discussions which run for 13 weeks. Undergraduate students from various faculties were exposed to themes and concepts related to radiation and society. A variety of topics included nuclear fall-out, historical contextualization of nuclear fear/stigma, STS, science communication, and most importantly, the uses of radiation in biomedicine. Data from our own and from existing literature were described without having to go through basic knowledge of radiation sciences. Field visits were arranged – one to a research reactor and a radiation oncology department at the hospital to enable students to understand the various peaceful uses of nuclear radiation. Expert guests were invited to share their perspectives on related matters, such as ongoing technological developments and the societal impacts of radiation. I have facilitated this course from 2015 – 2020 which over 125 students attended in during that period. This seminar-style module has equipped students with the tools required to analyse evidence sources and critically assess social perceptions of radiation. Such educational efforts enable future leaders to have a deeper understanding of the uses and effects of nuclear radiation. Engaging the public and stakeholders in such dialogues may enable the population to be better informed and prepared for any untoward emergencies. Appropriate education and effective communication are essential and will facilitate our efforts on preparedness and response during nuclear emergencies.

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