ISCB 2025

BOOK OF ABSTRACTS

INTERNATIONAL SYMPOSIUM ON CILIATE BIOLOGY & INTERDISCIPLINARY RESEARCH

organized by

ACHARYA NARENDRA DEV COLLEGE

NEW DELHI, INDIA

in association with

INDIAN SOCIETY OF CILIATE BIOLOGY (ISOCB)

Affiliated society of
Indian Network of Soil Contamination Research (INSCR) &
International Society of Protistologists (ISOP)

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ABOUT
THE SYMPOSIUM

ISCB 2025

The Indian Society of Ciliate Biology (ISoCB), an affiliate body of the Indian Network for Soil Contamination Research (INSCR), is dedicated to promoting microbiology through various scientific events, including workshops, symposia, and conferences. As part of its commitment to advancing studies on ciliated protists, ISoCB is organizing the International Symposium on Ciliate Biology 2025 (ISCB 2025) on February 06-07, 2025, at Acharya Narendra Dev College, University of Delhi.

Objectives of ISCB 2025

The symposium aims to:

- Provide a platform for researchers and scientists interested in ciliate biology to exchange knowledge, present their latest research findings, and foster collaborations.
- Inspire undergraduate and postgraduate students, both from India and abroad, to pursue research on ciliated protists.
- Facilitate networking opportunities for students seeking doctoral and postdoctoral research positions in the field of ciliate biology.

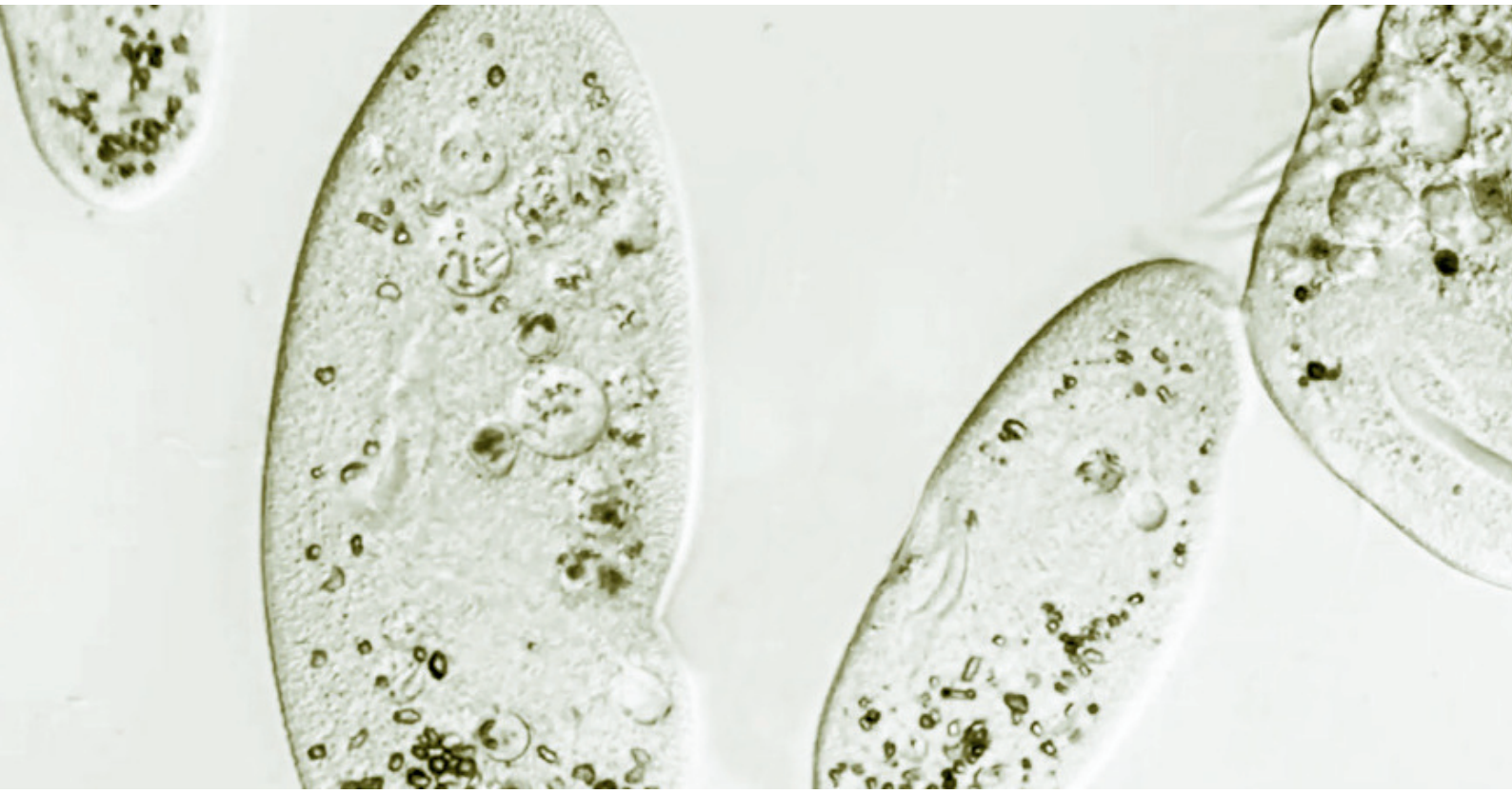
Scientific Content

ISCB 2025 will encompass a wide range of topics related to ciliate biology, including but not limited to:

- Biodiversity and Ecology
- Evolution and Systematics
- Genomics and Epigenetics
- DNA Barcoding and Proteomics
- Ciliates and Industry Applications
- Ciliates as Model Organisms in Undergraduate Teaching and Research
- Other Individual Specializations

Additionally, the symposium will feature a session dedicated to non-ciliated protists to encourage broader discussions in the field of protistology.

ABOUT ISoCB



The Indian Society of Ciliate Biology is an association of scientists devoted to research on ciliated protists. The Indian Society of Ciliate Biology envisions a world where the intricate complexities of ciliate single celled eukaryotic organisms are fully understood, appreciated, and harnessed for the betterment of science and society. The Society strives to be a global leader in advancing the frontiers of ciliate biology, fostering interdisciplinary collaboration, and promoting sustainable solutions for environmental and health challenges through innovative research and education. The Indian Society of Ciliate Biology seeks to advance scientific understanding, promote conservation, and inspire the next generation of ciliate biologists to explore and protect the rich diversity of ciliate organisms and their ecosystems.

ABOUT
ACHARYA NARENDRA DEV COLLEGE

Acharya Narendra Dev College (ANDC), constituent college of University of Delhi, stands as a beacon of excellence in higher education, known for its unwavering commitment to academic rigor, holistic development, and societal engagement. Founded in 1991, ANDC has emerged as a premier institution dedicated to nurturing young minds and fostering a culture of innovation and inquiry. Located in the heart of Delhi, ANDC boasts state-of-the-art infrastructure and facilities conducive to learning and research. The college offers a diverse array of undergraduate and postgraduate programs across various disciplines, including Sciences and Commerce, catering to the academic interests and aspirations of a dynamic student body. At ANDC, academic excellence is complemented by a vibrant campus life enriched with co-curricular activities, sports, and cultural events.The college provides a nurturing environment that encourages students to explore their passions, hone their talents, and develop essential life skills, preparing them to thrive in an increasingly complex and interconnected world. Driven by a dedicated faculty comprising eminent scholars, researchers, and practitioners, ANDC is committed to fostering intellectual curiosity, critical thinking, and ethical leadership among its students.

Through innovative teaching methodologies, interdisciplinary research, and industry collaborations, the college equips students with the knowledge, skills, and perspectives necessary to excel in their chosen fields and make meaningful contributions to society. Beyond academics, ANDC is deeply invested in community outreach and social responsibility. Through various outreach programs, community service initiatives, and partnerships with local organizations, the college actively engages in addressing societal challenges and promoting sustainable development, embodying its ethos of academic excellence with a purpose. As a proud member of the esteemed University of Delhi, Acharya Narendra Dev College continues to uphold its legacy of excellence, innovation, and service, inspiring generations of students to realize their full potential and become responsible global citizens poised to shape the future.

ABOUT CILIATE BIOLOGY LABORATORY

Research on ciliated protists at the University of Delhi began with Prof. BL Bhatia in 1932 and continued with Prof. BR Seshachar. After his retirement in 1970, his students, including Profs. CMS Dass, DM Saxena, and GR Sapra, carried forward the legacy. Since the mid-eighties, Prof. Sapra's group explored ciliates in cellular aging, metal toxicity, biodiversity, and systematics. The Ciliate Biology Research Laboratory was later established at Acharya Narendra Dev College by Profs. Renu Gupta, Seema Makhija, and Ravi Toteja.

Research Interests of the Ciliate Biology Group

Response to Environmental Stress:
Heavy metal pollution, particularly from mining and industry, is a growing concern. The group examines how spirotrich ciliates respond to metal stress by studying heat shock proteins, metallothioneins, and glutathione peroxidase gene expression under such conditions.

Ciliate Biodiversity and Taxonomy:
Researchers isolate and identify freshwater ciliates from Delhi using morphology, morphogenetic stages, and molecular markers like 18S rRNA, ITS1/2, and histone genes.

Barcoding Ciliates:
DNA-based taxonomic identification, widely used for multicellular organisms, remains underexplored for ciliates. The group collaborates with the Protist Working Group (ProWG) and has secured DST-SERB funding for ciliate barcoding in Delhi.

Ciliates as Bio-Indicators:
Freshwater ciliate communities are studied as bio-indicators of pollution, particularly in the Yamuna River. The group also assesses soil quality in Delhi by analyzing soil ciliates alongside physical and chemical properties such as pH, conductivity, and nutrient content.
Their research aims to enhance understanding of ciliate biology and its environmental applications, contributing to pollution monitoring and ecological assessments.

ABOUT
ISOP

The International Society of Protistologists is an association of scientists devoted to research on single-celled eukaryotes, or protists. The ISOP promotes the presentation and discussion of new or important facts and problems in protistology, and works to provide resources for the promotion and advancement of this science.
ISOP recognizes the growing need to connect protistologists displaced by disasters, both man-made and natural.

To serve protistologists, ISOP has established ISOP Solidarity Forums, bulletin boards on the ISOP website where protistologists affected by disasters and those willing to host scientists can make contact. The platform is available to any protistologists who are dispossessed and displaced due to natural or man-made disasters as a way for ISOP to continue fostering the protistologists.

ISOP also supports seminal activities conducted by its affiliated societies across the world by providing financial assistance and disseminating information about these activities on its website and other social media.

The International Symposium on Ciliate Biology 2025 has been given grant in aid by ISOP for its successful conduct.

International Society of Protistologists

MESSAGES

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH

दिल्ली विश्वविद्यालय
University of Delhi

प्रो॰ योगेश सिंह
कुलपति

Prof. Yogesh Singh
Vice-Chancellor

No. DU/VC/2025/470
15th January 2025

MESSAGE

In 2024, the Nobel Prizes in Sciences were awarded for works that do not conform to those disciplines' regular boundaries. The Nobel Prize in Physics was awarded for laying the foundation for machine learning through training artificial neural networks using Physics. Similarly, the Nobel Prize in Chemistry was awarded for predicting the complex structure of proteins from their amino acid sequences by developing the Artificial Intelligence model *AlphaFold2*.

In citing these examples, I urge the participants of this International Symposium on Ciliate Biology and Interdisciplinary Research, to be held at Acharya Narendra Dev College, to think about their work critically and if their research is learning from other streams of Sciences and Technology. The symposium's focus on interdisciplinary research also underlines the importance of collaborative efforts in addressing complex scientific questions and societal challenges.

I am confident that the symposium will reinvigorate the spirit of inquiry and innovation among participants. I congratulate Acharya Narendra Dev College and the organising committee for their work towards conceiving this symposium. I also extend my best wishes to all the distinguished speakers, delegates, and participants.

As you begin this symposium, I want you to ponder on Shri Maithili Sharan Gupt's words from *Bharat Bharti*.

हमको विदित थे तत्त्व सारे नाश और विकाश के,
कोई रहस्य छिपे न थे पृथ्वी तथा आकाश के...
हम कौन थे, क्या हो गये हैं, और क्या होंगे अभी
आओ विचारें आज मिल कर, यह समस्याएं सभी

Yogesh Singh 15/1/25

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UNIVERSITY OF DELHI
दिल्ली विश्वविद्यालय

प्रोफेसर बलराम पाणी
अधिष्ठाता महाविद्यालय
Professor Balaram Pani
Dean of Colleges

****** MESSAGE*******

It is my pleasure to extend warm greetings to all the participants of the International Symposium on Ciliate Biology and Interdisciplinary Research, scheduled to be held at Acharya Narendra Dev College from February 5 to 7, 2025. This symposium stands as a beacon of scholarly interaction, bringing together researchers, academicians, and students from across the globe to explore the intricate world of ciliates and their interdisciplinary applications.

Ciliates have long been recognized as essential model organisms in the scientific community. Their role in advancing our understanding of genetics, cellular functions, and evolutionary biology remains unparalleled. By focusing on interdisciplinary research, this symposium highlights the importance of integrating knowledge across diverse fields to address complex biological challenges.

Acharya Narendra Dev College has always been at the forefront of academic excellence and innovation. The organization of an international event of this magnitude is a testament to the college's unwavering commitment to fostering intellectual growth and collaborative research. I am certain that this symposium will serve as a catalyst for meaningful discussions, innovative ideas, and fruitful collaborations.

I would like to take this opportunity to commend the organizing committee for their dedication and hard work in making this event a reality. I also extend a heartfelt welcome to all the distinguished speakers, researchers, and participants. I hope this symposium proves to be an enriching and memorable experience for everyone involved.

Wishing all attendees a successful and inspiring International Symposium on Ciliate Biology and Interdisciplinary Research.

Warm regards,

Prof. Balaram Pani

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University of Delhi

प्रो॰ श्रीप्रकाश सिंह
निदेशक, दक्षिण दिल्ली परिसर

Prof. Shri Prakash Singh
Director, South Delhi Campus

DATED: 08/01/2025

MESSAGE FROM THE DIRECTOR

UNIVERSITY OF DELHI SOUTH CAMPUS

It is a matter of great pride to extend my best wishes to all participants of the International Symposium on Ciliate Biology and Interdisciplinary Research, scheduled to be held at Acharya Narendra Dev College from February 5 to 7, 2025. This symposium marks a significant milestone in fostering global academic interaction and exploring new frontiers in the study of ciliates.

Ciliates play a crucial role in advancing our understanding of fundamental biological processes, particularly in genetics, cellular biology, and molecular mechanisms. The interdisciplinary nature of this symposium highlights the growing importance of integrating diverse fields of knowledge to solve complex scientific problems. Such initiatives are essential in building a holistic approach toward scientific inquiry and innovation.

Acharya Narendra Dev College, with its unwavering commitment to academic excellence and research-driven education, continues to set a benchmark by organizing such international events. The symposium provides an exceptional platform for knowledge sharing, collaborative research, and intellectual growth, which will undoubtedly inspire future discoveries.

I commend the organizers for their relentless efforts in bringing together a distinguished group of experts and scholars. I am confident that this symposium will lead to meaningful discussions and foster lasting partnerships.

I extend my warm welcome to all delegates, speakers, and participants, and wish them a productive and enriching experience at the symposium.

Prof. Shri Prakash Singh

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MESSAGE

I am delighted to know that Acharya Narendra Dev College of the University of Delhi is organising an International Symposium on Ciliate Biology and Interdisciplinary Research scheduled to be held from February 5 to 7, 2025.

The importance of the knowledge domain of Ciliate Biology in the contemporary times is well known to the Scientific Community, especially those dealing with the knowledge domains of Cellular Biology, Genetics and Molecular Mechanisms. I am sure this Symposium will prove to be a significant step towards fostering academic collaboration and advancing research in the field of Ciliate Biology.

The interdisciplinary approach adopted by this symposium reflects the need to merge diverse knowledge domains to address contemporary scientific challenges. Such initiatives are vital in building a research ecosystem which encourages innovative approach in research.

I believe that the International Symposium on Ciliate Biology and Interdisciplinary Research will undoubtedly provide a valuable platform for the researchers, academicians and the students to engage in meaningful and purposive deliberations which will have a lasting impact in furtherance of academic and research initiatives in this direction.

I would like to take this opportunity to convey my best wishes to the distinguished delegates and participants for successful organisation of this International Symposium. I would also like to commend the efforts of the organizing committee of the International Symposium for their persistent dedication and hard work for organising this International symposium. I am confident that the event will be a resounding success and will pave the way for new insights and partnerships in this knowledge domain.

REGISTRAR

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PROF. MANOJ KUMAR KHANNA | प्रो. मनोज कुमार खन्ना

Chairman, Governing Body / अध्यक्ष, शासी निकाय

Acharya Narendra Dev College

University of Delhi | NAAC accredited: A^+

आचार्य नरेंद्र देव कॉलेज

दिल्ली विश्वविद्यालय | नैक मान्यता प्राप्त: ए$^+$

It is with great enthusiasm that I extend my best wishes to all the participants of the International Symposium on Ciliate Biology and Interdisciplinary Research, to be held at Acharya Narendra Dev College. This symposium is a testament to the college's commitment to fostering academic growth and promoting research excellence in cutting-edge scientific fields.

The interdisciplinary approach of this symposium will encourage innovative perspectives and collaborative solutions to address pressing scientific and societal challenges. Events like these underscore the importance of integrating diverse fields of research to make meaningful advancements.

As the Chairperson of the Governing Body of Acharya Narendra Dev College, I am proud of the college's continued dedication to organizing such prestigious events that bring together leading scientists, academicians, and students from across the globe. These initiatives play a crucial role in inspiring future generations of researchers and fostering a culture of inquiry and innovation.

I commend the organizing committee for their tireless efforts in making this symposium a reality. I extend a warm welcome to all distinguished speakers, delegates, and participants, and I am confident that the symposium will be a resounding success.

Wishing everyone an intellectually stimulating and rewarding experience at the International Symposium on Ciliate Biology and Interdisciplinary Research.

Prof. Manoj Khanna
Chairperson, Governing Body
Acharya Narendra Dev College
University of Delhi

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PROF. H. K. Dangi | प्रो. एच. के. डांगी

Treasurer, Governing Body / कोषाध्यक्ष, शासी निकाय

Acharya Narendra Dev College

University of Delhi | NAAC accredited: A^+

आचार्य नरेंद्र देव कॉलेज

दिल्ली विश्वविद्यालय | नैक मान्यता प्राप्त: ए$^+$

I extend my best wishes to all the participants of the International Symposium on Ciliate Biology and Interdisciplinary Research, being held at Acharya Narendra Dev College from February 5 to 7, 2025. This symposium is a significant step toward fostering academic collaboration and exploring the vast potential of interdisciplinary research in the field of ciliate biology. The interdisciplinary focus of this symposium reflects the importance of integrating diverse areas of knowledge to address complex scientific questions and challenges. Such initiatives play a crucial role in shaping the future of scientific inquiry and innovation.

As the Treasurer of the Governing Body of Acharya Narendra Dev College, I am proud to see the college take the lead in organizing an international event of this magnitude. It demonstrates the institution's commitment to academic excellence and its dedication to promoting meaningful research collaborations.

I congratulate the organizing committee for their hard work and perseverance in bringing together distinguished researchers, academicians, and students from various fields. I am confident that this symposium will serve as a platform for productive discussions and pave the way for future advancements in research.

I extend my warm wishes to all the speakers, delegates, and participants for a successful and enriching symposium.

Prof. H.K. Dangi
Treasurer, Governing Body
Acharya Narendra Dev College

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Indian Network for Soil Contamination Research
(INSCR)

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INSCR Presidential Message

It gives me immense pleasure to welcome you all to the **International Symposium on Ciliate Biology 2025 (ISCB 2025)**, being organized by the **Indian Society of Ciliate Biology (ISoCB)** in association with the **Indian Network for Soil Contamination Research (INSCR)** at Acharya Narendra Dev College, University of Delhi. This event is a testament to the shared commitment of INSCR, ISoCB and Acharya Narendra Dev College to advance the frontiers of microbiological research, foster scientific collaboration, and inspire the next generation of researchers.

The mandate of INSCR and ISoCB has always been to promote excellence in microbiology through the facilitation of workshops, symposia, and conferences. This symposium, hosted at Acharya Narendra Dev College, University of Delhi, from February 5th to 7th, 2025, marks a significant step in this direction, focusing on the fascinating and diverse field of ciliate biology.

Ciliates, with their unique structural and functional characteristics, offer immense potential for understanding biodiversity, ecology, evolution, and molecular biology. This symposium is an ideal platform to bring together a vibrant community of ciliate researchers and microbiologists from across the globe to share their latest findings, exchange ideas, and explore future directions in this dynamic field.

I am particularly pleased to note the emphasis placed on engaging undergraduate and postgraduate students. By providing opportunities for young scientists to present their research, network with global experts, and explore doctoral or postdoctoral research prospects, this symposium will undoubtedly inspire the next wave of breakthroughs in ciliate biology. I am also delighted to see the inclusion of a session on non-ciliated protists, which broadens the symposium's scope and ensures a holistic perspective.

As we convene here under the auspices of INSCR and ISoCB, I am confident that this symposium will set new benchmarks in ciliate research and further strengthen the ties between our scientific communities.

Rup Lal

Prof. Rup Lal

President, INSCR

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PROF. RAVI TOTEJA | प्रो. रवि टोटेजा

Officiating Principal | कार्यवाहक प्राचार्य

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आचार्य नरेंद्र देव कॉलेज

दिल्ली विश्वविद्यालय | नैक मान्यता प्राप्त: ए$^+$

Dear Participants,

I am delighted that the International Symposium on Ciliate Biology and Interdisciplinary Research (ISCB 2025) is scheduled to take place at Acharya Narendra Dev College from February 5-7, 2025. This symposium, organized by the Indian Society of Ciliate Biology (ISoCB), aims to foster collaboration and knowledge exchange among researchers and students in the field of ciliate biology.

We are honoured to host this international gathering, which will feature insightful plenary addresses, engaging panel discussions, invited talks by faculty and the presentation of groundbreaking research. This event promises to serve as a vibrant platform for fostering collaboration and inspiring innovation.

We look forward to welcoming esteemed scientists and enthusiastic students to engage in discussions on various aspects of ciliate research, including biodiversity, ecology, and genomics. This event promises to be an enriching experience for all participants.

Let us come together to celebrate scientific exploration and build connections that advance knowledge and understanding in the realm of ciliate biology and beyond.

Warm regards,

Prof Ravi Toteja
Principal (Offg.)
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Dear Participants, Scholars, and Esteemed Guests,

It is an honor to welcome you to the **International Symposium on Ciliate Biology and Interdisciplinary Research**, hosted by Acharya Narendra Dev College. This abstract book is a testament to the diverse and pioneering research contributions presented at this symposium.

Ciliates, with their unique cellular complexity and versatility, continue to provide profound insights into fundamental biological processes and offer promising applications across various scientific disciplines. This symposium celebrates these tiny but mighty organisms, bringing together a vibrant community of researchers to foster collaboration and advance the frontiers of knowledge.

The abstracts compiled here represent the dedication and creativity of the global scientific community in unravelling the mysteries of ciliate biology and exploring its intersections with fields such as genomics, biotechnology, ecology, and more. Each contribution reflects a step toward addressing critical questions and challenges in science and society.

I extend my heartfelt gratitude to all the authors, participants, and organizing committee members whose efforts have made this event a reality. Let this symposium serve as a platform for meaningful discussions, the exchange of ideas, and the establishment of lasting collaborations.

I welcome you to this academic gathering and encourage you to immerse yourself in the knowledge and inspiration it offers.

Warm regards,

Rina Chakrabarti

Prof Rina Chakrabarti
Senior Professor and Head
Department of Zoology

The International Union of Biological Sciences (IUBS) is very pleased to be associated with the International Symposium on Ciliate Biology (ISCB 2025). The involvement of Acharya Narendra Dev College in this endeavour is commendable. This Symposium is an activity of the Indian Society of Ciliate Biology which is affiliated with the Indian Network of Soil Contamination Research and the International Society of Protistologists.

IUBS is an international voice for biodiversity research and is always keen on supporting neglected areas of biology such as systematics of microbes and invertebrates. Furthermore, ciliates found in soil and water are understudied and need more focus. Therefore, this International Symposium is extremely important.

I wish the International Symposium every success.

Renee M. Borges

Secretary General, IUBS

International Society of Protistologists

The International Society of Protistology (ISoP) is an interdisciplinary community of scientists studying single-celled eukaryotes, or protists. ISoP fosters collaborations among researchers to examine, discuss, and communicate the science of protistology.

ISoP promotes forums like the ISCB 2025, where ciliate biologists will discuss *biodiversity, ecology, evolution, systematics, genomics, epigenetics, DNA barcoding, proteomics, and applied science.*

We are pleased to sponsor ISCB 2025 and wish the organizers and participants a successful meeting.

-sd-
Sina Adl, Ph.D.
President, ISoP

Azadi Ka Amrit Mahotsav
MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE
पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय

सत्यमेव जयते
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GOVERNMENT OF INDIA

ZOOLOGICAL SURVEY OF INDIA
Prani Vigyan Bhavan
भारतीय प्राणि सर्वेक्षण
प्राणि विज्ञान भवन

Message

It is my great pleasure to welcome you all to the International Symposium on Ciliate Biology (ISCB 2025), scheduled to take place on February 6th and 7th, 2025, at the Acharya Narendra Dev College, University of Delhi. This conference offers a distinguished platform for scientists, researchers, and environmentalists to explore the fascinating world of ciliates and their vital role in diverse ecosystems.

Ciliates are indispensable players in the intricate balance of aquatic and terrestrial environments, significantly contributing to the health of freshwater, marine, and terrestrial ecosystems worldwide. These remarkable single-celled organisms, equipped with their characteristic cilia, perform critical ecological functions such as nutrient cycling, microbial population regulation, and the decomposition of organic matter. Through these essential processes, ciliates help maintain water quality, prevent the proliferation of harmful microorganisms, and sustain the complex food webs that support life of higher organisms.

The Zoological Survey of India (ZSI), a premier organization dedicated to surveying and studying faunal groups from protists to mammals since 1916, is proud to be a part of this symposium. For over a century, ZSI has been at the forefront of documenting the country's faunal resources for their effective conservation, management, and sustainable utilization. ZSI has made significant contributions to the field of ciliate biology, not only by maintaining a national repository of type and voucher specimens but also by advancing our understanding of ciliates' ecological roles. ZSI has conducted numerous surveys and published influential works, including patents, in the field of ciliate biology. Beyond alpha taxonomy, ZSI's applied research on ciliates includes developing technologies for water purification, creating ciliate-based biofertilizers, designing ciliate-based kits for environmental pollution detection, and investigating selected ciliate species for their potential in controlling human disease vectors.

I am confident that this conference will unite experts to discuss cutting-edge research on ciliate biology, their ecological roles, and their potential applications in environmental management. I encourage all participants to engage in meaningful discussions, share knowledge, and collaborate on innovative solutions to preserve our aquatic and terrestrial ecosystems.

I look forward to a successful and enriching event and sincerely thank you for your contributions to this crucial field of study

Dr. Dhriti Banerjee

Director,
Zoological Survey of India

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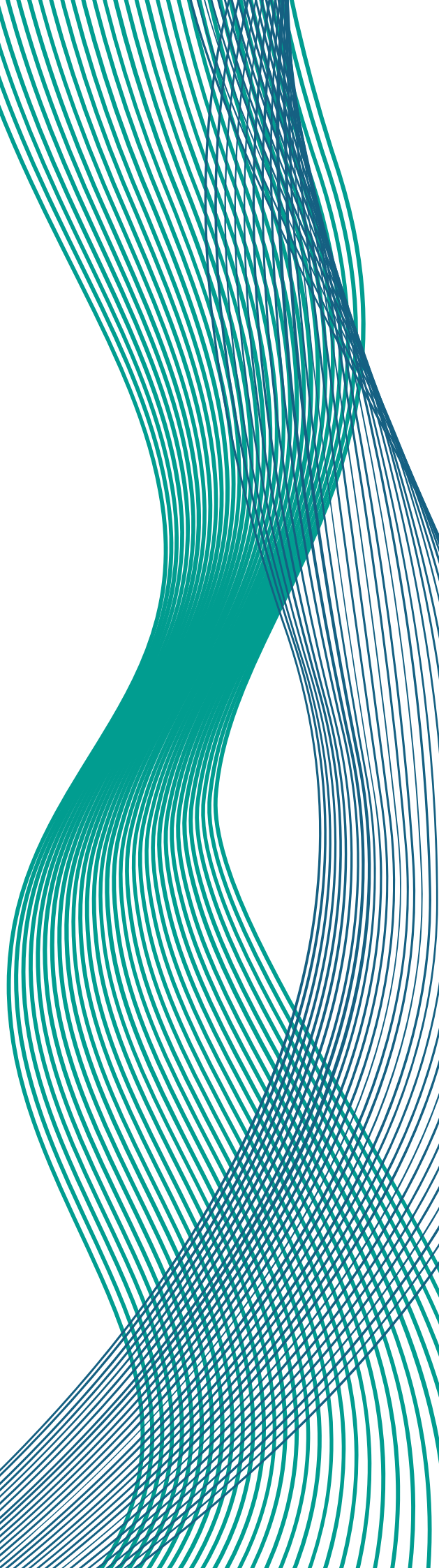
ISCB 2025
ORGANIZERS

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH



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ISCB 2025

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ISCB 2025
SCHEDULE

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH

SCHEDULE: ISCB 2025

Pre-Symposium Workshop

Date	Time		
February 03, 2025	09.00 am – 05.00 pm	Workshop-I: Culturing and Identification of Ciliates Workshop-II: Bioinformatic Tools for Studying Ciliates	To be conducted jointly by ISoCB, ZSI, INSCR and phixgen

DAY 1 (Room A)

Date	Time	
February 06, 2025	08.00 am – 09.00 am	Registration Interaction amongst Scientists and Students
	09.00 am – 09.30 am	Inauguration
		Chairpersons: Dr Alan Warren, Prof Yuri Mazei Co-Chairperson: Dr Rimpy Kaur Chowhan
	09.30 am – 10.10 am	Plenary Lecture I Prof Joel Dacks (University of Alberta, Canada): Evolutionary Cell Biology of the Endomembrane System: How Ciliate Biology Frames Pan-Eukaryotic Phenomena?
	10.10 am – 10.50 am	Plenary Lecture II Prof Elena Sabaneyeva (St Petersburg State University, Russia): The Ciliate *Paramecium bursaria* and its Inhabitants
	10.50 am – 11.10 am	Tea & Photo Session
	11.10 am – 11.40 am	Poster Session
		Chairpersons: Prof Joel Dacks, Prof Elena Sabaneyeva Co-Chairperson: Dr Ritu Khosla
	11.40 am – 12.20 pm	Plenary Lecture III Prof Yuri Mazei (Lomonosov Moscow State University, Russia): Community Ecology of Marine Benthic Ciliates: Integrating Taxonomic, Metabarcoding and Functional Traits Approaches
	12.20 pm – 01.00 pm	Plenary Lecture IV Dr Alan Warren (Natural History Museum, London, UK): Cell Shape-Shifting and Ultrafast Contraction in Ciliates
	01.00 pm – 01.40 pm	Plenary Lecture V Prof Rup Lal (ANDC, University of Delhi, Delhi): Ciliate Protozoans in Microbiomes: A Neglected Resource Awaiting Discovery
	01.40 pm – 02.30 pm	Lunch
		Symposium Lectures
		Chairpersons: Prof Rup Lal, Prof Sukanya Lal Co-Chairperson: Dr Anita Thakur
	02.30 pm – 03.00 pm	Prof Atul K Johri (Jawaharlal Nehru University, New Delhi, India): Vaccine Development from Jenner to Genomics
	03.00 pm – 03.30 pm	Dr Abdur Rahaman (National Institute of Science Education and Research (NISER)-Bhubaneswar): Cellular Trafficking and Organellar Homeostasis
	03.30 pm – 04.00 pm	Plenary Lecture VI Prof David JS Montagnes (University of Liverpool, UK): Finding Your Scientific Story by Writing Backwards
	04.00 pm – 04.20 pm	Tea
		Chairpersons: Dr Abdur Rahaman, Dr Simran Bhullar Co-Chairperson: Dr Sushma Bharadwaj
	04.20 pm – 04.50 pm	Poster Session
	04.50 pm – 05.20 pm	Plenary Lecture VII Dr Alexey Potekhin (University of Innsbruck, Austria): Bacterial Killer Symbionts of *Paramecium*: Diversity, Ecology, Genomics
	05.20 pm – 05.50 pm	Plenary Lecture VIII Prof Bettina Sonntag (University of Innsbruck, Austria): Ciliates in Science Communication
	06.00 pm – 07.00 pm	Cultural Program (Dhwani Room)
	07.00 pm onwards	Dinner

DAY 1 (Room B)

Date	Time	
February 06, 2025	Invited Talks by Faculty	
		Chairpersons: Prof Charu Khosla Gupta, Prof Pooja Bhagat Co-Chairperson: Dr Aparna Sharma
	02.30 pm – 02.40 pm	Prof Soma Mondal Ghorai (Hindu College, University of Delhi, India): Anti-Staphylococcal and Anti-Biofilm Activity Analysis of Chimeric Endolysins: An in-vitro, ex-vivo and in-vivo Study
	02.40 pm – 02.50 pm	Prof Urmi Bajpai (Acharya Narendra Dev College, University of Delhi, India): The Rise of Superbugs: can Bacteriophages offer A Line of Defense?
	02.50 pm – 03.00 pm	Dr Jyoti Taneja (Daulat Ram College, University of Delhi, India): Identification and Characterization of Potential Vaccine Candidate using Hypothetical Proteins from *Mycoplasma genitalium*: A Reverse Vaccinology Based Approach
	03.00 pm – 03.10 pm	Dr Raunak Dhanker (GD Goenka University, Gurugram, India): Importance of Ciliates in Zooplankton Diet
	03.10 pm – 03.20 pm	Dr Parveen Gill (Zakir Husain Delhi College, University of Delhi, India): LC50 Assessment of Neonicotinoid Insecticide Imidacloprid and Evaluation of its Toxicity Parameters Against *Eisenia fetida*
	03.20 pm – 03.30 pm	Prof Sarita Kumar (Acharya Narendra Dev College, University of Delhi, India): The Buzzing Threat: Innovative and Sustainable Approaches for Mosquito Control
	03.30 pm – 03.40 pm	Dr Arpita Sharma (GD Goenka University, Gurugram, India): Harnessing Genetic Engineering for Enhancing Abiotic Stress Tolerance: A Sustainable Pathway for Future Agriculture
	03.40 pm – 03.50 pm	Dr Geetika Kalra (Acharya Narendra Dev College, University of Delhi, India): Impact of Exogenous Application of Antioxidants on ROS Signaling in Germinating Seeds of *Solanum Lycopersicum* L.
	03.50 pm – 04.00 pm	Dr Manoj Kumar Singh (University of Allahabad, Prayagraj, India): Exploring the Potential of Endophytic Bacteria isolated from Dragon Fruit Plant
	04.00 pm – 04.20 pm	Tea
	04.20 pm – 04.50 pm	Poster Session
	06.00 pm – 07.00 pm	Cultural Program
	07.00 pm onwards	Dinner

DAY 2 (Room A)

Date	Time	
		Chairpersons: Dr Bharti Sarkar, Dr Debjani Dutta Mukhopadhyay Co-Chairperson: Dr Deepshikha
February 07, 2025	08.50 am – 09.30 am	Plenary Lecture IX Prof Gaytha Langlois (Bryant University, USA): Video Storytelling – Tracking Microbial Communities on Coral Reefs
	Symposium Lectures	
		Chairpersons: Dr Komal Kamra, Dr Archna Pandey Co-Chairperson: Dr Kavita Mittal
	09.30 am – 10.10 am	Dr Santosh Kumar (BRIC-National Centre for Cell Science, Pune, India): Understanding the Molecular Mechanism of Biogenesis of Lysosome-Related Organelles using the *Tetrahymena thermophila*
	10.10 am – 10.40 am	Dr Dagmar Jirsova (Arizona State University, USA): Mosaic Protein Localization of Glycolysis and Gluconeogenesis in *Paramecium Tetraurelia* and its preference for Anabolic Metabolism
	10.40 am – 10.55 am	Prof Seema Makhija (ANDC, University of Delhi, India): Molecular and Morphological Descriptions of three Species Belonging to Class Colpodea: A Journey from Classical Taxonomy to Macrogenome Analysis
	10.55 am – 11.10 am	Prof Ravi Toteja (ANDC, University of Delhi, India): Ciliates and Human Health
	11.10 am – 11.30 am	Tea

	11.30 am – 12.00 noon	Poster Session
		Chairpersons: Prof Seema Makhija, Dr Princy Hira Co-Chairperson: Dr Vineet Girdharwal
	12.00 noon – 12.15 pm	Dr Ilmas Naqvi (Zakir Husain Delhi College, University of Delhi, India): Discovering a new species of the Genus *Hemiurosomoida* from a Fresh Water Body, Delhi, India
	12.15 pm – 12.30 pm	Dr Santosh Kumar (Zoological Survey of India, Kolkata, India): Curiosity Driven Frugal Science with Ciliates
	Young Scientist Presentations	
	12.30 pm – 12.45 pm	Dr Harpreet Kaur (University of Alberta, Canada): Comparative and Phylogenetic Analyses of Snares across the Ciliate Diversity
	12.45 pm – 01.00 pm	Dr Simran Bhullar (Ramalingaswami Re-Entry Fellow (RLS), Department of Genetics, University of Delhi South Campus): *Paramecium tetraurelia*: Lessons Learnt
	01.00 pm – 01.15 pm	Dr S Sripoorna (Ohio State University, USA): Unveiling the Complexity of Rumen Ciliates: Insights into Diversity and Lysosomal Peptidase Profile
	01.15 pm – 01.30 pm	Dr Jeeva S Abrham (Columbia University, USA): Diversity and Taxonomic Study of Ciliates from Freshwater Sites in Delhi, India, with Special Emphasis on the Genus *Euplotes*
	01.30 pm – 02.20 pm	Lunch [GBM of ISoCB for members at 01.30 pm (committee room) followed by lunch]
	Symposium Lectures	
		Chairpersons: Dr Utkarsh Sood, Prof Anita Narang, Dr Meenakshi Thakur Co-Chairperson: Dr Rashmi Sharma
	02.20 pm – 02.50 pm	Dr Komal Kamra (ANDC, University of Delhi, India): Mining Ciliates for Science and Fun
	02.50 pm – 03.20 pm	Dr Maximilian H. Ganser (Paris Lodron University of Salzburg, Austria): A Multidisciplinary Approach for Investigating Marine Planktonic Ciliates (Alveolata, Ciliophora, Oligotrichea)
	03.20 pm – 03.50 pm	Dr Valentina Serra (University of Pisa, Italy): One Mitogenome to Rule them all: How Mitochondrial Genomes Help in Disentangling the Phylogeny of Ciliophora
	03.50 pm – 04.20 pm	Poster Session
	04.20 pm – 04.40 pm	Cultural Program
	04.40 pm – 05.20 pm	Valedictory: Presentation of Summary, Dr Alan Warren Quiz Using Cut Outs from the Presentations Open to Students, Prize Distribution to Winners
	05.20 pm	High Tea

DAY 2 (Room B)

Date	Time	
February 07, 2025	Invited Talks by Faculty	
		Chairpersons: Prof Urmi Bajpai, Prof Geetu Gambhir Co-Chairperson: Dr Rimpy Kaur Chowhan
	10.10 am – 10.20 am	Dr Khangembam Cherita Devi (University of Allahabad, Prayagraj, India): *Nitrospira*: Nature's One-Stop Shop for Nitrification
	10.20 am – 10.30 am	Prof Charu Khosla Gupta (Acharya Narendra Dev College, University of Delhi, India): Ciliates: The Warriors of Ecorestoration
	10.30 am – 10.40 am	Prof Hardeep Kaur (Ramjas College, University of Delhi, India): Environmental Drivers of Fungal Resistance: Evolution, Mechanisms, And Impact
	10.40 am – 10.50 am	Dr Rahul Dev Ambedkar (School of Open Learning, University of Delhi, India): A Bioinformatics Approach for the Novel Corona Virus
	10.50 am – 11.00 am	Dr Parminder Kaur Narang (SGTB Khalsa College, University of Delhi, India): Microalgae: Future Perspectives- Human Welfare
	11.00 am – 11.10 am	Prof Anita Narang (Acharya Narendra Dev College, University of Delhi, India): Optimizing in-vitro Culture of *Acacia nilotica*: Overcoming Contamination, Browning, and Seasonal Variability
	11.10 am – 11.30 am	Tea

	11.30 am – 12.00 noon	**Poster Session**
		Chairpersons: Dr Ilmas Naqvi, Dr B. Hareramadas **Co-Chairperson: Dr Rahul Dev**
	12.00 noon – 12.10 pm	**Dr Shashi Dahiya (ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India): AI in Agriculture**
	12.10 pm – 12.20 pm	**Dr Archna Pandey (Acharya Narendra Dev College, University of Delhi, India): A Bioluminescence-Based Whole-Cell Biosensor for Quality Control of Food-Grade Silver Foil (E174)**
	12.20 pm – 12.30 pm	**Prof Uma Dhawan (Bhaskaracharya College of Applied Sciences, University of Delhi, India): Unfolding the Epigenetic Code: Role of 5-Hmc In REM Sleep Deprivation Associated Neurodegeneration**
	12.30 pm – 12.40 pm	**Prof Uma Chaudhary (Bhaskaracharya College of Applied Sciences, University of Delhi, India): Exploiting Moonlight Proteins to Combat Antimicrobial Resistance**
	12.40 pm – 12.50 pm	**Dr Sumit Sahni (School of Open Learning, University of Delhi, India): Transforming Agri-Waste into a Bio-Circular Economy: Sustainable Mushroom Cultivation And Resource Reutilization**
	12.50 pm – 01.00 pm	**Dr Sunita Jetly (Acharya Narendra Dev College, University of Delhi, India): Unveiling the Silent Threat: A Comprehensive Review on the Imperative Role of Thalassemia Screening in Bharat**
	01.00 pm – 01.10 pm	**Dr Swati Sharma (Blood Research Center, University of North Carolina Chapel Hill, NC): Platelet PAR4 (F2RL3) plays a Protective Role in Viral Infections by Inducing the Release of Anti-Inflammatory Extracellular Vesicles (EVs)**
	01.10 pm – 01.20 pm	**Dr Rashmi Sharma (Acharya Narendra Dev College, University of Delhi, India): Anticholinesterases in Plants and their Allelopathic Potential**
	01.20 pm – 01.30 pm	
	01.30 pm – 02.20 pm	**Lunch** **[GBM of ISoCB for members at 01.30 pm (committee room) followed by lunch]**
	Oral Presentations by Faculty	
		Chairpersons: Prof Uma Chaudhary, Dr Raunak Dhanker **Co-Chairperson: Dr Pragati Malik**
	02.20 pm – 02.30 pm	**Dr Deepali Joon (SGTB Khalsa College, University of Delhi, India): Developing a Rapid Diagnostic Tool using Loop Mediated Isothermal Amplification Combined with Lateral Flow Dipstick: Insights for Ciliate Pathogen Detection**
	02.30 pm – 02.40 pm	**Dr Vineet Girdharwal (Acharya Narendra Dev College, University of Delhi, India): Habitat Ecology of Spotted Owlet *Athene brama brama* (Temminck 1981) in Rural Area**
	02.40 pm – 02.50 pm	**Dr Rimpy Kaur Chowhan (Acharya Narendra Dev College, University of Delhi, India): SARS-Cov-2 and Heart Tissue Pathology: Uncovering New Insights into Protein Accumulation and Cardiovascular Impact**
	02.50 pm – 03.00 pm	**Dr Jagjeet Singh (RPS Group of Institutions, Mahendergarh, Haryana, India): Protective Efficacy of Berberine against Acetamiprid-Mediated Impaired Electron Transport System and Mitochondrial Ailments**
	03.00 pm – 03.10 pm	**Dr Divya Bajaj (Hindu College, University of Delhi, India): The Vicious Cycle of Anthropogenic Environmental Pollutants and their Biomagnification Causing Food Insecurity**
	03.10 pm – 03.20 pm	**Ms Swati Maurya (Acharya Narendra Dev College, University of Delhi, India): To Study the Spatial and Temporal Variations in the Physical, Chemical Parameters and Ciliate Community Structure from the Forest Area and the Extreme Environments.**
	03.20 pm – 03.30 pm	**Dr Mandeep Kaur (Acharya Narendra Dev College, University of Delhi, India): Exploring the Efficacy of Plant Extracts in the Biological Control of Plant Pathogenic Fungi**
	03.30 pm – 03.40 pm	**Dr Rajeev Ranjan (Acharya Narendra Dev College, University of Delhi, India): Bacterial Bioluminescence: A Rapid Biosensing Tool for Ecotoxicological Monitoring**
	03.40 pm – 03.50 pm	**Ms Bhumika Chauhan (Acharya Narendra Dev College, University of Delhi, India): A Comprehensive Study on Prevalance of Parasitic Infection in Commonly Edible Freshwater Fish *Channa striata* (Snakeheaded Murrel) from Meerut Region**

	03.50 pm – 04.20 pm	Poster Session
	04.20 pm – 04.40 pm	Cultural Program
	04.40 pm – 05.20 pm	Valedictory: Presentation of Summary, Dr Alan Warren Quiz Using Cut Outs from the Presentations Open to Students, Prize Distribution to Winners
	05.20 pm	High Tea

DAY 2 (Room C)

Date	Time	
February 07, 2025	Oral Presentations by Students	
		Chairpersons: Prof Soma Mondal Ghorai, Dr Jyoti Taneja Co-Chairperson: Dr Md. Arafat Hussain
	12.00 noon – 12.10 pm	Ms Muskan Yadav (Acharya Narendra Dev College, University of Delhi, India): Optimization of Recombinant Interferon Beta (IFN-ß) Expression in *E. coli* through Systematic Variation of Induction Parameters
	12.10 pm – 12.20 pm	Mr Nitin Joshi (Acharya Narendra Dev College, University of Delhi, India): Impact of Air Pollution on Leaf Morphology in Urban Tree Species of Delhi
	12.20 pm – 12.30 pm	Mr Arnav Abhay Narayan (Acharya Narendra Dev College, University of Delhi, India): Biomechatronic Robotic Arm Actuated by Biological Muscle Tissue
	12.30 pm – 12.40 pm	Mr Ashish Arora (Indian Institute of Technology Delhi, India): Synthesis and Evaluation of Pangas Catfish (*Pangasius pangasius*) Tail-Derived Hydroxyapatite-Based 3D Porous Scaffolds for Bone Regeneration
	12.40 pm – 12.50 pm	Ms Jyoti Dagar (Acharya Narendra Dev College, University of Delhi, India): Advancing Ciliate Diversity Studies: Insights from DNA Barcoding in Freshwater and Terrestrial Ecosystems
	12.50 pm – 01.00 pm	Ms Saloni Ghosh (Acharya Narendra Dev College, University of Delhi, India): Unlocking SARS-Cov-2 Secrets: In-Silico Design of RT-PCR Primers for Rapid Diagnosis and Research
	01.00 pm – 01.10 pm	Mr Sandeep Antil (Acharya Narendra Dev College, University of Delhi, India): Assessing Ciliate Diversity as a Bioindicator of Heavy Metal Pollution and Seasonal Water Quality Changes in the Yamuna River
	01.10 pm – 01.20 pm	Mr Hariom Chaudhary (Acharya Narendra Dev College, University of Delhi, India): Cancer Resistance and MDM2: Uncovering the Molecular Mechanisms
	01.20 pm – 01.30 pm	Ms Tanisha Singh (Acharya Narendra Dev College, University of Delhi, India): Efficacy of Zinc and Copper Nanoparticles in Modulating Seed Germination
	01.30 pm – 02.20 pm	Lunch [GBM of ISoCB for members at 01.30 pm (committee room) followed by lunch]
		Chairpersons: Dr Neetu Kukreja, Prof Uma Dhawan Co-Chairperson: Dr Sushma Bharadwaj
	02.20 pm – 02.30 pm	Mr Vatsal Bhargava (Department of Zoology, University of Delhi, India): Reclassification of *Spiroplasma atrichopogonis* Koerber *Et Al.* 2005 as a Later Heterotypic Synonym of *Spiroplasma mirum* Tully *Et Al.* 1982 using Genome-Centric Methodologies
	02.30 pm – 02.40 pm	Mr Abhilash Kumar (Ramjas College, University of Delhi, India): Resolving Taxonomic Ambiguities in *Williamsia* Species: A Whole-Genome Approach
	02.40 pm – 02.50 pm	Dr Annu (Maharshi Dayanand University, Rohtak, Haryana, India): Acetamiprid Exposure Mediates Structural and Molecular Alterations in the Liver Tissue of Rats
	02.50 pm – 03.00 pm	Ms Ritu Arora (Acharya Narendra Dev College, University of Delhi, India): Bacteriophage-Encoded Endolysins as Protein Antibiotic Candidates
	03.00 pm – 03.10 pm	Mr Sandeep Gupta (Acharya Narendra Dev College, University of Delhi, India): Assessing the Impact of COVID-19 and its Vaccination on the Reactivation of Varicella-Zoster Virus
	03.10 pm – 03.20 pm	Mr Hritik Kadian (Guru Gobind Singh Indraprastha University, New Delhi, India): Metal Mayhem: Unveiling the Toxic Impact of Heavy Metals on *Paramecium* Sp.

	03.20 pm – 03.30 pm	Mr Rohit Kumar Barnwal (Acharya Narendra Dev College, University of Delhi, India): Magnetic Nanoparticle-Mediated Immobilization of Alpha-Amylase from Germinating Barley Seedlings
	03.30 pm – 03.40 pm	Ms Divya (Acharya Narendra Dev College, University of Delhi, India): Impact of Novaluron on the Reproductive Potential and Gonotrophic Cycles of *Aedes aegypti* L. (Diptera: Culicidae)
	03.40 pm – 03.50 pm	
	03.50 pm – 04.20 pm	Poster Session
	04.20 pm – 04.40 pm	Cultural Program
	04.40 pm – 05.20 pm	Valedictory: Presentation of Summary, Dr Alan Warren Quiz Using Cut Outs from the Presentations Open to Students, Prize Distribution to Winners
	05.20 pm	High Tea

Venue, unless mentioned otherwise, is Acharya Narendra Dev College, Govindpuri, Kalka ji, New Delhi 110019

PLENARY LECTURES
SPEAKERS

INTERNATIONAL SYMPOSIUM ON
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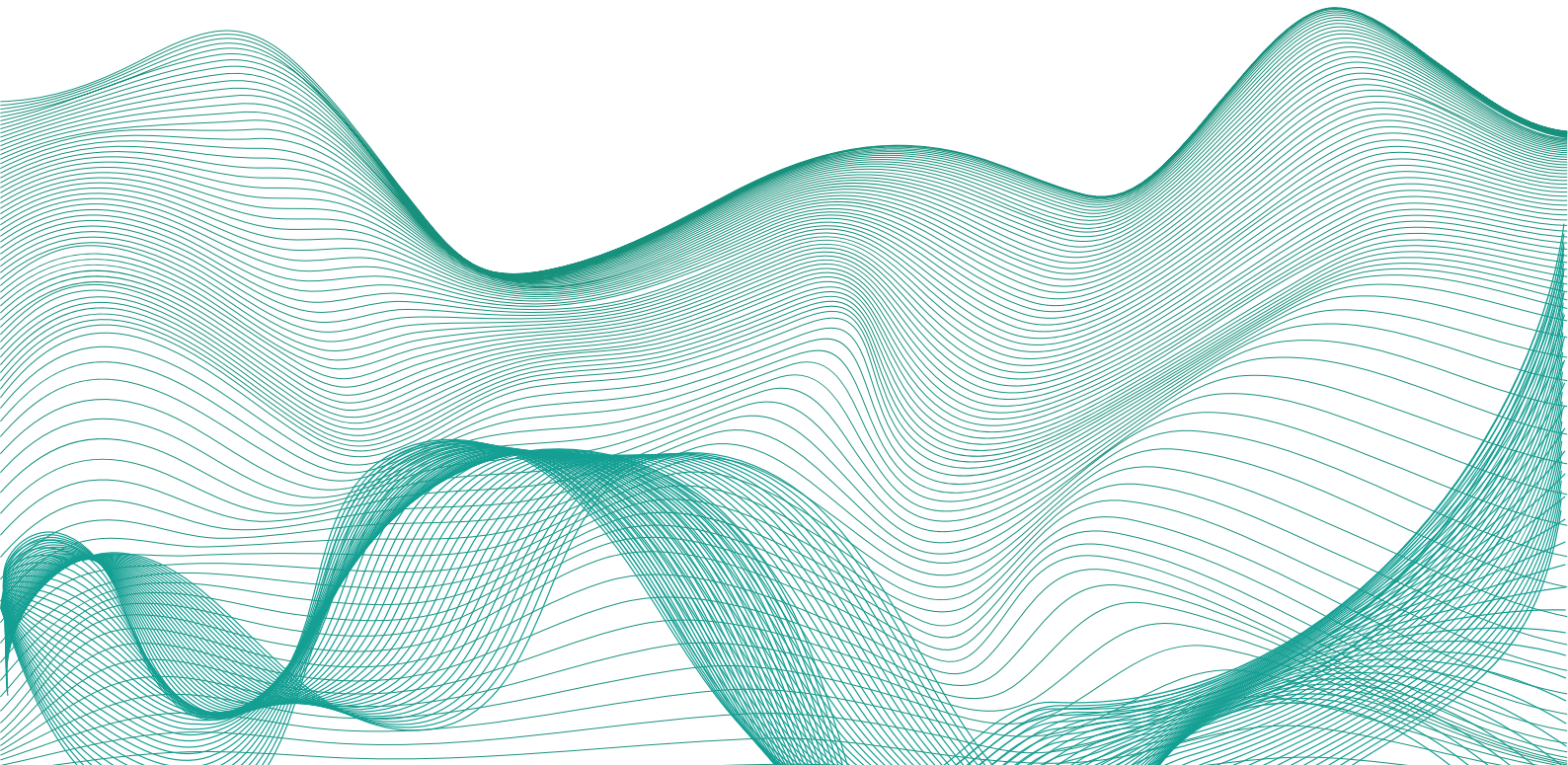

JOEL B. DACKS

Professor in the Department of Medicine, Division of Infectious Diseases at the University of Alberta, Canada

PROFILE

Joel B. Dacks is a Professor in the Department of Medicine, Division of Infectious Diseases at the University of Alberta. His research program explores the evolution and diversity of the eukaryotic membrane-trafficking system using 'omics, molecular evolution, and evolutionary cell biology. Prof. Dacks obtained his PhD with W. Ford Doolittle at Dalhousie University (2003), and then did a Research Fellowship with Mark Field at U. Cambridge, before returning to Canada and taking a position at the University of Alberta in 2008. He holds cross-appointment in the Department of Biological Sciences at the U. Alberta, a Research Scientist position at the Institute of Parasitology, Czech Academy of Sciences, and is an Honorary Professor in the Centre for Life's Origins and Evolution, University College London.

Evolutionary cell biology of the endomembrane system: how ciliate biology frames pan-eukaryotic phenomena?

Harpreet Kaur*, Kiran More*, and Joel B Dacks

Department of Medicine, Division of Infectious Diseases at the University of Alberta, Canada

ABSTRACT

The endomembrane system is a hallmark cellular feature and is critical to the normal healthy function of eukaryotes. Evolutionary cell biology has identified conserved and lineage-specific aspects of the organellar complement and machinery leading to both more general understanding of the eukaryotic condition and insight into its ancient evolution. Here I will focus on the contractile vacuole complex (CVC), a dynamic and complex organelle comprised of large vacuole (Bladder) connected to tubular reticulum (Spongiome). The CVC plays a vital role in osmoregulation and maintains cellular osmolarity of freshwater or soil dwelling protists across the eukaryotic lineages under hypotonic and hypertonic conditions. Despite the importance and widespread occurrence of the CVC, its evolutionary origins remain unclear. The evolutionary cell biology of this organelle will be examined by a transcriptomic and molecular evolutionary approach, highlighting data from ciliate model organisms. The proposed origins of the organelle will be placed in the larger evolutionary framework of endomembrane organelles from across eukaryotes and looking back to the emergence of the eukaryotic configuration.

ELENA SABANEYEVA

Associate Professor at the Department of Cytology and Histology, Saint-Petersburg State University, Russian Federation.

PROFILE

Elena Sabaneyeva, PhD, is an Associate Professor at the Department of Cytology and Histology, Faculty of Biology, Saint-Petersburg State University, Russian Federation. For more than 30 years, she has been studying symbiotic associations between ciliates and other microorganisms. Her other research interests include nuclear dualism in ciliates and the role of the intranuclear actin in nuclear organization in protists. Elena Sabaneyeva possesses expertise in light, electron and confocal laser scanning microscopy, fluorescence *in situ* hybridization and immunocytochemistry. The results of her studies are published in "Protist", "European Journal of Protistology", "Protoplasma", "Plos ONE", "Scientific Reports", "Symbiosis", "The ISME Journal", "Nature Communications". She gives a general course of lectures "Cell Biology" and specialized courses of lectures "Model Objects in Cell Biology" and "Special Issues of Cell Biology".

She was a Saint-Petersburg Unit coordinator in two projects supported by European Commission: 7FP IRSES projects "CIliates as natural reservoir of potentially pathogenic bacteria: an ecological, functional and evolutionary genomic investigation" (CINAR PATHOBACTER) and "Carbon balancing for nutrient control in wastewater treatment" (CARBALA).

Elena Sabaneyeva is on the editorial board of an international journal "Protistology".

Paramecium bursaria and its inhabitants

Elena Sabaneyeva, Arina Sotnikova, Natalia Lebedeva

Saint-Petersburg State University

ABSTRACT

Ciliates tend to from symbiotic associations with a plethora of microorganisms, prokaryotic as well as eukaryotic ones. The relationships between the partners in these symbiotic systems vary from mutualism to parasitism. Such symbioses play an important role in ecological systems and have a significant impact on evolution of both partners and the association as a whole. The partners in these symbioses interact at the cellular level of organization, the fine mechanisms of these interactions being the object of cell biology. Since some ciliates can be infected with potential human pathogens, the studies of symbiotic systems in these protists acquired a practical touch.

At present, Paramecium bursaria morphospecies is considered to be a cryptic species complex comprising at least 5 reproductively isolated species, the 6th putative species having been apparently lost from the current culture collections. *P. bursaria* symbioses with the unicellular algae *Chlorella* and *Micractinum* are the most common in nature populations, and they seem to be the most studied ones. Besides these associations, *P. bursaria* strains are known to harbor several Alfaproteobacteria and yeasts, these systems being largely underinvestigated.

Three *P. bursaria* strains from the ciliate culture collection of Saint-Petersburg State University (RC CCM) carrying endosymbiotic microorganisms were studied using confocal laser scanning microscopy, transmission electron microscopy and SSU rRNA sequencing. One of the strains was shown to be infected with the yeast Rhodotorula mucilaginosa, which is at the present time regarded as an opportunistic pathogen of humans. Infectivity of the yeast isolate towards Chlorella-free strains depended on yeast concentration; possible reasons for this dependance are proposed. The second strain, presumably belonging to the 6th species of

P. bursaria species complex was found to be infected with a novel cytoplasmic endosymbiotic bacterium. Phylogenetic relationships and

peculiarities of the fine structure of the partners of this symbiotic system are discussed. The third strain contained rod-like structures formed in the macronucleus upon experimental infection with the intranuclear symbiont *Holospora curviuscula*. The nature of the intranuclear rods was studied using TRITC-phalloidin staining and transmission electron microscopy. The data obtained with the both techniques argue for the presence of the cytoskeleton protein actin in the intranuclear rods, suggesting that the stress caused by the infection may lead to disturbance of nucleocytoplasmic transport of actin. This study was carried out using the materials and the equipment of the Core Facility Centers of Saint-Petersburg State University "Cultivation of Microorganisms", "Microscopy and Microanalysis", "Development of Molecular and Cellular Technologies". The authors acknowledge Saint-Petersburg State University for a research project 124032000041-1.

YURI MAZEI

Professor at Lomonosov Moscow State University (Russia) and Shenzhen MSU-BIT University (China)

PROFILE

Dr. Yuri Mazei is professor at Lomonosov Moscow State University (Russia) and Shenzhen MSU-BIT University (China). He is Deputy Editor-in-Chief of Protistology and Editorial board member of European Journal of Protistology and Nature Conservation Research. Dr. Mazei's research focuses on the ecology marine benthic ciliates, taxonomy and ecology of testate amoebae in freshwaters, soils and peatlands, developing applications of protists in addressing the issues of global climate changes, carbon sequestration, environmental pollution, paleoecological reconstructions. He has published over 200 papers in international journals including Nature Geosciences, Nature Communications, Global Change Biology, Annual Review of Environment and Resources, Current Biology, iMeta, Ecology, Journal of Ecology, Global ecology and Biogeography, Quaternary Science Reviews. He has been recognized with several prestigious awards, including the title of Chevalier des Palmes académiques, France (2020) and a medal of the Russian Academy of Sciences for young scientists (2008). Yuri Mazei was a visiting scholar of the range of the institutions including Ocean University of China, Qingdao; Università degli Studi di Padova, Italy; Université de Neuchâtel, Switzerland; Natural History Museum, London, UK; Annamalai University, India.

Community ecology of marine benthic ciliates: integrating taxonomic, metabarcoding and functional traits approaches

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ABSTRACT

Ciliates represent an important component of marine bottom ecosystems both intertidal and deep-sea. Being part of microbial loop ciliates play crucial role in the interaction between biotic community and environment facing ongoing global planetary changes. To better understand the response of marine benthic ecosystems towards rapid climate change and increasing human impact, we reviewed original data about the community structure, spatial patterns and as well as seasonal and long-term dynamics of benthic ciliate assemblages in the intertidal and bathyal zones of the Arctic Ocean (White Sea, Barents Sea, Kara Sea), Pacific Ocean (South China Sea) and Indian Ocean (Bay of Bengal).

We applied taxonomic, functional traits and DNA metabarcoding approaches to reveal major environmental factors that affect community structure and compositions, such as sediment properties, depth, beach type, salinity. We stress that functional traits approach exhibit more unified patterns across different ecosystems, while taxonomic and DNA-metabarcoding approaches reflect unique biodiversity properties of certain assemblages. Analysis of long-term dynamics of intertidal ciliate assemblages shows that from 1980s–1990s to 2009–2019 the role of competitive factors is decreasing, and communities are becoming more spatially and temporally homogeneous with insignificant contribution of stochastic processes to the ciliate community assembly in the White Sea. Such community transformation is likely due to the response of the entire intertidal ecosystem to global climate change in Arctic.

ALAN WARREN

Scientific Associate
Natural History Museum, London, UK.

PROFILE

After graduating with a BSc in Microbiology in 1977, Professor Alan Warren joined the Natural History Museum (NHM), London, to undertake a PhD focused on the ecology and systematics of peritrich ciliates. In 1979, he became a member of staff in the Protozoa Research Group at the NHM and was awarded his PhD in 1983.

He continued to conduct research on the systematics and biodiversity of ciliates, initially focusing on freshwater forms but dedicating the last 25 years of his career to marine forms, primarily in collaboration with various research groups in China. For approximately 35 years, he also held curatorial responsibility for the NHM protozoa collection.

Professor Warren has served as an editorial board member for several journals and held various positions on the committees of both Protistology-UK and the International Society of Protistologists. Additionally, he was a member of the Editorial Board of the World Register for Marine Species (WoRMS), overseeing the classification of *Ciliophora* (ciliates).

Over the course of his career, he has published approximately 380 articles in peer-reviewed journals, contributed 23 book chapters, and co-edited two books. He retired in 2021 but continues to pursue his research interests as a Scientific Associate of the NHM.

Cell shape-shifting and ultrafast contraction in ciliates

Alan Warren

Natural History Museum, London, UK

ABSTRACT

Although many ciliates have a fixed cell shape and size, others are flexible, and some can contract rapidly or are capable of remarkable shape change. Stalk contraction in peritrichs is one of the fastest in the biological world: in less than 9 milliseconds, the stalk contracts completely and the cell body (zooid) moves at a maximum velocity of about 1,200 body lengths per second. This is an example of ultrafast contraction. Contraction and extension processes are driven by calcium ion binding and release, resulting in small conformational changes in protein subunits which are amplified by their linear arrangement in filaments in the stalk myoneme (spasmoneme). These subunits are primarily composed of spasmins which are centrin-like filamentous fibres. A genomic analysis revealed that spasmins appear to have played a major role in the evolutionary history of peritrichs due to their differential rates of evolution and repeated acquisition and loss.

The giant ciliate *Spirostomum* is also capable of ultrafast contraction and can reduce its body length by up to 75% in about 5 milliseconds. By analyzing the genome of *S. minus*, the key molecular components of its contractile apparatus were identified. This includes two types of spasmin and two giant spasmin binding proteins (GSBPs), which act as a backbone to which hundreds of spasmin molecules can bind. The GSBP-spasmin protein complex appears to be the functional unit of the mesh-like contractile fibrillar system which, coupled with various other subcellular structures, provides the mechanism for repetitive ultrafast cell contraction and extension.

The predatory ciliate *Lacrymaria* has a flexible ‘‘neck’’ that can stretch 7–8 times the length of its body to capture prey. This morphological change involves a unique actin-myosin system, two cytoskeletons, and an unusual GSPB. By combining analysis of cell behaviour, immunofluorescence staining, super-resolution imaging of subcellular structures, and 3D reconstruction, it was found that the two cytoskeletal structures work together to facilitate the extraordinary dynamic shape-shifting in *Lacrymaria.*

RUP LAL

INSA Senior Scientist at Acharya Narendra Dev College, University of Delhi, Delhi, India

PROFILE

Prof. Rup Lal (FNA, FNASc, FNAAS, FAAM) is an INSA Senior Scientist at Acharya Narendra Dev College, University of Delhi and a former ASM Ambassador for India (2012-2015). He is currently the ISME, FEMS, and IMiLI Ambassador. He has received numerous awards, including the Alexander von Humboldt Fellowship, DBT-Overseas Fellowship, Indo-US-ASM Professorship in Microbiology, and the Australian Government Endeavour Executive Fellowship (2018-2019), ASM Moselio Schaechter Distinguished Service Award, Prof. S.R. Vyas Memorial Award, Prof. BN Johri Award, and Lifetime Achievement Award from the Association of Microbiologists of India. He served as Editor-in-Chief of the Indian Journal of Microbiology from 2006 to 2013 and is a member of the editorial board for several journals including ISME, mSystem, Environmental Microbiology etc. With over 45 years of experience in microbial diversity and genomics, he has supervised more than 75 Ph.D. theses, published over 250 papers with more than 11,000 citations, and holds two patents.

Ciliate Protozoans in Microbiomes: A Neglected Resource Awaiting Discovery

Rup Lal
INSA Senior Scientist, Acharya Narendra Dev College, University of Delhi

ABSTRACT

Ciliate protozoans, often overshadowed by bacteria and archaea in microbiome research, represent a crucial yet underexplored component of microbial ecosystems. These organisms play intricate roles as grazers, nutrient cyclers, and ecosystem engineers, significantly shaping microbial community dynamics and functional diversity. Despite their ecological importance, ciliate protozoans have been largely neglected in microbiome studies, partly due to challenges in their identification and quantification. Another factor that warrants further exploration is their large and complex genomic content. With the advent of accessible DNA sequencing technologies, computational biology tools, and advanced molecular and imaging techniques, the study of ciliate protozoans can yield transformative insights into microbial interactions, host-microbiome relationships, and environmental processes. The lecture on **"Ciliate Protozoans in Microbiomes: A Neglected Resource Awaiting Discovery"** advocates for the integration of these organisms into microbiome research frameworks to fully uncover their contributions and vast untapped potential

DAVID JS MONTAGNES

Reader Evolution, Institute of Infection, Veterinary & Ecological Sciences Faculty of Health & Life Science, University of Liverpool

PROFILE

In the mid-80s, Prof. Potekhin conducted fieldwork to assess ciliate biomass and abundance, leading to the development of the Quantitative Protargol Stain (QPS) and the discovery of new ciliate species. His research also included meta-analyses linking ciliate growth rates to cell size, providing a foundation for future studies. In the late 80s, his focus shifted to laboratory research on ciliate growth and grazing rates, integrating these into ecosystem models. By the mid-90s, he studied the effects of temperature on protist composition, growth, and food web dynamics. Around 2000, he combined taxonomic and ecological expertise to explore how protists and metazoans respond to environmental changes, including climate-induced temperature shifts. By 2010, his research focused on using ciliates as models for predator-prey dynamics, thermal performance, and bioassays, and highlighted their ecological role in controlling zoosporotic diseases and toxic cyanobacterial blooms. Now retired, Prof. Potekhin continues to contribute to studies and serves as an editor for *Marine Life Sciences and Technology*. He will address the theme of cohesive scientific narratives at the 2025 International Symposium on Ciliate Biology.

Finding your scientific story by writing backwards

David JS Montagnes

University of Liverpool, UK

ABSTRACT

To succeed, a scientist must write well. Substantial guidance exists on writing papers that follow the classic Introduction, Methods, Results, and Discussion (IMRaD) structure. Here, we fill a critical gap in this pedagogical canon. We offer guidance on developing a good scientific story. This valuable—yet often poorly achieved—skill can increase the impact of a study and its likelihood of acceptance. A scientific story goes beyond presenting information. It is a cohesive narrative that engages the reader by presenting and solving a problem, with a beginning, middle, and end. To create this narrative structure, we urge writers to consider starting at the end of their study, starting with writing their main conclusions, which provide the basis of the Discussion, and then work backwards: Results → Methods → refine the Discussion → Introduction → Abstract → Title. In this brief and informal editorial, we offer guidance to a wide audience, ranging from upper-level undergraduates (who have just conducted their first research project) to senior scientists (who may benefit from re-thinking their approach to writing). To do so, we provide specific instruction, examples, and a guide to the literature on how to "write backwards", linking scientific storytelling to the IMRaD structure.

Keywords: Scientific narrative, Scientific pedagogy, Scientific writing, Story-telling · Writing structure

ALEXEY POTEKHIN

Professor & Senior Researcher at the Department for Limnology, Mondsee, University of Innsbruck, Austria.

PROFILE

Prof. Dr. Alexey Potekhin, born in 1975 in Saint Petersburg (formerly Leningrad), USSR, obtained his Ph.D. in Cell Biology in 2002 from St. Petersburg State University. He has been with St. Petersburg State University since 2007, where he became an associate professor and later a full professor in 2015 at the Department of Microbiology, Faculty of Biology. In the summer of 2022, he transitioned to a position as a senior researcher at the Department for Limnology at the University of Innsbruck in Mondsee, Austria.

His research primarily focuses on ciliates, with particular interest in Paramecium genetics, epigenetics, speciation, and the diverse symbioses between ciliates and bacteria. Prof. Potekhin has authored more than 50 publications in peer-reviewed journals, including *Nature*, *Nature Communications*, *ISME Journal*, *Genome Biology and Evolution*, and *Microorganisms*. He has also held positions as an Invited Professor at institutions such as Ecole Normale Superieure in Paris, France; the University of Pisa in Italy; and the National Autonomous University of Mexico. Over the past decade, he has served as a principal investigator for various research grants and his research group has participated in several European international network projects. Prof. Potekhin maintains active collaborations with research groups in Paris, France; Pisa and Pavia, Italy; Wuppertal, Germany; and Mexico City, Mexico.

Bacterial killer symbionts of *Paramecium*: diversity, ecology, genomics

Alexey Potekhin

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ABSTRACT

Some *Paramecium* strains are known to acquire a killer trait. Coincubation of such killer cells together with sensitive paramecia results in a rapid death of the latter. Ability to kill is conferred to the ciliates by their bacterial endosymbionts belonging to *Caedimonas* (Alphaproteobacteria) or *Caedibacter* (Gammaproteobacteria). These symbionts kill naïve ciliates when they get into the hosts' food vacuoles. The mechanism of killer effect remains unclear, as well as the causes of resistance to killer trait of many symbiont-free paramecia and killers themselves.

We studied the killer traits, quantitative dependences and dynamics of killer effects associated with several isolates of *Caedimonas varicaedens* from *Paramecium biaurelia* and *P. caudatum*. We found that killer effects of different isolates were unequal, and that the killer strains themselves had reciprocal resistance, though not absolute. *Caedimonas*-associated killer traits were tested on a range of *Paramecium* species. In general, the strains of the *P. aurelia* species complex and *P. caudatum* were mostly sensitive to the killer trait, while the strains of phylogenetically distant *Paramecium* species were resistant. Thus, *Caedimonas*-bearing ciliates acquire with the symbionts not only a burden, but also an advantage allowing them to win competition with uninfected paramecia normally present in the same environment. We showed that these non-infectious symbionts can be transferred from one host cell to another during sexual process via a cytoplasmic bridge.

We also found the *Caedimonas* strain which make its host, *P. tetraurelia*, a mate killer: an uninfected mating partner dies fast after conjugation. We sequenced several metagenomes of the *Paramecium* killer strains, and will discuss the emergence, phylogenetics, and evolution of the "killer symbiosis".

BETTINA SONNTAG

Senior scientist, Head of working group "Ciliate ecology and taxonomy", Research Department for Limnology, Mondsee of the Leopold-Franzens- University Innsbruck

PROFILE

Her research group focuses on the ecology, diversity and taxonomy of ciliates mainly from lakes. To understand the autecology of ciliates and their bacterial and algal endosymbionts, we study these protists on an alpha- taxonomic level including morphological and molecular state-of-the-art methods. Presently She is a Senior scientist and Head of the research group 'Ciliate ecology and taxonomy', Research Department for Limnology, Mondsee, University of Innsbruck, Austria. Academic education: 2000 Ph.D. in Natural Sciences, University of Innsbruck, Austria; 1998 Diploma in Biology with a focus on Ecology and Limnology.
Publications (peer-reviewed)
See www.ciliates.at for a full list

Ciliates in science communication

Bettina Sonntag

Ciliate Biology Research Lab, Acharya Narendra Dev College, University of Delhi

ABSTRACT

Science dissemination is key to counter science skepticism and make non-experts aware of the importance of protists in aquatic ecosystems. Ciliates are key protists in water bodies. These unicellular eukaryotes are essential microbes in the trophic transfer in aquatic food webs. Investigating tiny ciliates by non-experts is closely coupled with the use of a microscope including colorful explanations by an expert. Many simple approaches demonstrating the individual role of the highly diverse group of ciliates, how they live, what they look like and what they eat are already available. Apart from 'diving' microscopically into a drop of lake or river water, cultivated model protists can be shown. By using larger ciliates such as stentors as 'role models', non-experts are gaining fascinating insights into these comparatively huge, colorful and sessile or slow-moving organisms. Other well-known model ciliates are paramecia that can be involved into simple experiments. Though, whatever is demonstrated to non-experts shall not only include basic knowledge but of course also state-of-the-art research, e.g., morphological and molecular identification of a certain ciliate including ecological information about the taxon and its value as an indicator species. In this way, scientists can communicate their 'lab news' directly to non-experts and explain why basic research is important.

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GAYTHA A. LANGLOIS

Professor Emerita in Environmental Policy at Bryant University, Rhode Island, USA,

PROFILE

Gaytha A. Langlois, PhD, is Professor Emerita in Environmental Policy at Bryant University, located in Rhode Island, USA, where her scholarly pursuits have included studies of microbial communities associated with coral reefs and oil-stressed ecosystems. Her research focuses on the microbial dynamics of ciliates in shallow coastal sediments and the diversity of epiphytic marine ciliates in rock pools, along with the ecological implications of ciliate/coral interactions following bleaching episodes. She has served as Membership Secretary and President of the International Society of Protistology (ISOP). Her courses and writings have addressed climate change impacts on Arctic tundra habitats, protection strategies for endangered Metasequoia redwoods in China, and the challenges of integrating innovative energy technology solutions. Dr. Langlois served as Chair of the Department of Science and Technology at Bryant and co-developed the Global Environmental Studies program. She created the Center for Sustainable Business Practices and has been active in community service where she helped to craft municipal and statewide environmental policy in both governmental and NGO roles.

Video storytelling – Tracking microbial communities on coral reefs

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ABSTRACT

Multi-year field and laboratory studies conducted at the Heron Island Research Station (HIRS) located in the Capricorn Region of the Great Barrier Reef revealed complex microbial communities. Heron Reef, home to about two-thirds of the coral species found on the GBR, has experienced repeated bleaching episodes in the past decades. This ongoing project emphasizes the diversity of ciliates found in shallow reef sediments, including the dynamics of opportunistic and/or potentially pathogenic species associated with damaged corals undergoing disease conditions and these altered communities are characterized by rapid tissue breakdown in hard corals and release of high levels of dissolved organic matter. Benthic samples were taken by direct capture, observed with phase contrast and epifluorescence microscopy, recorded by video and photomicrography, and fixed for further identification and genomic assessment. Photographic and video images are being assembled into online reference collections that will be available for future HIRS researchers and other protistologists and coral reef scientists, accompanied by field notes and locational information. This presentation will feature video imagery documenting the diversity of protists, primarily ciliates observers on Heron Island and will illustrate the potential for developing educational tools for urgently addressing climate change.

SYMPOSIUM LECTURES

SPEAKERS

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH

ATUL JOHRI

Professor, School of Life Sciences, Jawaharlal Nehru University, Delhi, India

PROFILE

Prof. Johri has obtained Ph.D. in Microbiology with Prof. Rup Lal, Zoology Department, Delhi University. He has done post-doctoral fellowship work in the world top universities like University of Waterloo, Canada, Tufts University Boston, University of California, Harvard Medical School, Harvard University, Boston USA. Prof. Johri has won many prestigious international award like namely UNESCO Young Scientist Award, ASM visiting research Professorship award. Prof. Johri has published research papers in journals like Nature, Science Transnational medicine, Nature Microbiology, PNAS, Plant Cell JBC and Nature Communications. Currently, he is serving as a Professor in JNU, New Delhi and working on the vaccine development against human pathogens.

Vaccine development from Jenner to genomics

Pooja Mahajan[1], Rupesh Aggarwal[1], Samiksha Pandiya[1], Meenakshi Dua[2] and Atul Kumar Johri[1]*
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ABSTRACT

With the advent of genomics, it is now possible to develop vaccine in a short of period of time as compared to the conventional approaches. In this regard, the systematic approach to identify or search for a vaccine candidate in the data base is known as Reverse Vaccinology approach (RV). We have used RV in order to identify a universal vaccine candidate against Group B Streptococcus which causes pneumonia sepsis and meningitis in new borne babies. We will be presenting data related to this aspect.

ABDUR RAHAMAN

Associate Professor, National Institute of Science Education and Research, Bhubaneswar

PROFILE

Abdur Rahaman obtained his doctoral degree from Indian Institute of Science (IISc), Bangalore in 2003. Before joining the National Institute of Science Education and Research (NISER)-Bhubaneswar in 2009, he has carried out his postdoctoral studies in the University of Chicago, Cornell University and McGill University. Currently, Dr Rahaman is an associate professor and his laboratory is interested in understanding the mechanism and regulation of nuclear expansion.

Cellular trafficking and organellar homeostasis

Abdur Rahaman

School of Biological Sciences, National Institute of Science Education and Research-Bhubaneswar

ABSTRACT

Biomolecules are trafficked and targeted to various compartments after their synthesis. This process plays important role in organelle biogenesis and cellular homeostasis. Our lab focuses on understanding the mechanism of nuclear expansion and role of a dynamin related protein Drp6 in this process. By employing various cell biological, biochemical, biophysical and genetic approaches we have delineated the mechanism of targeting Drp6 to the nuclear envelope. Using an in vitro assay we demonstrate that Drp6 performs membrane fusion function and mediates nuclear expansion by controlling perinuclear endoplasmic reticular network. We have also delineated the mechanism behind regulation of nuclear expansion by Drp6 and observed that phosphorylation of a single serine residue in the GTPase domain regulates its nuclear localization. Recently we have discovered a novel endocytic route to deliver a specific lipid cargo to the nucleus important for nuclear expansion. In this presentation I would discuss about the cellular trafficking and protein targeting, and their role in nuclear expansion.

SANTOSH KUMAR

Scientist D, National Centre for Cell Science (NCCS), Pune .

PROFILE

B.Sc. in Biology from MDS University, Ajmer, and an M.Sc. in Biotechnology from Kumaun University, Nainital. He was awarded a Ph.D. in Life Sciences by CSIR-IMTECH, Chandigarh, in collaboration with JNU, New Delhi, in 2011.

With 17 years of research experience, Dr. Kumar has worked at CSIR-IMTECH, Chandigarh, The University of Chicago (as a Postdoctoral Researcher), Yale University (as an Associate Research Scientist), Panjab University, Chandigarh (as a UGC-Assistant Professor), and now at NCCS, Pune. His expertise spans cell biology, biochemistry, and molecular biology, with research covering protein trafficking, proteomic analysis, mammalian cell culture, and model organisms such as *C. elegans*, *Tetrahymena*, and yeast.

He has reviewed for eight international journals, supervised 12 M.S. students, and served as an invited speaker at various national and international conferences. He has published over 22 papers in renowned journals and is a reviewing editor for *Frontiers in Biophysics*. Recently, he was awarded a Wellcome Trust DBT Intermediate Fellowship in basic biology.

Understanding the molecular mechanism of biogenesis of lysosome-related organelles using the *Tetrahymena thermophila*

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ABSTRACT

Dense core granules (DCGs) are specialized secretory vesicles playing key tissue-specific roles in animals and other eukaryotic lineages. In the *Tetrahymena*, formation of secretory organelles (mucocyst) shares striking similarities to insulin granule formation in animals. However, recent studies have suggested unexpected similarities between DCGs and lysosome-related organelles (LROs), making the study of LROs even more important for advancing human health. The studies of mucocysts in Tetrahymena, including our previous work have indicated that mucocysts are belong to the family of LROs, while parallel studies in animal cells have hypothesized DCGs to be LROs. One factor in the formation of animal cell LROs is control of luminal ion concentrations, for which key determinants are proton-translocating Vacuolar-type ATPases (V-ATPase). In this study, we show that the evolutionarily conserved a1 subunit of V-ATPase complex, which determines the compartment specificity of the entire complex, is required for the biogenesis of LROs in *Tetrahymena*.

DAGMAR JIRSOVÁ

Postdoctoral fellow at Arizona State University (ASU), USA

PROFILE

Dr. Dagmar Jirsová is a postdoc fellow at Arizona State University (ASU) in the Wideman lab, exploring the evolutionary cell biology of various protists. She obtained her PhD at the Department of Parasitology, South Bohemian University, in collaboration with the Natural History Museum, London, in Dr. Lukas Rüber's group, comparing genomic traits in parasites and their hosts under the same environmental pressure. Soon after, she fully converted to protistology and worked in Prof. Julius Lukeš's group and Prof. Miroslav Oborník's group at the Biological Centre of the Czech Academy of Sciences, shifting her focus towards cell culturing, microscopy, cell biology, and biochemistry of parasitic and free-living protists. Four years ago, she began her current postdoctoral position at ASU, where she established the culturing section of the protistology lab and successfully implemented a protocol for organellar proteomics. She was recently awarded a prestigious European MSCA Fellowship CZ, which allows her to continue her work.

Mosaic protein localization of glycolysis and gluconeogenesis in *Paramecium tetraurelia* and its preference for anabolic metabolism

Dagmar Jirsová
Wideman lab, Arizona State University (ASU), USA

ABSTRACT

Our understanding of metabolic pathway localisation is highly limited by data obtained from model organisms like yeast and humans. These organisms use glucose as a primary source of energy. But what happens if glucose is not the most widely available resource? We used organellar proteomics to examine and untangle the carbon metabolism of the ciliate *Paramecium tetraurelia*. This protocol allowed us to classify over 9,000 proteins across 16 cellular compartments in *P. tetraurelia*, providing significant insights into its cell biology and metabolism. Glycolysis is one of the main carbon pathways and is traditionally placed **in** the cytosol, according to the model organism knowledge. However, our data show a mosaic localisation of this pathway in both the cytosol and mitochondria in *P. tetraurelia*.

As *P. tetraurelia* is a heterotrophic bacterivore, **which feeds on a protein-rich diet**, we hypothesise that **it catabolises** the resulting amino acids through the TCA cycle and subsequently **anabolises** carbon compounds to synthesise glucose via gluconeogenesis. This challenges the traditional view of glycolysis as a strictly cytosolic process and highlights metabolic plasticity in ciliates, and potentially in other heterotrophs. Furthermore, we localised glycolytic enzymes to various cellular compartments and explored their additional roles in glycolysis self-regulation, gene transcription, and apoptosis-like functions. These findings highlight the flexibility of metabolic pathways and enzyme moonlighting in ciliates, contributing to a deeper understanding of metabolic specialisation and compartmentalisation in this lineage.

SEEMA MAKHIJA

Professor, Department of Zoology, Acharya Narendra Dev College, University of Delhi, Delhi, India

PROFILE

Prof. Seema Makhija is an esteemed Professor at Department of Zoology, Acharya Narendra Dev College, University of Delhi. Her expertise involves Cell Biology and Molecular Ciliate Biology. Currently, her area of research includes biodiversity of ciliates, stress response in ciliates and DNA barcoding of ciliates for species identification. She has been the Principal Investigator of various UGC (University Grants Commission) and DST-sanctioned research projects. She has authored various chapters for Undergraduate courses in NSDL and ILLL, a Textbook of Immunology and a Cell Biology Practical Manual. Prof. Makhija was awarded with "Distinguished Teacher" award by University of Delhi. She is also a life member of International Society of Protistology (ISOP) and Association of Teachers in Biological Sciences.

Molecular and morphological descriptions of three species belonging to class Colpodea: A journey from classical taxonomy to macrogenome analysis

Swati Maurya[1], Sandeep Antil[1], Jyoti Dagar[1], Sripoorna Somasundaram[2], Jeeva Susan Abraham[3], Seema Makhija[1] and Ravi Toteja[1*]

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ABSTRACT

Colpoda belong to the phylum Ciliophora, class Colpodea, order Colpodida. In the present study, morphology and phylogenetic position of three species belonging to class Colpodea from various habitats are described using classical and molecular methods. Two species *Colpoda* n. sp1. and *Colpoda* n. sp were isolated from Okhla Sewage Treatment Plant (STP) and Okhla Landfill (L) respectively. One species of *Colpoda* n. sp2. was isolated from Jahanpanah forest (J). *Colpoda* n. sp1. is characterized as follows: size *in vivo* about 20-24 X 28-32 µm, after protargol staining 14.03-19.57 x 8.76-14.46 µm. The shape of macronucleus is spherical or ellipsoid. The micronucleus is single and ellipsoid in shape, attached to macronucleus. Whereas, Colpoda n. sp. is characterized as follows: size *in vivo* about 20-24 X 28-32 µm, after protargol staining 19.94-31.31 x 11.97-23.01 µm. The shape of macronucleus is spherical with one micronucleus not attached to the macronucleus. The average number of somatic kineties in Colpoda n. sp1. and *Colpoda* n. sp2. is 12 and 9 respectively. *Colpoda* n. sp2. is characterized as follows: size *in vivo* about 25-30x39-43 µm, after protargol staining 14.04-30.86 x 10.49-21.87 µm. The shape of macronucleus is spherical with no micronucleus, broadly reniform, colorless, rigid, swimming in a spiral path. The oral apparatus is located mid apically. The average number of somatic kineties is 18. The 18S or SSU rRNA gene has also been sequenced and submitted to genbank. A comparison of all the three species with their congeners has also been done. Partial macrogenome of this species was also sequenced through high-throughput sequencing using

telomere-primer PCR amplification. The genome has been analysed and annotated using various bioinformatics tools. This is the first macrogenome sequence of a ciliate *Colpoda* n. sp1. Submitted by an Indian group.

Keywords: Colpodea, Macrogenome, Sewage treatment plant, Macronucleus

RAVI TOTEJA

Professor & Officiating Principal at Acharya Narendra Dev College, University of Delhi, Delhi, India

PROFILE

Prof. Ravi Toteja, Officiating Principal of AND College and an esteemed Professor in the Department of Zoology, has been teaching Cell and Molecular Biology and Immunology since 2000. He holds a Zoology (Hons.) degree, an MSc in Cell Biology, an MPhil in Tumor Immunology, and a PhD in Molecular Parasitology from the University of Delhi. Prof. Toteja's research focuses on the biodiversity and stress responses of ciliates, as well as DNA barcoding for species identification.

He has published extensively in peer-reviewed journals and presented his findings at numerous national and international conferences. An accomplished author, he has co-authored the *Textbook of Biotechnology*, *Textbook of Immunology*, and a *Cell Biology Practical Manual*, alongside contributing chapters for ILLL and NSDL. Prof. Toteja is a life member of the Indian Parasitology Society and a member of the Association of Teachers in Biological Sciences. Recognized for his dedication to teaching and research, he received the Meritorious Teachers' Award in 2017 from the Government of Delhi. Through his academic and research contributions, Prof. Toteja continues to make significant impacts in the fields of cell biology, immunology, and parasitology.

Ciliates and Human Health

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ABSTRACT

Water is an essential element of the ecosystem, offering numerous health advantages. In recent decades, the availability of potable water has dramatically diminished due to anthropogenic activities that adversely affect human health and aquatic ecosystems. If current trends persist, almost 50% of the global population is projected to experience water shortages by the end of the forthcoming year. Ciliates, unicellular eukaryotic microbes, play a crucial role in sustaining water health and, consequently, in safeguarding human health. Their presence and diversity act as valuable markers of water quality, which aid in the early detection of environmental hazards that can impact human populations., while their ecological roles, such as nutrient and pollutant consumption and recycling, facilitate the self-purification of aquatic environments. Moreover, bacterial predator ciliates diminish pathogenic bacterial populations responsible for waterborne diseases such as dysentery, diarrhoea, and jaundice. Euplotin C, a secondary metabolite synthesized by the marine ciliate *Euplotes crassus* has demonstrated significant anti-cancer properties. Understanding the role of ciliates in human health requires a One Health perspective that integrates environmental, animal, and human health. Investigating ciliate ecology and their interactions with pathogens presents intriguing opportunities for developing strategies to mitigate health risks while leveraging their advantages in environmental monitoring and disease prevention. This comprehensive understanding highlights the underexplored dualistic nature of ciliates in human health, emphasizing their importance in maintaining overall well-being.

Keywords: Water, Human Health, Ciliates, Ecosystem, Diversity

ILMAS NAQVI

Associate Professor
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PROFILE

Dr Ilmas Naqvi has completed her graduation and post-graduation from Aligarh Muslim University. She has obtained her M.Phil. and Ph.D. degrees from University of Delhi. She has published 6 papers in the journals of national and international repute on ciliate biology. She has also attended many workshops, national conferences and international symposiums. Currently, she has been working as Associate Professor in Zakir Husain Delhi College.

Discovering a new species of the genus *Hemiurosomoida* from a fresh water body, Delhi, India

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ABSTRACT

Genus *Hemiurosomoida* was created by Singh and Kamra in 2015 on the basis of its morphology, morphogenesis and molecular data. Because the cells in these three genera are morphologically identical, members of this genus were first assigned to the genus *Oxytricha*, then moved to the genus *Urosomoida*, and finally to *Hemiurosomoida*. However, the SSU rRNA-based molecular study revealed that this genus's members are positioned in a new genus called *Hemiurosomoida* because they are situated far from the other two genera in the phylogenetic tree. To date, four species of this genus have been identified: i.e. *H. longa*, *H. warreni*, *H. tibetensis* and *H. koreana*. In the present study, we are reporting a new species of genus Hemiurosomoida n. sp. From a fresh water body from Delhi, India, based on its morphology and morphogenesis.

The morphology and morphogenesis of a new freshwater ciliate, *Hemiurosomoida* n. sp. were described for the first time. Diagnostic feature of *Hemiurosomoida* includes; Flexible body; size of protargol stained cell 81x18 µm; cells narrowly elongated with rounded anterior end and tapering posterior end; 2 macronuclear nodules and 2 micronuclei; 17 Frontal-Ventral-Transverse (F_{1-8}, V_{1-5}, T_{1-4}); transverse cirri arranged in a linear row; four dorsal rows of bristles (DK_{1-3} and DM_1); 2 caudal cirri; on an average 19 adoral membranelles; 17 right marginal cirri; 17 left marginal cirri; No fragmentation of DP_3; buccal cavity flat and narrow and undulating membranes (UMs) in *Oxytricha* pattern.

SANTOSH KUMAR

Senior scientist at the Zoological Survey of India, Kolkata

PROFILE

Dr. Santosh Kumar is a senior scientist at the Zoological Survey of India, Kolkata. His research mainly focuses on the taxonomy and ecology of ciliated protists. He obtained his Ph.D. from the University of Delhi, where he studied the diversity of ciliates from selected biotopes in India and the effects of heavy metals on certain ciliates, especially the recombinant cell lines of *Tetrahymena thermophila*. He was part of the Soil Mapping project in Italy, where he studied ciliated protozoa as bio-indicators of soil quality in agricultural fields under different farming practices. He also participated in the Korean Research Fellowship program, where he investigated ciliated protists as bio-indicators of water quality in industrial polluted sites and extreme habitats. His current research focuses on studying the diversity of ciliates and gastrotrichs from Protected areas (National parks and Sanctuaries) as well as Ramsar wetlands of India; the diversity of marine ciliates associated with healthy and diseased corals; developing technology for reducing bacterial contamination in rivers, ponds, and drains; and studying faunal diversity in the Ramsar Wetlands of India. Dr. Kumar has described over 20 novel ciliates from India, Australia, Jamaica, South Korea, and Italy, using standard methods such as morphology and molecular phylogeny employing ribosomal and mitochondrial genes. He has published numerous articles in reputable journals, holds a patent, and has contributed to over 25 presentations in national and international conferences, symposia, and workshops.

Preliminary studies on ciliates associated with corals of Gulf of Mannar Marine National Park, India

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ABSTRACT

Ciliates, a diverse array of single-celled organisms, have garnered attention in coral disease research due to their roles in coral health and disease dynamics. This study delves into the significance of ciliates in coral diseases, emphasizing their potential as indicators and contributors to the decline in coral health. Coral reefs, crucial ecosystems supporting marine biodiversity, are under unprecedented threats, including disease outbreaks linked to environmental stressors. Although often overlooked in coral disease research, ciliates have been found associated with various coral diseases globally. Their presence and abundance in diseased coral tissues suggest potential involvement in disease pathogenesis and progression. Ciliates exhibit a range of interactions with coral hosts, from commensalism to parasitism, with certain species causing tissue necrosis and lesions. Their capacity to colonize coral surfaces and infiltrate host tissues underscores their significant role in coral disease dynamics. The present study conducted in the Gulf of Mannar Marine National Park (GoM MNP) over a period of four years (2019 – 2023) revealed the presence of over 55 ciliate species associated with both live and diseased corals. The data indicates the presence of 22 ciliates known to cause diseases in corals worldwide. Moreover, this study expands the list of ciliates associated with coral diseases globally and suggests that the corals of GoM MNP may be at a higher risk than previously considered. Next-generation sequencing (NGS) data on the bacterial communities associated with corals indicated the presence of over 450 bacterial species. Understanding the interactions between ciliates and corals is crucial for effective coral disease management and conservation strategies. Targeted monitoring of ciliate populations in coral reefs can facilitate early detection and response efforts to mitigate disease outbreaks. Furthermore, incorporating ciliates into coral health assessments can improve our ability to evaluate ecosystem resilience and predict the future of coral reefs amidst ongoing environmental changes. In conclusion, ciliates play significant roles in coral disease ecology, influencing the health and resilience of coral reef ecosystems. Continued research on ciliate-coral interactions is vital for advancing our understanding of coral disease dynamics and guiding conservation efforts aimed at preserving these invaluable marine habitats.

KOMAL KAMRA

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PROFILE

An alumnus University of Delhi, higher education in Zoology (specialization Cell Biology), research in Eukaryotic Microbiology, she was faculty for 44+ years in SGTB Khalsa College, University of Delhi until retirement as Associate Professor of Zoology; presently, Adjunct Scientist, Ciliate Biology Research Lab, Acharya Narendra Dev College, University of Delhi. She has several publications in Peer Reviewed Journals, Chapters in Books, Articles and Reports, Presentations at Conferences, Principal Investigator of Several Research Projects, Supervision of PhD students, Reviewer of Research articles in Journals, Organization of several National & International Conferences

Mining ciliates for science and fun

Komal Kamra

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ABSTRACT

Ciliated Protists are unicellular eukaryotes which have held a high position as model organisms for biological research. It was my good fortune to have had the opportunity to study, and later teach and do research, at the University of Delhi which already had scientists as faculty who were working with ciliates. To use them for cytochemical staining as an undergraduate student and later do research using them as experimental organisms for a wide variety of subjects – aging, DNA damage and repair, species identification and systematics, developmental biology, population analysis with respect to physico-chemical parameters, metal toxicity, extremophiles, role in STPs, phylogenetic analysis and metagenomics to a more recent venture into their cell biology understanding the vesicle fusion machinery. Some published and unpublished observations shall be shared.

This presentation thus meanders through my journey of over 40 years using ciliated protists for research and for fun.

MAXIMILIAN H. GANSER

Postdoctoral researcher at the Paris Lodron University of Salzburg

PROFILE

Dr. Maximilian H. Ganser, a postdoctoral researcher at the Paris Lodron University of Salzburg, earned his PhD in 2022, focusing on diversity, evolution, and geographic distribution in marine planktonic ciliates, particularly Oligotrichea. His expertise lies in the taxonomy, phylogenetics, systematics, and -omics of free-living marine planktonic ciliates, employing advanced microscopical (e.g., LM, SEM, TEM, CLSM) and molecular methods, including transcriptomics and proteomics. Currently, Dr. Ganser contributes to an Austrian Science Fund project exploring tintinnid (Alveolata, Ciliophora) shells using phylogeny-aware comparative transcriptomics and various microscopical techniques.

His research achievements include analyzing metabarcoding data from European and Chinese coastal waters, uncovering significant biogeographic patterns in ciliates. He also developed DeSignate, an interdisciplinary tool for identifying diagnostic molecular characters in gene sequence alignments, complementing taxonomic diagnoses. Notably, Dr. Ganser discovered a new tintinnid genus, conducted ultrastructural investigations of tintinnid resting stages, and explored tintinnid extrusomes. His work advances our understanding of marine biodiversity and ciliate systematics. For further information, Dr. Ganser's professional profiles are available on ORCID and PLUS Research platforms.

A multidisciplinary approach for investigating marine planktonic ciliates (Alveolata, Ciliophora, Oligotrichea)

Maximilian H. Ganser
Paris Lodron University of Salzburg

ABSTRACT

The Oligotrichea are among the most diverse and abundant ciliates in the marine plankton. We investigate various aspects of these ciliated protists through a multidisciplinary approach integrating genetic methodologies such as metabarcoding, phylogenetics, and transcriptomics, alongside microscopic techniques including light, scanning, and transmission electron microscopy. Our metabarcoding study revealed significant disparities in planktonic ciliate communities between Chinese and European coastal waters, indicating biogeographic patterns typically attributed to multicellular organisms. Based on morphological and molecular data, we established a novel genus within tintinnids, a group of ciliates known for their intricate vase-shaped loricae (shells), which are still their main taxonomic feature. To facilitate the integration of molecular data with morphological analyses in taxon diagnoses, we developed the web-based tool DeSignate. Its application to detect signature characters in multisequence alignments is exemplified in a bioinformatic approach with data from marine planktonic ciliates. Despite unresolved phylogenetic relationships, our ultrastructural studies provide crucial insights into the lorica-forming tintinnid ciliates. We employed transmission and scanning electron microscopy to investigate the capsules, nano harpoons, as well as the variety of lorica wall structures, aiding in hypothesizing relationships. We were the first to ultrastructurally investigate a tintinnid resting cyst with different wall layers shielding the dormant cell from adverse environmental conditions. Our current project focusses on understanding how tintinnids form their loricae, starting with material production via secretion to assembly. In essence, our research illuminates the fascinating world of marine planktonic ciliates, offering glimpses into the mechanisms underlying their remarkable adaptations and evolutionary relationships.

This research was funded by the Austrian Science Fund (FWF) [Grant-DOI: 10.55776/P35736; 10.55776/I3268].

VALENTINA SERRA

Researcher at the Biology Department, Pisa University

PROFILE

Dr. Valentina Serra is a researcher at the Biology Department of Pisa University, where she carried out her PhD on biodiversity of Ciliates and their symbionts, from the Indian subcontinent. She contributed to the development of the "next generation taxonomy" (NGTax) workflow to achieve a comprehensive description of ciliates and their symbionts, incorporating traditional techniques, ultrastructural analyses, molecular and state of the art genomics through bioinformatics tools. She has been contributing to the field of ciliate biodiversity, systematic and symbiosis for more than ten years.

One mitogenome to rule them all: how mitochondrial genomes help in disentangling the phylogeny of Ciliophora

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ABSTRACT

In recent years, the use of mitochondrial genes, or even entire mitochondrial genomes (mitogenomes), to investigate phylogenetic relationships became more and more popular. These kinds of analyses had been used, for example, to successfully depict cryptic species in protist, annelids and arthropods, or to discriminate between subspecies of *Apis mellifera*. In this regard, ciliates possess very peculiar mitochondrial genomes, being among the first to be identified as linear, showing several split rRNA genes and protein genes and being relatively long (~ 40 Kbp) in respect with other eukaryotes. Nevertheless, the low amount of available mitochondrial genomes of ciliates in online databases, as well as the absence of representatives of many classes of this phylum, didn't allow, up to now, to perform extensive and in-depth analyses using mitochondrial genomes. Here we present a first attempt to perform a phylogeny of phylum Ciliophora, using the whole mitochondrial genome. All the available mitochondrial genomes in online databases were collected. Moreover, genomic project involving ciliates were inspected, and when possible related reads were downloaded and analyzed in order to reconstruct mitochondrial genomes previously neglected or overlooked. For at least two representatives of each missing class in online databases, the whole DNA material was extracted, and the mitochondrial genome was sequenced and bioinformatically assembled. A selection of 17 protein coding genes was then used to perform the phylogenetic analysis, among over 100 representatives of the phylum. In conclusion, some considerations about pros and cons of using mitochondrial genomes for phylogenetic analyses will be presented, as well as some considerations about synteny and genome content in ciliate mitochondria.

SHAN GAO

Professor at Ocean University of China

PROFILE

Dr Shan Gao, Professor at Ocean University of China, recipient of the National Science Fund for Distinguished Young Scholars. She has been focused on examining the fundamental process of epigenetics, primarily using a model ciliate *Tetrahymena thermophila*. Her recent work emphasizes regulatory mechanisms and functional divergence of DNA N⁶-methyladenine (6mA) in eukaryotes, as well as the role of histone modifications in replication-transcription conflicts. She has published over 70 papers in top-tier journals including *Genes & Development*, *Genome Research*, and *Nucleic Acids Research*.

Dr Gao has served as a committee member of the International Congress of Protistology (ICOP), Vice Chair of the Ciliate Advisory Board, Secretary-General of the Asian Congress of Protistology (ACOP-II), Executive council member of the Chinese Society of Protozoology (CSP), and Junior Editor of *Science China Life Sciences*. Her awards include the Holz-Conner Award from the International Society of Protistologists, the Career Development Grant from the Chinese Society for Cell Biology, the Changlong Award and Young Scientist Award from the China Zoological Society, and the Shandong Province Natural Science Award (Youth Award).

Identification and characterization of the de novo methyltransferases for eukaryotic N6-methyladenine (6mA)

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ABSTRACT

N⁶-methyladenine (6mA) is an intensively investigated epigenetic modification in eukaryotes. 6mA is maintained through semi-conservative transmission during DNA replication, but the identity of *de novo* methyltransferase (MTase) catalyzing its establishment remains unknown. Here we identified MT-A70 family proteins AMT2 and AMT5 as the *de novo* MTases responsible for 6mA establishment, utilizing the unique sexual reproduction process of the unicellular eukaryote *Tetrahymena thermophila*. Deletion of *AMT2* and *AMT5* led to a substantial decrease in 6mA levels in the progeny macronucleus, resulting in an altered gene expression pattern and a significant decline in the survival rate of sexual progenies. Additionally, the maintenance MTase AMT1 could exhibit a much diminished *de novo* methylation activity in cells lacking AMT2 and AMT5. Our study delineated the establishment-maintenance pathway of 6mA and underscored the biological importance of *de novo* methylation, revealing a striking parallel between 6mA and the classical 5-methylcytosine (5mC) in eukaryotes.

WEIBO SONG

Professor at Ocean University of China (OUC)

PROFILE

Dr Weibo Song, Professor at Ocean University of China (OUC), Academician of the Chinese Academy of Sciences. Dr Song obtained his Ph.D. from the University of Bonn in Germany in 1989. Currently, he serves as the Director of the Institute of Marine Biodiversity and Evolution (IEMB) at OU. He is the Editor-in-Chief of *Marine Life Science & Technology*, Deputy Editor-in-Chief of *Fauna Sinica*, and an editorial board member of journals including *Science China Life Sciences*, *European Journal of Protistology*, *Journal of Eukaryotic Microbiology*, *Integrative Zoology*, and *Systematics and Biodiversity*.

Dr Song's research focuses on the basic biology of ciliated protozoa, covering areas such as cytology, systematics, morphological taxonomy, pathology, and ecology. He has published over 400 papers in international journals and authored/co-authored 5 monographs/volumes. He has been recognized with several prestigious awards, including the National Science Fund for Distinguished Young Scholars (1994), the Changjiang Scholar Distinguished Professor by the Ministry of Education (1999), and the China Young Scientist Award (2005). His research achievements have been honored with one National Natural Science Award (second prize) and four Natural Science Award by the Ministry of Education (first prize).

Diversity in oral structure and morphology of peritrichous ciliates: new findings mainly based on the fauna investigation in China

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ABSTRACT

With support from the NSFC, the fauna researches on the morphology, taxonomy, and phylogeny of peritrichous ciliates, especially from the Lake Weishan Wetland, the largest freshwater wetland in northern China, have been carried out over the last five years. These include: **(1)** more than 70 sessilid species have been identified/ morphologically studied and described using "integrative" methods (living morphology, silver staining, mark gene sequencing, previous definition comparison etc.). Many confusions, insufficient descriptions, synonyms, and misidentification of the "known" forms have been clarified, redefined, newly diagnosed, neo-typed, or critically revised; **(2)** two new families (Campanellidae and Rhabdostylidae), one new genus (*Parapiosoma*), and twelve new species have been established and described; **(3)** oral structure (especially the infundibular polykineties) as a phylogenetically informative character for resolving evolutionary relationships among peritrichs has been reconfirmed, the patterns of infundibular polykinety 3 have been categorized into five type-complexes; **(4)** at the same time, the marker genes (18S, ITS, 5.8S, COI) of all populations found including over 50 species have been sequenced and about 140 new sequences of related isolations have been submitted to the GenBank; and **(5)** the phylogenetic relationships and evolution within Peritrichia have been deciphered based on both morphological and molecular data. The results of the work mentioned above appeared in 14 research articles published in peer-reviewed international journals.

YING YAN

Professor at Ocean University of China (OUC)

PROFILE

Dr Ying Yan, Professor at Ocean University of China. She earned a Ph.D. in Aquatic Biology from the College of Fisheries at the same university in 2018. Following the completion of doctoral studies, Dr Yan pursued postdoctoral research at Smith College in the United States from 2018 to 2020. Dr Yan's research focuses on the genomics and gene evolution of ciliates. Employing a combination of genomics, cell biology, and molecular biology techniques, Dr Yan investigates ciliate genome evolution and regulatory mechanisms during cell division. Dr Yan has published over 30 SCI papers in journals such as mBio, Science China Life Sciences, and Molecular Biology and Evolution, with 25 of these articles being first-author or corresponding-author contributions. She has served as an editorial board member of Marine Life Science & Technology, and awarded as Young Expert of Taishan Scholars in Shandong Province

Role of Mob proteins in polarity and cytokinesis regulation in *Paramecium tetraurelia*

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ABSTRACT

To date, research indicates that the Mob protein family serves as crucial regulators in eukaryotic cell division, with their dysfunction resulting in abnormal cytokinesis. Previous studies in the single-celled model organism, *Paramecium tetraurelia*, have identified two Mob proteins, ptMob1 and ptMob4. Our results show that ptMob1 presents a decreasing gradient from the posterior to the anterior end of the cell, while ptMob4 shows a decreasing gradient from the anterior to the posterior end. As cytokinesis proceeds, ptMob1 spreads upward to the newborn posterior basal bodies of the anterior progeny, and ptMob4 localizes to the posterior progeny. We speculate that ptMob1 is involved in the regulation of the polarity of nascent basal body, thereby ensuring the correct localization of the division plane and proper cytokinesis. Depletion of ptMob1 and/or ptMob4 leads to polarity defects and affects cell proliferation rate by arresting cell cytokinesis. Additionally, we found that ptMST1 regulates the localization of ptMob1 at the cleavage furrow. This study provides novel insights into the regulatory role of Mob proteins in cytokinesis and contributes to the understanding of cytokinesis regulation in single-celled eukaryotes.

INVITED LECTURES

SPEAKERS

INTERNATIONAL SYMPOSIUM ON

CILIATE BIOLOGY

& INTERDISCIPLINARY RESEARCH

SOMA MONDAL GHORAI

Professor, in the Department of Zoology, Hindu College, University of Delhi, Delhi, India

PROFILE

Dr. Soma Mondal Ghorai completed her PhD from University of Delhi and is presently positioned as Professsor in the Department of Zoology, Hindu College, University of Delhi, Delhi, INDIA. She has publications in many reputed journals and has been actively involved in research in Comparative Immunology, microbiology and pharmacokinetics.

Anti-*staphylococcal* and anti-biofilm activity analysis of chimeric endolysins: An in-vitro, ex-vivo and in-vivo study

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ABSTRACT

Antimicrobial resistance (AMR) is a global concern associated with the emergence of resistance against antimicrobials like antibiotics, antifungals, or antivirals in microorganisms like bacteria, fungi, and viruses respectively. AMR has been declared as a top 10 global health threat by the World Health Organization (WHO). The worldwide spread of AMR ESKAPE pathogens (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter species)* are the major cause of mortality and morbidity in humans and animals worldwide. Among these ESKAPE pathogens, *Staphylococcus aureus* is the most opportunistic Gram-positive human and animal pathogen. The spread of methicillin-resistant Staphylococcus aureus and its ability to form biofilms impedes antibiotic treatment. This intensifies the search for novel antimicrobials like bacteriophage endolysins. This study presents the expression of chimeric endolysin CHAPk-SH3bk and investigates its anti-staphylococcal and anti-biofilm activity. The in-vitro antibacterial assays displayed higher activity of CHAPk against planktonic MRSA as compared to CHAPk-SH3bk; whereas CHAPk-SH3bk reduced biofilm of hospital and bovine origin MRSA more effectively as compared to CHAPk. In-vivo mice skin infection model and ex-vivo histology analysis for the anti-staphylococcal and anti-biofilm activity of chimeric constructs CHAPk, and CHAPk-SH3bk displayed significant biofilm reduction 24-hour biofilm in mice skin infection model. The ex-vivo histological studies, CLSM and Scanning electron microscopy confirmed by the in-vivo results. The results indicate that the presence of cell wall binding domain SH3b increased the biofilm reduction ability of enzymatically active domain CHAPk. The study demonstrates that construction of novel chimeric

endolysins by shuffling parental endolysin domains may increase their anti-biofilm activity to fight biofilm-forming MRSA.

Keywords: Biofilm, Chimeric endolysin, CHAPk-SH3bk, MRSA, skin infection

URMI BAJPAI

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PROFILE

Dr. Urmi Bajpai, a distinguished microbiologist, holds a PhD from the University of Delhi, South Campus, and has 25 years of teaching experience. She is a Professor in the Department of Biomedical Science at Acharya Narendra Dev College, University of Delhi. Dr. Bajpai is the co-founder of the International Bacteriophage Research Consortium (IBRC) in collaboration with OHSL, USA, and serves as Director of the Phage Program at Open Source Pharma Foundation. She also advises a DBT-BIRAC project on endolysins.

Her research focuses on antimycobacterial solutions, including exploring the anti-mycobacterial potential of mycobacteriophages and their lytic enzymes (endolysins) as alternatives to antibiotics. Dr. Bajpai is spearheading the development of Mycobacteriophage and Endolysin Banks. In TB drug discovery, her work targets multi-target therapy, identifying Mur enzyme inhibitors in *Mycobacterium tuberculosis* cell wall biosynthesis and repurposing drugs targeting Mtb Mur enzymes.

Dr. Bajpai's accolades include the INSA Teacher Award (2018), Meritorious Teacher Award (2014), and recognition as an SBRT Fellow by the Indian Bacteriophage Society (2022). She was named among Vigyan Vidushis by Vigyan Prasar, DST, in 2023, and featured in #365IndianWomxnInSTEM by TheLifeofScience.com (2021). Her contributions to bacteriophage science and education exemplify her dedication to scientific advancement and teaching excellence.

The rise of Superbugs: Can Bacteriophages offer a line of defense?

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ABSTRACT

Can we imagine modern medicine--the surgeries, chemotherapies, organ transplants, C-sections without antibiotics? Even a simple cut can get fatal!

Antimicrobials are essential for preventing and treating infections across humans, animals, and plants. However, the overuse and misuse of these drugs have led to a global antimicrobial resistance (AMR) crisis, characterised by the rise of 'superbugs'--microbial pathogens that are not killed by existing drugs. This escalating threat of AMR calls for immediate actions to safeguard our health across sectors and ensure a sustainable future. Essential mitigating measures include promoting preventive strategies, creating awareness of antimicrobials' responsible use, and exploring solutions like Phage Therapy.

Bacteriophages (phages for short), viruses that specifically target and kill bacteria and are safe for the environment, are Earth's most abundant life forms. They were first observed in India in Ganga-Yamuna rivers in the late 19th century. Historically used for treating bacterial infections in the early twentieth century, their application has been limited to Eastern European countries. However, the mounting AMR crisis and the scarcity of new antibiotics--have led to a renewed worldwide interest in phages as a viable alternative.

In this talk, I will explain the importance of phage discovery in stimulating interest in basic science and research among students, the role different disciplines can play in contributing to phage research and how we can all be a part of the solution to the AMR challenge.

JYOTI TANEJA

Associate Professor in the Department of Zoology, Daulat Ram College, University of Delhi, India

PROFILE

Dr. Jyoti Taneja is an active Researcher and Faculty at Department of Zoology, Daulat Ram College, University of Delhi, India. Dr. Taneja's research interests revolve around identifying and addressing the women's reproductive and sexual health related scientific challenges in the Asian community. She has demonstrated her research expertise in the area of COVID pandemic, STI's, PCOS and reproductive health with a quality publication track record and acquisition of reputed research grants as PI from prestigious funding agencies to carry out POST COVID sequelae study, STI and bacterial, viral pathogens related research.

Identification and characterization of potential vaccine candidate using hypothetical proteins from *Mycoplasma genitalium*: A reverse vaccinology-based approach

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ABSTRACT

Background:
The Centre for Disease Control and Prevention has recognized *Mycoplasma genitalium* (MG) 'an emerging sexually transmitted pathogen superbug on the watch list, associated with non-gonococcal urethritis, non-chlamydial urethritis in men and cervicitis, pelvic inflammatory diseases (PIDs), and tubal infertility in women'. The increasing prevalence of antibiotic-resistant *Mycoplasma genitalium* poses a significant challenge to global public health, necessitating the exploration of alternative therapeutic strategies, such as vaccine development. Despite its clinical relevance, many hypothetical proteins (HPs) in the *M. genitalium* genome remain uncharacterized. These HPs may serve as promising vaccine candidates, yet their potential has yet to be fully explored. The goal of this study was to apply artificial intelligence (AI)-driven reverse vaccinology to identify and prioritize novel vaccine candidates to combat *M. genitalium*.

Methods:
Hypothetical protein retrieved from the MG_237 strain of *Mycoplasma genitalium*, a previously uncharacterized yet promising vaccine target was used. A systematic pipeline utilizing computational tools, including ProtParam, CELLO, PSORTb, TMHMM, SignalP, and VirulentPred was used. These tools assessed the physicochemical properties, subcellular localization, transmembrane domains, and virulence potential of HPs. Additionally, BepiPred was used to predict B-cell epitopes to evaluate the immunogenicity of the proteins. HPs that met critical

criteria—surface exposure, stability, immunogenicity, and potential involvement in virulence—were shortlisted for experimental validation.

Results:

Out of 74 HPs analysed, 23 were identified as high-priority vaccine candidates. These candidates were predominantly membrane-associated and exhibited favorable stability indices. Functional annotation highlighted their potential roles in host-pathogen interactions, emphasizing their involvement in virulence mechanisms. Immunogenic epitopes were predicted within these proteins, further supporting their vaccine potential.

Conclusion:

This study demonstrates the application of reverse vaccinology as a transformative method for identifying novel vaccine candidates for *M. genitalium*. The prioritized HPs provide a strong foundation for future experimental validation and vaccine development, addressing the critical need for new therapeutic strategies against antibiotic-resistant sexually transmitted infections.

Keywords:

Artificial Intelligence, Reverse Vaccinology, *Mycoplasma genitalium*, Vaccine Development, Hypothetical Proteins, Antibiotic Resistance.

RAUNAK DHANKER

Assistant Professor, in the School of Engineering and Sciences, GD Goenka University, Haryana, India.

PROFILE

Dr. Raunak Dhanker is an Assistant Professor, in the School of Engineering and Sciences, GD Goenka University, Haryana, India. She has served as Research Associate, Amity University; Research Assistant in Central University of South Bihar, and Acharya Narendra Dev College, Delhi University. Dr. Dhanker holds a Ph.D. from the National Taiwan Ocean University, Taiwan. She has over ten years of experience in academics and research. Her research interests include Industrial and Environmental Biotechnology, Green Nanotechnology and Aquaculture. Dr. Dhanker has contributed as a potential reviewer in several journals. She has won Best paper presentation award twice and second poster presentation award thrice in international conferences. She has delivered invited talks in different organizations. She participates in national and international conferences frequently. She has published several research articles in reputed journals and book chapters with renowned publishers. Postgraduates and undergraduate students have won prizes at national and international platforms under her mentorship. She has served as a Guest Editorial Member of the journal Frontiers in Ecology and Evolution.

Importance of ciliates in zooplankton diet

Raunak Dhanker

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ABSTRACT

Ciliates are a vital food source for zooplankton, playing a key role in aquatic ecosystems. These single-celled organisms are abundant in aquatic environments, forming an integral part of the planktonic food web. Their significance comes from their small size, high nutritional value, and accessibility to various zooplankton species. Ciliates are the perfect size (10 to 200 µm) for consumption by a wide variety of zooplankton, including copepods, rotifers, and protozoans. Their small size allows for efficient feeding, while their rich nutritional content packed with proteins, lipids, and essential amino acids provides zooplankton with the energy and nutrients required for growth, reproduction, and survival. This makes ciliates particularly important in nutrient-poor environments where other food sources may be limited. In addition to serving as a direct food source, ciliates play a crucial role in nutrient cycling within aquatic ecosystems. By feeding on bacteria, algae, and detritus, ciliates regulate microbial populations and aid in breaking down organic matter. When consumed by zooplankton, they transfer energy up the food chain, supporting higher trophic levels such as fish and larger invertebrates. The abundance of ciliates can directly influence zooplankton population dynamics, growth rates, and community composition. In ecosystems rich in ciliates, zooplankton typically experience improved survival and reproductive success. Furthermore, ciliates help maintain ecological balance by shaping interactions within planktonic communities, influencing competition and predation. In conclusion, ciliates are an essential dietary resource for zooplankton, contributing vital nutrients that support their growth and helping to maintain the health and productivity of aquatic food webs.

Keywords: Ciliates, Zooplankton, Nutrient cycle, Food web, Trophic levels.

PARVEEN GILL

Assistant Professor in the Department of Zoology at ZHDC, Delhi University.

PROFILE

Dr. Parveen Gill, an accomplished zoologist with MSc and PhD degrees from CCSHAU-Hisar, serves as an Assistant Professor in the Department of Zoology at ZHDC, Delhi University. Her research interests span vermicomposting, focusing on the growth and reproduction of Eisenia fetida, and the comparative toxicological effects of neonicotinoid insecticides on antioxidant defense systems in Eisenia fetida and their cascading impacts on Cyprinus carpio. Dr. Gill's scholarly contributions include 9 first-author research papers, 22 collaborative papers, 1 book, and 4 book chapters. She has actively participated in 8 international and 9 national conferences, received 3 awards, and engaged in 9 workshops, 9 trainings, and a webinar, reflecting her dedication to academic excellence and knowledge dissemination.

LC50 Assessment of neonicotinoid insecticide Imidacloprid and evaluation of its toxicity parameters against *Eisenia fetida*

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ABSTRACT

Earthworms are used as bio-indicator species determining soil toxicity against pesticides mainly due to their ability of producing high biomass in the soil. It's important to note from an ecological perspective how sensitive earthworms are to even low pesticide concentrations. Insecticide residues harm the micro and macro flora of beneficial invertebrates and disrupt the physiological functions of earthworms, resulting in damage to their external and internal organs leading to death. To calculate the LC_{50} value, the earthworm species *Eisenia fetida* was exposed to various concentrations of widely used neonicotinoid insecticide imidacloprid using the usual paper contact toxicity method. The mortality percentage was estimated after 24 hours of imidacloprid exposure, and it was confirmed that the dose of 0.195µl/cm^2 resulted in 50% mortality of earthworms. When earthworms are exposed to higher concentrations of imidacloprid few negative morphological and behavioural changes were observed these includes preclittelar bulging, blackening of the body, segment swelling, body constriction, cuticle rupture, and oozing of coelomic fluid from the body.

Keywords: *Ecotoxicity; Mortality; Pesticides; Bioindicators; Acetamiprid*

SARITA KUMAR

Professor, Department of Zoology,
Acharya Narendra Dev College,
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PROFILE

Prof. Sarita Kumar, currently working at Acharya Narendra Dev College, University of Delhi, completed her education from University of Delhi. Since then, she is working in every sphere of education. She carries expertise in the area of 'Insect Pest and Vector Control' and working on innovative and safe management approaches to mitigate them. Presently, she is credited with 85+ research publications, 90+ presentations/publications in National/International Conferences, 18 e-book chapters, 25+ e-modules for PG and UG programs, 23 Books on school science and 02 books for college students. She is a member of several prestigious committees and organizations, and has delivered talks at several National and International platforms. Under her supervision, several students have completed doctorate, PDF, RA and senior RA. An Editor/Associate editor and Reviewer of several Journals of National and International repute, she is a proud recipient of several prestigious awards, such as '*Meritorious Teacher Award*', Govt. of NCT of Delhi & '*Distinguished Teacher Award*' from University of Delhi, to name a few.

The Buzzing Threat: Innovative and Sustainable Approaches for Mosquito Control

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ABSTRACT

Mosquitoes are the most significant disease vectors responsible for the transmission of several diseases of human concern such as dengue, chikungunya, malaria, encephalitis, filariasis and yellow fever. Lack of effective medication and successful vaccines has made the management of these diseases difficult resulting in reliance on the vector management. Despite formulation and utilization of several control measures, chemicals-based interventions are the most preferred methods. However, use of these insecticides frequently and extensively has increased the problem of environmental pollution and led to the selection of resistance alleles in mosquitoes causing widespread development of insecticide resistance. In addition, bioaccumulation of toxicants in the environment has caused their biological magnification through the ecosystem. These issues have highlighted and necessitated the need for the development of novel and effective strategies to manage insecticide resistance, prevent resurgence of mosquito-borne diseases and maintain the drive towards disease elimination using biorational and other novel approaches. As a result, alternative applications in mosquito control were explored to maintain a healthy environment through appropriate utilization and disposal of insecticides and improve the total eminence of life by adopting practical and effective pest control strategies. Several innovative mosquito control interventions have been devised against mosquitoes by harnessing the nature as well as causing genetic, physical and behavioral modifications in mosquitoes. These strategies span from use of biological agents (microbes, ciliates, nematodes, fishes etc.), botanicals, Sterile Insect Technique (SIT), Release of Insects Carrying a Dominant Lethal (RIDL), creating transgenics with abnormal and lethal genes, gene drive technology, reducing the vectorial capacity by *Wolbachia* infection and application of attractive

toxic sugar baits (ATSB) in the fields. The talk will discuss various conventional, novel and innovative techniques devised for the control of mosquito vectors.

ARPITA SHARMA

Assistant Professor, School of Agricultural Sciences, GD Goenka University, Gurugram, India

PROFILE

Dr. Arpita Sharma, a leading expert in stress tolerance in crops, holds a Ph.D. in Biotechnology. Her research, supported by esteemed organisations, focuses on molecular mechanisms that help plants withstand environmental challenges. Over eight years, Dr. Sharma has excelled as an assistant professor, research coordinator and researcher at prestigious institutions. A prolific writer with over 25 publications, she actively presents research at conferences and serves as a mentor to Ph.D. scholars. Her dedication has been recognised through prestigious awards like the Young Scientist Award (ITM University & Niti Aayog), Excellence in research award (Green agri professional society), Global Excellence Award (2023) and Young Women Scientist award in year 2024 (University of Kota, Rajasthan).

Harnessing genetic engineering for enhancing abiotic stress tolerance: A sustainable pathway for future agriculture

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[2] Deputy Director, IGNOU, Regional Centre Jaipur, Jaipur, Rajasthan

ABSTRACT

Abiotic stress factors such as drought, salinity, extreme temperatures, and nutrient deficiencies significantly impact agricultural productivity and threaten global food security. Traditional breeding methods have limitations in addressing these complex stresses due to their multifactorial nature and slow progress. Genetic engineering offers a promising solution by enabling precise modifications in plants to enhance their resilience to adverse environmental conditions. Advances in molecular biology, genomics, and bioinformatics have facilitated the identification and manipulation of stress-responsive genes, transcription factors, and metabolic pathways, improving plant performance under abiotic stress.

This domain explores key breakthroughs in genetic engineering for abiotic stress tolerance, focusing on strategies such as gene editing using CRISPR-Cas9, transgenic approaches, and molecular priming techniques. It will highlight successful case studies where genetically engineered crops have demonstrated enhanced drought resistance, salinity tolerance, and heat resilience. Furthermore, the ethical considerations, regulatory frameworks, and societal acceptance of genetically modified crops will be discussed to address public concerns.

The research will emphasize the importance of integrating genetic engineering with traditional practices and modern agricultural technologies to achieve sustainable crop production. It will also explore the potential of genetic innovations to contribute to climate-resilient agriculture, thereby ensuring food security for future generations. This discussion aims to inspire researchers, policymakers, and stakeholders to embrace genetic engineering as a critical tool for mitigating the impact of abiotic stresses in agriculture and promoting sustainable farming systems.

Keywords:
CRISPR-Cas9, Transgenic Crops, Climate-Resilient Agriculture, Sustainable Crop Production, Molecular Priming, Stress-Responsive Genes, Food Security, Biotechnology in Agriculture

GEETIKA KALRA

Associate Professor, Department Botany, Acharya Narendra Dev College, University of Delhi

PROFILE

Dr Geetika Kalra obtained her Ph.D. from the Department of Botany, University of Delhi in 1995. She has been teaching plant physiology and plant metabolism to the undergraduate students at Acharya Narendra Dev College since 2005. She specializes in Signal transduction; Physiology of Adventitious root formation and cell communication. She has numerous National and International publications to her credit. She has significant contributions in developing curriculum in her subject of specialisation.

Impact of Exogenous Application of Antioxidants on ROS Signaling in Germinating Seeds of *Solanum lycopersicum* L.

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ABSTRACT

Reactive Oxygen Species (ROS) and Antioxidants are known to play critical roles in regulating seed dormancy and germination in higher plants. ROS are partially reduced forms of oxygen and include free radicals such as superoxide anion (O_2^-), hydroxyl radical (·OH), and non-radical molecules like hydrogen peroxide (H_2O_2). ROS modulates the redox status of cells which influences signaling cascades and gene expression, ultimately driving the progression from seed dormancy to germination. This makes ROS to be known as the oxidative window to germination. On the other hand, ROS are also proven to be potentially cytotoxic, higher concentrations inducing oxidative stress that causes damage to cellular and molecular structures and physiological processes leading to reduced germination percentage and limited growth. Therefore, it becomes crucial to keep the ROS threshold maintained at a level which supports germination without any negative effect. Plants employ antioxidants to aid this.

Antioxidants are molecules capable of scavenging ROS molecules, thereby protecting cellular components from oxidative damage. In plants, enzymatic antioxidants such as superoxide dismutase (SOD), catalase (CAT), and peroxidases (POD) mitigate ROS by catalyzing their conversion to less reactive forms. Non-enzymatic antioxidants, including ascorbic acid (vitamin C), glutathione, and tocopherols (vitamin E), further stabilize and scavenge free radicals, maintaining aforesaid cellular redox homeostasis. Experimentally, antioxidants have been shown to modulate seed dormancy and germination by regulating ROS levels and signaling. Studies reveal that a delicate balance between ROS and antioxidants is pivotal in breaking seed dormancy to stimulate germination and reducing oxidative damage in growing seedlings. However sometimes, due to stress conditions or other factors, plants may not be able to synthesize the required amount of antioxidants to maintain the critical ROS threshold.

Exogenous application of antioxidants can be helpful to overcome such conditions. This study intends to find out the impact of exogenous application of antioxidants on ROS signaling in germinating tomato seeds. A laboratory-based experimentation was performed by treating one batch of tomato seeds with a certain concentration of Ascorbic Acid, a well-known non-enzymatic antioxidant while the other batch was allowed to germinate without such treatment. Germination performance was tracked for 6 days followed by a post-harvest assessment of morphological growth and protein estimation using Bradford standard curve method. Statistical analyses were performed for the reported dataset and results for treatment and control batches were compared to withdraw appropriate inferences.

Keywords: Reactive Oxygen Species (ROS), Antioxidants, Seed Dormancy, Seed Germination, Ascorbic Acid, Tomato

MANOJ KUMAR SINGH

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PROFILE

He is currently working as an Assistant Professor, Department of Botany, University of Allahabad, Prayagraj, Uttar Pradesh. Previously, he worked as Assistant Professor, Department of Botany, Acharya Narendra Dev College, University of Delhi. He has published a total of 8 research papers in national and international journals along with 6 book chapters. His research area of interest is industrial Microbiology and Biotechnology. He has supervised 9 postgraduate and 8 undergraduate students in different research projects and currently 4 Ph.D. students are working under his supervision.

Exploring the potential of endophytic bacteria isolated from dragon fruit plant

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ABSTRACT

Endophytes are microorganisms that reside within various parts of plants and cause no harm to their host. Endophytes have gained enormous popularity because of their plant growth promotion ability and various other beneficial traits. As of now, the endophytic diversity of dragon fruit belonging to the Cactaceae family has been underexplored. Here we report for the very first time the hidden microbial diversity within the stem and root of the dragon fruit plant. In the present study we isolate and characterize endophytic bacteria inhabiting the stems and roots of dragon fruit plant. Isolated endophytic bacteria were characterized and evaluated for varying plant growth promotion abilities and anti-fungal activity. A total of eight endophytes were isolated; among them, five endophytic bacterial isolates were chosen based on variance in morphology and culture. Three were isolated from the stem and two from the roots. All five isolates ESB1, ESB2, ESB3, ERB1, and ERB2, showed positive results for their potential to promote plant growth. Isolates ESB1, ERB1, and ERB2 tested positive for exopolysaccharide production. Isolate ESB1 exhibited inhibition against the fungal pathogens of dragon fruit and mustard. Upon bacterization, some of the endophytes promoted seed germination and augmented growth in tomatoes. This study attempts to unravel the hidden endophytic diversity and harness their full potential for the benefit of agriculture and society.

KHANGEMBAM CHERITA DEVI

Assistant Professor in the Department of Zoology at the University of Allahabad

PROFILE

Dr. Cherita is an Assistant Professor in the Department of Zoology at the University of Allahabad. She is a dynamic researcher and educator specializing in aquaculture, microbiology, and environmental science. She holds a Ph.D. in Zoology from the University of Delhi (2017), where her doctoral research focused on ammonia-oxidizing archaea and bacteria in recirculating aquaculture systems, examining their composition, activity, and the abundance of *amoA* genes. Her research experience includes maintaining and optimizing recirculating aquaculture systems, investigating various biofilters, and assessing water quality in fish culture systems. Additionally, she has expertise in the culture of zooplankton, fish diet preparation, and digestive enzyme-producing gut microbes of fish.

Dr. Khangembam has authored papers on diversity of ammonia oxidizing microbes and its optimum conditions. Her work has made significant contributions to the understanding of microbial communities in aquaculture environments, particularly the role of ammonia-oxidizing microorganisms.

In addition to her academic endeavors, Dr. Khangembam is skilled ornamental fish technician and serve as a resource person for various govt. sponsored training programs.

Nitrospira: Nature's one-stop shop for nitrification

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ABSTRACT

Nitrospira, a genus of Gram-negative bacteria, has emerged as a critical player in the biological removal of ammonia through nitrification processes. Traditionally, ammonia oxidation has been attributed to ammonia-oxidizing bacteria (AOB), such as *Nitrosomonas*, and ammonia-oxidizing archaea (AOA). However, recent studies have revealed that *Nitrospira*, once thought to predominantly carry out nitrite oxidation in the nitrification process, also has significant involvement in ammonia oxidation. This discovery has reshaped our understanding of nitrogen cycling in both natural and engineered ecosystems, such as wastewater treatment systems. *Nitrospira* sp. exhibit a broad ecological versatility, capable of oxidizing ammonia under conditions where AOB might be less efficient. Their role in ammonia removal is particularly notable in environments with fluctuating or low oxygen concentrations, where *Nitrospira*'s metabolic flexibility allows them to contribute to efficient nitrogen removal processes. Furthermore, the ability of *Nitrospira* to function at a range of environmental conditions has sparked new interest in its potential application in enhancing biotechnological processes for nitrogen removal, particularly in biofilms and bioelectrochemical systems. This abstract provides an overview of the growing recognition of *Nitrospira* as a key player in ammonia removal and its potential implications for improving nitrogen cycling and management in various ecosystems. *Nitrospira* sp. reported to be better player particularly under stress or other harsh conditions. *Nitrospira*'s adaptability to diverse environments and their role in minimizing nitrous oxide release makes them vital for efficient nitrogen cycling in various ecosystems.

CHARU KHOSLA GUPTA

Professor, Department of Botany, Acharya Narendra Dev College, University of Delhi, Delhi, India

PROFILE

Dr. Charu Khosla Gupta, is a Professor in Botany in Acharya Narendra Dev College (University of Delhi). She is a recipient of the "Meritorious Teacher Award" instituted by Government of National Capital of Delhi for the year 2021. She has been an INSA visiting scientist to Slovenia in 2019 and also the recipient of 'Teaching Excellence Award for Innovation' by University of Delhi in 2015. Currently, she is actively engaged in environment monitoring and assessment with primary focus on climate change and plant-pollinator relationships besides measuring and devising means of mitigating ambient air pollution, for which she has an active collaboration with Josef Stefan Institute, Ljubljana, SLOVENIA. She is also keenly interested in Ecological restoration and is currently engaged in learning and planning about the restoration of various degraded ecosystems. Prof Charu has a total of 60 scientific papers/articles published in international journals of repute with more than 30 presentations in international conferences. She has been Scientific Chair and Judge at International Conference on Education (ICEDU) for last five years (2019-23) and has also chaired different tracks as Session Chair. She has successfully completed 02 major and 04 minor research projects with funding support from DST, University of Delhi and CSIR with a teaching career spanning 25 years.

Ciliates: The warriors of Ecorestoration

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ABSTRACT

Environmental degradation is a pressing global issue caused by natural disturbances and human activities such as deforestation, pollution, and urban expansion. These actions weaken ecosystems, elevate greenhouse gas emissions, and create conditions for disease proliferation. To combat these challenges, ecosystem restoration has emerged as a vital strategy to rebuild degraded environments, conserve biodiversity, and mitigate climate change.

Ciliates, the microscopic organisms characterized by their hair-like cilia, are pivotal yet often overlooked contributors to ecological restoration. Thriving in diverse habitats such as soil, freshwater, and marine ecosystems, ciliates play a key role in maintaining ecological balance and supporting ecosystem recovery.

A significant contribution of ciliates lies in nutrient cycling. By feeding on bacteria, algae, and organic debris, they break down complex materials and release essential nutrients like nitrogen and phosphorus into the environment, enriching soil and water and promoting plant growth. In aquatic systems, ciliates help purify water by consuming excess algae and bacteria, controlling harmful algal blooms, and mitigating eutrophication. They also aid in degrading organic pollutants and sequestering toxic heavy metals, making them vital agents of bioremediation. In soil ecosystems, ciliates enhance microbial diversity, regulate bacterial populations, and aerate the soil through their movement, improving oxygen flow and water retention—critical for revitalizing degraded lands. As part of the microbial food web, they support higher trophic levels by serving as a food source for small aquatic organisms, sustaining biodiversity.

Ciliates also hold promise in engineered environments like constructed wetlands and wastewater treatment systems. As biological indicators, they monitor ecosystem health and track restoration progress. Their ability to restore balance, regulate populations, and purify environments underscores their essential role in ecosystem restoration. These resilient microorganisms exemplify the interconnectedness crucial for healing Earth's ecosystems.

HARDEEP KAUR

Vice Principal at Ramjas College, University of Delhi (Officiating Principal, Oct 2023–June 2024)

PROFILE

Professor Hardeep Kaur, Vice Principal at Ramjas College, University of Delhi (Officiating Principal, Oct 2023–June 2024), has 21 years of undergraduate teaching experience. She earned her PhD in Biotechnology from the University of Delhi under Prof. Rup Lal, with research exposure at the University of Cambridge, UK. She has corporate experience as a Knowledge Scientist at Wipro-Spectramind Pvt. Ltd. and served as Academic Secretary at ILLL and CPDHE, University of Delhi. Dr. Kaur is a recipient of several accolades, including the Congress of Zoology Medal (2023), Ramjas College Faculty Achievement Award (2016–17), and the Ciba Geigy (India) Research Fellowship.

She co-authored a textbook on immunology (WILEY) and published over 33 peer-reviewed papers in journals such as *Trends in Biotechnology* and *mBio*. Actively involved in international conferences, she has presented in China and Israel and coordinates courses at Ramjas College. Currently supervising four PhD scholars, her research focuses on environmental niches of the fungal superbug *Candida auris* and azole antifungal resistance in non-albicans *Candida* species. Dr. Kaur also served as Secretary of the UNESCO Club, University of Delhi.

Environmental Drivers of Fungal Resistance: Evolution, Mechanisms, and Impact

Professor Hardeep Kaur*

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ABSTRACT

Fungal resistance to antimicrobial agents has become a significant global concern, further complicating the treatment of fungal infections and exacerbating public health challenges. Environmental factors play a crucial role in driving the evolution of drug resistance. Fungi, capable of rapid genetic adaptation, are particularly susceptible to selective pressures from environmental stresses, leading to the development of resistance mechanisms. For example, *Aspergillus fumigatus*, a common pathogen in immunocompromised individuals, has developed resistance to azoles due to selective pressure from agricultural fungicides. Similarly, *Candida albicans* has developed resistance to multiple classes of antifungal drugs due to prolonged exposure to both medical and environmental antifungals. Environmental exposure to sub-lethal concentrations of fungicides, heavy metals and inappropriate use of antifungal agents in agriculture and medicine can induce mutations that confer antifungal drug resistance, and further accelerate this process. The ability of fungi to exchange genetic material, through horizontal gene transfer and sexual reproduction, also enhances their adaptability to dynamic environmental conditions. Thus, it is very important to know the detailed mechanism underlying how fungi acquire resistance through environmental influences, its survival adaptation, and their consequences in clinical and agricultural settings. Understanding these processes is very important for developing strategies to overcome challenges offered by antifungal drug resistance to ensure effective treatment of fungal infections in future.

Keyword: Antifungal, Drug Resistance, *Candida*

RAHUL DEV AMBEDKAR

Assistant Professor in the Department of Biology at the School of Open Learning, University of Delhi, Delhi, India.

PROFILE

Dr. Rahul Dev Ambedkar is an Assistant Professor in the Department of Biology at the School of Open Learning, University of Delhi. He holds a PhD in studies on protein-ligand interactions in SARS-CoV-2 from Shobhit Institute of Engineering & Technology, Meerut. He completed his MSc in Botany (2004) and BSc (2002) from C.C.S. University, Meerut. Dr. Ambedkar has over a decade of teaching experience, having served as an Assistant Professor at Sri Aurobindo College, University of Delhi (2013–2023), before joining the School of Open Learning in 2023. His specialization includes bioinformatics and tissue culture. He has published five research papers, authored three academic books and book chapters, and supervised undergraduate research projects, such as biodiversity databases of Arbuscular Mycorrhizal Fungi in Delhi and a spawn culture project at Sri Aurobindo College. Actively engaged in academic and administrative activities, Dr. Ambedkar serves as the Start-up Activity Coordinator in the Institution's Innovation Council at SOL and contributes as a convenor and member of various committees. He has organized and participated in numerous workshops, webinars, and Faculty Development Programs (FDPs) on bioinformatics, organic farming, tissue culture, and sustainable development. Dr. Ambedkar frequently delivers tutorials and lectures on bioinformatics tools and techniques, contributing significantly to the academic growth and research ecosystem at the University of Delhi.

A Bioinformatics approach for the novel corona virus

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ABSTRACT

The COVID-19 pandemic has profoundly affected global health, economies, and societal systems, exacerbated economic instability and poverty while emphasized the necessity of proactive public health measures. Non-pharmacological interventions (NPIs) like social distancing, mask usage, and hygiene practices have been critical in mitigating the spread of SARS-CoV-2, especially for vulnerable groups such as the elderly and those with pre-existing conditions. Declared a Public Health Emergency of International Concern by the World Health Organization in January 2020, the pandemic has demanded global collaboration and resource mobilization.

This research focused on identifying novel molecular targets in the SARS-CoV-2 spike protein to develop herbal-based antiviral agents. Using in-silico methods, a three-dimensional (3D) spike protein model was created through homology modelling, aligning its sequence with a structural template (PDBID 8DT3). The model underwent refinement for stability and biological relevance, validated by Ramachandran plot.

CASTp tool was employed to analyse protein cavities and binding pockets. Critical residues—TYR 741, ARG 847, ASN 856, ILE 980, LEU 981, ARG 995, LEU 996, ILE 997, and ASN 1030—were identified as promising candidates for ligand binding. These residues offer insights into potential binding interactions between the spike protein and bioactive herbal compounds, providing a foundation for the rational design of phytochemicals with enhanced binding affinity and inhibitory potential.

Docking studies, molecular dynamics simulations, and virtual screenings highlighted Tetrandrine (L1) as a promising antiviral compound due to its stable interactions with the spike protein. These findings pave the way for developing innovative, nature-inspired therapeutic strategies against COVID-19.

Keywords: SARS-CoV-2, in-silico, CASTp tool, Docking, Molecular dynamics simulations.

PARMINDER KAUR NARANG

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PROFILE

Dr. Parminder Kaur Narang is an Associate Professor at Department of Zoology, Sri Guru Tegh Bahadur Khalsa College, University of Delhi. She has obtained her doctoral degree from School of Biotechnology, KIIT University, and her M.Phil and B.Ed degree from University of Delhi. Her current research work is on Bioinformatic studies and is working on the enzymatic profile of microalgae. She has publications in several journals of repute and has delivered talks at several National and International Conferences. She has also organized numerous conferences of both academic and extracurricular interests. She has also contributed e-chapters for pg-pathshala under the MHRD Project National Mission on Education through ICT, University of Delhi. With over 20 years of teaching experience, Dr. Narang specializes in teaching Physiology and Cell Biology to undergraduates and holds several academic and administrative positions within her institution.

Microalgae: Future prespectives-human welfare

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Microalgae are among the most prevalent aquatic eukaryotic microorganisms on the planet. The phenomenal biodiversity in the oceans makes these microalgae the most valuable natural resource having huge significance. Today, microalgae from several taxonomic groups are the most sustainable natural source of production of a wide variety of carotenoids including astaxanthin, β-carotene, lutein, lycopene, canthaxanthin and zeaxanthin. These are often referred to as the prospective feedstock for commercial production of carotenoids. Additionally, these microorganisms offer a lot of promise in the healthcare sector which ranges from nutraceutical benefits to immunomodulatory effects to anti-atherogenic effects on human health. Furthermore, even in terms of environmental sustainability, these organisms have proved to be advantageous in their role in biofuels production including biodiesel, and wastewater treatment. The high content of carotenoids and other components including minerals and vitamins makes these organisms a rich ingredient for the animal feed. These functional aspects of this group of microorganisms makes them a potential solution for addressing various global challenges.

Keywords: Bio-manufacturing; Microalgae; Carotenoids; Bioinformatics; Enzymes

ANITA NARANG

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PROFILE

Dr Anita Narang is a Professor in Botany at Acharya Narendra Dev College, University of Delhi. She obtained her Doctoral degree from University of Delhi in Plant tissue culture. Her areas of interest are Plant biotechnology, genetics and mushroom cultivation. Her teaching career spans over 28 years. Besides several research publications in Scientific journals of National and International acclaim, she has also authored 03 chapters in books. She is a reviewer for the journals Plant Science Today, Journal of Tropical Life Sciences, International Journal of Plant and soil science, Journal of advances in biology and biotechnology. She has been the recipient of Women's Achievement award by the Court of Governors of Women International Network in 2008.

Optimizing in vitro culture of *Acacia nilotica*: overcoming contamination, browning, and seasonal variability

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ABSTRACT

Acacia species hold significant importance in reforestation and the reclamation of wastelands. However, establishing axenic cultures of these species is challenging due to high contamination rates and browning of explants and culture media. Contamination typically arises from explants excised from adult trees or plants grown in vitro. To mitigate this issue, various sterilization techniques have been recommended, including treatments with sterilizing agents such as Tween 20, chlorine water, silver nitrate, and mercuric chloride, or by washing in antibiotic solutions and culturing on antibiotic-supplemented media.

In present work a multi-step sterilization protocol effectively reduced contamination. This protocol involved washing explants with 5% (v/v) Polysan, followed by thorough rinsing under running tap water, treatment with 70% ethanol, and finally, immersion in 0.1% mercuric chloride ($HgCl_2$). Phenolic compounds released from the cut surfaces of explants significantly contributed to media browning and inhibited explant growth. In current work phenolic exudation, was mitigated through several strategies which included the addition of antioxidants such as polyvinylpyrrolidone (PVP), activated charcoal (AC), ascorbic acid, citric acid, or sodium sulfate to the culture medium. Frequent subculturing of explants to fresh media within short intervals (two to three times within a few days) also proved beneficial. Furthermore, pre-treatment of explants with an antioxidant solution, both during initial collection and prior to inoculation, significantly reduced phenolic exudation. Supplementation of the culture medium with 100 mg/L citric acid demonstrated a significant reduction in media browning. Moreover, in our study A significant seasonal variation in both contamination and browning rates was observed. Contamination and browning levels peaked during winter and reached their minimum during summer. This seasonal fluctuation exhibited an inverse correlation with the morphogenic response of the explants. The highest rates of

caulogenesis were observed during the summer months of July and August

Key words- $HgCl_2$-Mercuric chloride, PVP-Polyvinylpyruvic acid, AC-Activated charcoal

SHASHI DAHIYA

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PROFILE

Dr. Shashi Dahiya is a Principal Scientist at the Indian Agricultural Statistics Research Institute (ICAR-IASRI), a premier research institute specializing in Statistics and Informatics in Agriculture under the Indian Council of Agricultural Research (ICAR), New Delhi. She holds a Ph.D. in Computer Science and Engineering and has over 25 years of experience in research, teaching, training, and research guidance in Computer Applications in Agriculture.

Dr. Dahiya has led projects on Machine Learning, Knowledge Management Systems, Decision Support Systems, and e-Learning systems. As a faculty member in Computer Applications, she mentors M.Sc. and Ph.D. students at the Graduate School, IARI, New Delhi. She is actively involved in organizing training programs, workshops, and national and international conferences in areas such as Machine Learning, Blended Learning, and Knowledge Management Systems.

She has published over 50 research papers and articles in prestigious Indian and international journals with high impact factors. Additionally, she has chaired and convened sessions and delivered invited talks at various national and international platforms.

Artificial intelligence in agriculture

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ABSTRACT

The world population is increasing at a very fast rate and with increase in population, the need for food increases briskly. Traditional methods used by farmers aren't sufficient enough to serve the increasing demand. The World Resource Institute estimates that by 2050 there will be a shortfall between food being produced and the amount needed to feed an estimated 10 billion people. With the quantity of available arable land on the decline, the scarcity of water and limiting factors and growing challenges such as soil quality, pest and weed infestations, it is increasingly important that innovative approaches to food production are implemented to optimise agricultural practices.

IoT, big data, and artificial intelligence (AI) are playing a big role in shaping the future of agri-food systems including the greenhouse monitoring, intelligent farm machines, and drone-based crop imaging, supply chain modernization, social media (for open innovation and sentiment analysis) in food industry, food quality assessment (using spectral methods and sensor fusion), and food safety (using gene sequencing and blockchain-based digital traceability). Other agricultural areas where these techniques are being utilized are, crop disease identification, storage management, pesticide control, weed management, irrigation and water management, post-harvest crop management, soil properties and crop growth management and many more.

These technologies have the potential to reduce resource wastage and assist in feeding the world's growing population. An advancement in these techniques, their commercialization and proper utilization by farming community will definitely result in the growth of agriculture and agri-food systems.

Keywords: Artificial Intelligence, Agriculture, Big Data, Internet of Things, Agri-food systems

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PROFILE

Dr. Archna Pandey is Associate Professor in Department of Biomedical Science Acharya Narendra Dev College, University of Delhi, India. She did her B.Sc. (Biochemistry) and M.Sc. and Ph.D. (Biomedical Science) from University of Delhi, in the field of Human genetic disorder -Fragila X Syndrome using transgenic mice models. She is a gold medallist in her Under-graduation. and also, recipient of the prestigious CSIR-Catch Them Young Fellowship in her Masters. Dr. Archna has around 24 years of teaching experience. Her current research interests include the development of bioluminescence-based Whole-cell biosensors for food safety and environmental monitoring, She is credited with multiple research publications in peer-reviewed journals of high repute. and one book chapter She has also presented her research in various eminent national and international conferences and seminars.

A bioluminescence-based whole-cell biosensor for qua control of food-grade silver foil (E174)

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Abstract

Unintentional consumption of spurious E174-coated food commodities such as sweets, candies, and condiments may lead to chronic ailments even at the parts per billion (ppb) level. The present study investigates the hazardous implications of spurious E174 through a whole-cell biosensor (Calcium alginate immobilized bioluminescent bacteria) at ultrasensitive levels of up to parts per billion. The proposed bioassay was perceived as a sensitive, inexpensive, reliable, and rapid method and can be deployed for routine assessment of the quality of E174, a globally used food colorant. In the present research, the effect of E174 samples procured from nine different vendors was observed on calcium alginate immobilized bioluminescent bacteria (BB') in terms of % residual luminescence (% RL). Further, the E174 samples (c, e, f, g, h, and i) were analyzed for the metal contaminants (Al, and Cu) using atomic absorption spectroscopy (AAS). The E174 samples were tested at 500 ppm, 0.5 ppm, and 5 ppb for their effect on BB' in terms of bioluminescence inhibition (BLI).

Keywords: Whole-cell biosensor; bioluminescent bacteria; E174; metal contaminants; atomic absorption spectroscopy.

UMA DHAWAN

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PROFILE

Dr. Uma Dhawan is a faculty member in the Department of Biomedical Science at Bhaskaracharya College of Applied Sciences, University of Delhi and also a visiting faculty at Dr. B. R. Ambedkar Center for Biomedical Research.

An alumnus of the University of Delhi, she earned her doctorate from the CSIR-Institute of Genomics and Integrative Biology, Delhi. Her numerous accolades include the *Universitas 21* Fellow (University of Edinburgh), UGC-Raman Fellow (Boston University), Early Career Research Award (2017), and INSA Teachers Award (2021)

Dr. Dhawan is affiliated with several esteemed academic bodies, including the Linnean Society of London (Fellow), the Royal Society of Biology, London (Member), the Japan Neuroscience Society (Member), and the Indian Academy of Neurosciences (Life Member).

Her research focuses on the genetics and epigenetics of neurodegenerative disorders. She has contributed extensively to leading international journals, advancing understanding in her field.

Unfolding the epigenetic code: Role of 5-hmC in REM sleep deprivation associated neurodegeneration

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ABSTRACT

Stress caused due to rapid eye movement sleep deprivation (REMSD) causes changes in the brain leading to significant neurological effects and cognitive dysfunction, similar to those observed in neurodegenerative and behavioral disorders like Alzheimer's disease (AD) and Amyotrophic lateral sclerosis (ALS). These disorders are multifactorial and arise from complex interactions between genetic predispositions and environmental factors, yet the mechanism of neurodegeneration associated with sleep deprivation, particularly REMSD remains insufficiently explored.

Among various epigenetic mechanisms, 5-hydroxymethylcytosine (5-hmC) has gained attention for its role in the regulation of gene expression within the central nervous system (CNS). 5-hmC is abundantly enriched in the brain, but little is known about its role in association with sleep deprivation-associated neurodegeneration. We have identified significant disruptions in 5-hmC at the genomic level in brain tissue of REMSD rats using hMeDIP sequencing. Differential hydroxymethylation is associated with various genes related to nervous system development, memory, learning, neurotransmission, synapse and cognitive functioning, all of which are affected in neurodegeneration including various RNA Binding Protein (RBP) encoding genes like TDP-43. These changes coupled with altered expression and aggregation of RBPs suggest a mechanistic link between sleep deprivation and neurodegeneration. Our study on rat brain thus underscores the interplay between altered DNA hydroxymethylation landscape and RBP dysfunction in REMSD related neurodegeneration.

UMA CHAUDHRY

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PROFILE

Prof. Uma Chaudhry is an academician and researcher in Biomedical Sciences, currently serving as a Professor at Bhaskaracharya College of Applied Sciences, University of Delhi. She also served on deputation at the Institute of Lifelong Learning, University of Delhi, where she developed a keen interest in creating e-content for undergraduate students. Prof. Chaudhry earned her Ph.D. in Biomedical Science from Dr. B. R. Ambedkar Center for Biomedical Research, University of Delhi, with her research focusing on PCR-based diagnostic analysis of gonorrhea. With over two decades of teaching and research experience, she has mentored four Ph.D. scholars to completion, with three more are currently under her guidance. Prof. Chaudhry has successfully led nine research projects funded by prestigious organizations, including Department of Biotechnology, Department of Science and Technology and Indian Council of Medical Research. Her research expertise includes PCR-based medical diagnostics, therapeutic target identification, and discovering novel drugs against bacterial moonlighting proteins. Recognized by the Department of Biotechnology as a National level Trainer for the Foldscope Microscope, she has trained numerous students. Prof. Chaudhry has publication records in National and International journals and has received accolades such as UGC Research Awards and International Scholarships. Her commitment to innovation and student mentorship drives impactful contributions to science and education.

Beyond conventional targets: Exploiting moonlight proteins to combat antimicrobial resistance.

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ABSTRACT

The rise of antimicrobial resistance (AMR) poses a critical threat to global health, necessitating innovative approaches to combat drug-resistant bacteria. Moonlighting proteins (MLPs), which perform multiple distinct functions within a single polypeptide chain, represent a promising frontier in this battle. These multifunctional proteins are widespread in bacteria, offering evolutionary advantages by optimizing genomic content and contributing to their survival and adaptability. This review explores the potential of targeting MLPs as a novel strategy to address the escalating challenge of AMR.

The concept of moonlighting proteins has evolved significantly since its inception, with increasing evidence of their role in bacterial virulence, immune evasion, and metabolic versatility. This review highlights key bacterial MLPs, including glyceraldehyde-3-phosphate dehydrogenase (GAPDH), phosphoglucose isomerase (PGI), glutamate racemase (GR), and DNA gyrase. These proteins are not only essential for bacterial survival but also play critical roles in pathogenesis, making them attractive therapeutic targets. By disrupting their multifunctional activities, it may be possible to impair bacterial fitness and virulence, offering a dual advantage in the fight against drug resistance.

We delve into the structural and functional relationships of MLPs, examining their evolutionary stability and adaptability. The unique structural features of MLPs, such as allosteric sites and dynamic conformations, present opportunities for selective drug targeting. Additionally, the diversity of functions performed by MLPs underscores their potential as universal targets across different bacterial

species. This review also emphasizes the importance of integrating computational and experimental approaches to identify novel MLPs and their roles in bacterial physiology.

A key focus of this review is the identification and characterization of small molecules that inhibit the biochemical activities of MLPs. These molecules serve as a foundation for developing next-generation antibiotics. For example, compounds targeting GAPDH have shown promise in disrupting glycolytic pathways and bacterial adhesion, while inhibitors of GR and DNA gyrase exhibit broad-spectrum antibacterial activity. We provide a comprehensive list of these small molecules, detailing their mechanisms of action and potential for therapeutic application.

Despite their promise, targeting MLPs presents challenges, including off-target effects and the risk of resistance development. To address these concerns, we advocate for a multi-pronged approach combining MLP inhibitors with traditional antibiotics or immunotherapeutic strategies. Additionally, advances in structural biology and high-throughput screening are expected to accelerate the discovery of novel inhibitors with enhanced specificity and efficacy.

In conclusion, moonlighting proteins represent a beacon of hope in the era of drug resistance. Their multifunctional nature, evolutionary conservation, and critical roles in bacterial survival make them ideal candidates for therapeutic intervention. By targeting MLPs, we can not only mitigate the impact of AMR but also pave the way for a new generation of antimicrobial agents. This review aims to inspire further research into the untapped potential of MLPs, fostering innovation in the fight against one of the most pressing challenges in modern medicine.

SUMIT SAHNI

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PROFILE

Dr. Sumit Sahni is an Assistant Professor in Environmental Studies at the School of Open Learning (SOL), University of Delhi, since 2023. With over 15 years of experience in research and academia, he has published 20+ articles in reputed journals with 70+ citations. He oversees academics, research, and administrative responsibilities at SOL.

Dr. Sahni develops Environmental Science courses for undergraduate and postgraduate students in Open and Distance Learning (ODL) mode, including course material creation and review. As President of the Institution's Innovation Council, he promotes innovation, leading to the launch of the start-up *10 Arms*. He also serves as the Nodal Officer of the Skill Enhancement Courses Committee (SECC).

Previously, he was an Assistant Professor in Botany at Acharya Narendra Dev College (2015–2023), where he founded the Mushroom Research and Skill Development Centre and helped establish Virtual Labs@ANDC in collaboration with IIT Delhi. Earlier, as a Scientist at the Mustard Research and Promotion Consortium (MRPC), he conducted R&D, developed policies, and connected academia, industry, and agriculture.

"Transforming agri-waste into a bio-circular economy: Sustainable mushroom cultivation and resource reutilization"

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ABSTRACT

India is producing more than 500 million tonnes of agri-waste annually. The agri-waste includes various types of stubble, straw, cotton seed hulls, corn cobs, peanut shells etc. These wastes or underutilized bioresources are rich in lignin, cellulose and hemicellulose which can be utilized and reutilized. In the current 'buy-grow-waste approach, the agri-waste (or lignocellulosic waste) are either burnt off or left as it is in landfills which causes pollution or unhygienic environmental conditions. The current study (based on 3R's i.e. reduce, recycle, and repurpose to keep the waste generated within the system) has shown a viable model of 'circular agriculture economy' by minimizing the number of external inputs for agricultural production, closing nutrient loops and reducing negative impacts to the environment using mushrooms. Mushrooms utilize lignocellulosic agri-waste as substrate and are good source of proteins, vitamins, essential minerals and fibres. Global market of edible mushrooms currently is of $63 billion and growing at 9.2% CAGR. Amongst the different cultivated species, *Pleurotus* with 16.3 % of the total production occupies third place in worldwide production of edible mushrooms. Apart utilizing agri-waste as substrate and providing protein rich fruiting body, their Spent Mushroom Substrate (SMS) is a rich source of industrially important extracellular enzymes such as lignin peroxidase, laccase and manganese-dependent peroxidase. After the enzyme recovery SMS can be used to make biodegradable packaging material, biofertilizer, bioremediation surface or as animal feed source. The SMS used up or exhausted in these can be called exhausted mushroom substrate can still be used as biofuels as they can still be converted into biopellets, briquettes or biochar. Through our study we utilized 7% of the annual in-campus generated lignocellulosic waste to grow *Pleurotus* mushrooms and reutilized its SMS for enzyme recovery. We are further

assessing ability of the exhausted SMS as biofilters for waste-water treatment. This model can be replicated commercially to make it a driver of bio-circular economy.
Keywords: Bio circular economy, agri-waste management, spent mushroom substrate, *Pleurotus* sp.

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PROFILE

Dr. Sunita Jetly, Associate Professor in Biomedical Science at Acharya Narendra Dev College, University of Delhi, is a gold medalist with 26 years of teaching experience. She specializes in Human Physiology, Pathology, and Cancer Diagnostics. Her doctoral research earned two patents for cost-effective diagnostics for Chronic and Acute Myeloid Leukemia. She leads research on cancer awareness, affordable diagnostics, and youth-focused Thalassemia screening programs, supported by institutions like the University of Delhi and DST.

A mentor to numerous students, Dr. Jetly has delivered talks on topics such as leukemia, diabetes, Thalassemia, and NEP 2020 on national and international platforms. As State Blood Cell Coordinator under the National Health Mission, she has made significant contributions to public health. At ANDC, she organized over 900 events as NSS Convenor (2020–2024) and led initiatives like Unnat Bharat Abhiyan and Azadi Ka Amrit Mahotsav.

An advocate for sustainability and holistic education, she promotes eco-friendly practices and awareness campaigns. Recognized with honors like the Social Impact Award (2024), Dr. Jetly is committed to creating a Thalassemia-free Bharat through screening and awareness programs. Her work exemplifies her dedication to education, research, and public health.

"Unveiling the silent threat: A comprehensive review of the critical role of thalassemia screening in Bharat"

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ABSTRACT

Thalassemia, an inherited single-gene blood disorder (hemoglobinopathy), affects approximately 15 million people worldwide. India bears the highest burden, with an estimated 1 to 1.5 lakh children suffering from Thalassemia major and around 42 million carriers of the β-thalassemia trait. Prevalence is particularly high in Northern and Western states, with 10,000 of the global 100,000 annual Thalassemia major births occurring in India.

A detailed analysis of the regional and ethnic variations in thalassemia and carrier prevalence across Bharat, coupled with state-specific studies, reveals an uneven landscape of thalassemia prevalence and screening outcomes. For instance, carrier prevalence ranges from 4-17% among high-risk communities such as Sindhis, Punjabis, and Gujaratis, underscoring the need for targeted and localized screening strategies. Efforts by the Indian Council of Medical Research (ICMR), governmental and non-governmental organizations (NGOs), have made progress but remain inadequate.

In West Bengal, a Knowledge, Attitude, and Practice (KAP) study highlighted a carrier prevalence ranging from 4-10%, with rural districts showing lower awareness levels compared to urban areas. Gujarat's Red Cross Society has implemented a robust screening initiative in colleges and antenatal care centers, achieving substantial coverage, yet challenges in follow-up and counselling remain. Punjab's Project Rainbow integrates government and NGO efforts to provide comprehensive care, including carrier identification and treatment subsidies. Maharashtra's pilot projects in districts like Amravati and Nashik have shown promising results, with plans for statewide implementation. Eastern states such as Bihar and Jharkhand, with a carrier prevalence of approximately 3.4%, are increasingly incorporating thalassemia into public health agendas, though infrastructure gaps persist.

Existing screening initiatives, including the West Bengal State Thalassemia Control Program and Gujarat's Red Cross Society initiative, have demonstrated potential but

face challenges due to gaps in awareness, limited coverage, and insufficient follow-up. The absence of a centralized national policy and fragmented integration of screening, counselling, and treatment services further impedes progress. Socioeconomic factors, including the high cost of treatment and logistical barriers, significantly contribute to the challenges faced by patients.

Globally, successful prevention programs provide valuable insights for Bharat. Examples include Cyprus' mandatory premarital screening and Italy's prenatal diagnostic initiatives, which have significantly reduced the incidence of thalassemia. Adopting similar comprehensive strategies in Bharat could lead to substantial reductions in the disease burden, particularly in regions with high prevalence.

Initiatives like "Rakt Kundali" focus on raising awareness, identifying carriers, and providing genetic counselling. A simple on/off-site CBC followed by confirmatory HPLC and molecular characterization can identify carriers effectively. Genetic counselling empowers families to make informed decisions, reducing emotional and financial burdens on healthcare systems. Mutational analysis and demographic studies further help identify high-risk racial, ethnic, or demographic groups for targeted interventions.

Screening camps conducted in collaboration with organizations like CNBC, Rotary, and Red Cross have identified a 5% carrier status among 1,835 random screenings and 4,339 antenatal screenings. Such initiatives highlight the importance of comprehensive screening to reduce the prevalence of thalassemia.

In conclusion, thalassemia represents a critical public health issue in Bharat with far-reaching emotional, financial, and social implications. By prioritizing comprehensive screening, genetic counselling, and adopting best practices from successful global initiatives, Bharat can significantly alleviate the burden of this disorder. This review serves as a call to action, urging policymakers, healthcare professionals, and communities to unite in combating the silent yet formidable threat posed by thalassemia.

SWATI SHARMA

Postdoctoral fellow at the UNC Blood Research Center, University of North Carolina at Chapel Hill, USA

PROFILE

Dr. Swati Sharma, a postdoctoral fellow at the UNC Blood Research Center, holds a PhD in Life Sciences from DIPAS-DRDO, India. Her research focuses on the intersection of coagulation, inflammation, and cardiovascular impacts of viral infections. Dr. Sharma's notable projects include investigating the role of tissue factor in acute respiratory distress syndrome (ARDS), studying SARS-CoV-2 protein fragment-induced coagulation, and exploring platelet-mediated immunoregulation in myocarditis. She has been awarded prestigious fellowships and accolades, including the Myocarditis Foundation Postdoctoral Fellowship and ISTH travel and poster awards. With expertise in thrombosis models and platelet biology, Dr. Sharma has authored influential reviews and research articles on thrombo-inflammation and the molecular mechanisms of viral-induced coagulopathies. Her dedication to mentoring and advancing scientific inquiry aligns with her ambition to lead independent research bridging virology, coagulation, and cardiovascular health. Dr. Sharma actively contributes to raising awareness about myocarditis and related health challenges.

Platelet PAR4 (F2RL3) plays a protective role in viral infections by inducing the release of anti-inflammatory extracellular vesicles (EVs)

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ABSTRACT

Background: Lack of platelets results in increased viral myocarditis. PAR4 is essential for normal platelet functions. We showed that global PAR4 deficiency resulted in increased viral myocarditis. Toll-like receptor 4 (TLR4) and M1 macrophages were shown to contribute to myocarditis pathology. EVs are small membrane vesicles that are released from cells after activation. We propose that thrombin-activation of platelet PAR4 leads to EV release which can reduce pathologic immune cell activation resulting in less severe CVB3 myocarditis.

Aim: To investigate the protective role of the platelet PAR4 EV axis in viral infection.

Methods: We infected PF4Cre; PAR4fl/fl (PAR4ΔPlt) and their controls (PAR4fl/fl) with CVB3 (Nancy strain) and analyzed myocarditis 8 days post infection (dpi). Platelets of WT and ΔPAR4 mice were stimulated with thrombin (1U/mL) to induce vesiculation. EV distribution in Plt-R was analyzed by using nano particle counting by zetaview. For in vitro studies, we tested the anti-inflammatory effect of thrombin-stimulated platelet releasate (Plt-R) and Plt-EVs on TLR3 and TLR4 stimulated macrophages (MΦ) with regard to NFκB pathway activation, cytokine production and their polarization. MΦ were stimulated with poly IC (10µg/mL) or LPS (0.1µg/mL) with Plt-R or Plt-EVs and responses analyzed up to 24hrs later.

Results: We found that PAR4ΔPlt mice exhibited increased cardiac infiltrations and increased cardiac virus load 8dpi compared to controls. We confirmed that

thrombin stimulation of mouse platelets is important for the generation of circulating EVs. Ex vivo, ΔPAR4 mouse platelets released ~50% less EVs as compared to WT platelets. Plt-R had anti-inflammatory effects on poly IC or LPS stimulated MΦs by reducing global NFκB pathway activation and TNFα production in murine RawDualTM or Raw264.7 cells, respectively. Plt-R further reduced the M1 polarization marker iNOS in stimulated MΦ. In addition, we found that the anti-inflammatory effect of Plt-R was mediated in part by the EV portion of Plt-R. Lastly, we found that inhibitors against miR21 and miR27 reduced the anti-inflammatory effect of the Plt-R on stimulated MΦ.

Conclusion: Our study demonstrates that platelet PAR4 limits myocarditis in mice. Platelet PAR4 is a major factor for the release of EVs. The Plt-EVs contain miRNAs which reduces proinflammatory responses in inflamed MΦ. We propose that treatment with Plt-EVs obtained after thrombin-PAR4 stimulation can be a potential new therapeutic approach in viral myocarditis.

RASHMI SHARMA

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PROFILE

Dr. Rashmi Sharma is an Associate Professor in the department of Botany, Acharya Narendra dev College, University of Delhi, with over 20 years of experience in teaching and research. She specializes in cell biology, molecular biology, genetics, and genomics. With a deep passion for science and education, Dr. Sharma has dedicated much of their career to advancing understanding in these dynamic and critical fields. Her expertise spans a range of topics, including gene expression, genetic regulation, cell signaling, and the molecular mechanisms of plant processes.

Anticholinesterases in plants and their allelopathic potential

Rashmi Sharma

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ABSTRACT

Plants, though brainless and nerveless, have long been known to have neurotransmitters and their associated metabolic pathway enzyme. Many plants have the cholinergic system and the many have high levels of anticholinesterases as well. Anticholinesterases inhibit the enzyme acetylcholinesterase and result in increase in the level of acetylcholine in the plant. Acetylcholine is known to influence various physiological processes in plants. There are reports of anticholinesterases helping the plants by inhibiting the proliferation of other plants in their vicinity, a phenomenon known as allelopathy. Anticholinesterases are chemicals like alkaloids, flavonoids and secondary metabolites. Understanding the biochemical pathway and the plant allelochemical interactions can help in developing natural herbicide strategies as well as sustainable agriculture practices.

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HARPREET KAUR

Postdoctoral Fellow at the University of Alberta, Canada,

PROFILE

Dr. Harpreet Kaur is a postdoctoral fellow at the University of Alberta, Canada, with a rich academic background, having completed her Bachelor's, Master's, and Doctorate degrees from the University of Delhi. Her doctoral research primarily focused on the characterization of free-living ciliated protists as bioindicators of pollution and their effects on the micro-ecology of the Yamuna River in the National Capital Region (NCR) of Delhi, India. She also explored the biodiversity of ciliates in extremophilic regions of India. Currently, Dr. Kaur is investigating the evolution of the contractile vacuole in eukaryotes using transcriptomic approaches and analyzing microbial communities in Alberta's oilsands through omics techniques. An accomplished researcher, she has presented her work at numerous international conferences and published ten research articles in peer-reviewed journals.

Comparative and Phylogenetic Analyses of SNAREs across ciliates

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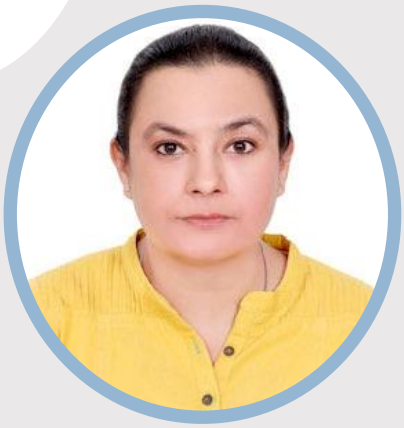
ABSTRACT

Ciliates, a highly diverse group of protists, possess a complex and differentiated membrane trafficking system, which includes secretory and osmoregulatory organelles, contributing to their adaptability in varying environmental conditions. SNARE (Soluble N-ethylmaleimide-sensitive factor attachment protein receptor) proteins are important components of membrane fusion machinery in eukaryotes. SNAREs are categorized into Qa, Qb, Qbc, Qc, and R, which are further divided based on their subcellular localization and specific trafficking pathways. In this study, we performed comparative and phylogenetic analyses of Qb and Qc-SNAREs using a comprehensive pan-ciliate genomic and transcriptomic dataset to explore the evolutionary history of these proteins within Ciliophora. Additionally, we updated the Qa-SNAREs and SM proteins from previous analyses by incorporating new genomic or transcriptomic data to ensure broader representation within ciliates. Our findings suggest that the last ciliate common ancestor possessed all Qb-SNAREs (Vti1, NPSN, Membrin, Gs28, Sec20) and Qc-SNAREs (Syp7, Bet1, Use1, Syn6, Syn8). Although, Sec20, Gs28, Use1 shows a patchy distribution. Notably, we identified independent expansions of Vti1 and NPSN (Qb-SNARE) & Syp7 and Syn8 (Qc-SNARE). The concurrent expansion

of interacting SNAREs, especially within classes Heterotrichea and Oligohymenophorea, indicates an independent diversification of membrane trafficking pathways associated with their structure and molecular complexity.

Keywords: membrane trafficking system, SNAREs, ciliates



SIMRAN BHULLAR

Ramalingaswami Re-Entry Fellow,
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PROFILE

Dr Simran Bhullar, has been a Ramalingaswami Re-Entry Fellow (RLS) since July 2020 and is hosted by the Department of Genetics, University of Delhi South Campus. The RLS Fellowship, awarded by the Department of Biotechnology, Government of India, is a five-year program designed to support the establishment of an independent research team.
She is exploring the field of epigenetics using *Paramecium* as a model organism, with a particular focus on genes involved in genome scanning for the faithful transmission of correctly arranged DNA to the somatic genome of the next generation after each sexual cycle. Their research has been published in renowned journals, including *Nucleic Acids Research*, *eLife*, *Nature*, *Molecular Biology and Evolution*, *PLOS Biology*, *Genes*, *Plant Biotechnology Journal*, *Plant Physiology*, and the *Journal of Biosciences*.

***Paramecium tetraurelia*: Lessons learnt**

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Genome maintenance is a very complex phenomenon and organisms deploy many ways to maintain the genome integrity and stability. A major defense strategy is to differentiate between cellular gene and genome invaders. Ciliates have evolved an interesting, yet an intriguing way to resolve the genome conflict by maintaining two nuclei within their single cell. Like in all ciliates, *Paramecium tetraurelia* has two identical transcriptionally silent germline diploid micronuclei (MIC, 2n) and the somatic polyploidy macronucleus (MAC, ~800n) that is transcriptionally active throughout the life cycle. In the ciliates, the defense strategy requires eliminating majority of the micronuclear genome (MIC) while developing macronucleus (MAC). MAC is streamlined for somatic gene expression and is devoid of any selfish genomic elements. The somatic genome (MAC) is processed from the germline genome (MIC) during sexual cycle and involves DNA rearrangement that includes precisely eliminating remnants of transposon sequences, and repeated sequences. During each sexual cycle, the information is passed faithfully, from the germline to zygotic genome through special small RNAs. The mechanisms of genome rearrangement involve an intriguing coordination between three nuclei: MIC, maternal MAC and developing zygotic MAC. Amongst these, the information about the genomic patterns is not only shared, but also reproduced in the next generation. I will talk about my work and what we learnt during the process.

JEEVA SUSAN ABRAHAM

Researcher at the Department of Biochemistry and Molecular Biophysics, Columbia University, New York

PROFILE

Dr. Jeeva Susan Abraham has completed her Ph.D. from Ciliate Biology Laboratory, Acharya Narendra Dev College, University of Delhi in the year 2021. Her doctoral research focused on the identification and characterization of freshwater ciliates using morphological and molecular markers. As part of her Ph.D. thesis, she reported 48 ciliate species for the first time from three freshwater sites in Delhi, including eight novel species of ciliates. Following her Ph.D., she served as an Assistant Professor at Hindu College and Kirori Mal College, both affiliated with the University of Delhi, during 2021-2022. Currently, she is working as a researcher at the Department of Biochemistry and Molecular Biophysics, Columbia University, New York. She has published 20 research papers and presented in numerous national and international conferences.

Diversity and taxonomic study of ciliates from freshwater sites in Delhi, India, with special emphasis on the Genus *Euplotes.*

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ABSTRACT

Ciliates are a highly diverse clade of eukaryotic microorganisms that are morphologically the most complex and highly differentiated taxa among single-celled organisms. The present study was done to elucidate the diversity from three freshwater sites of the Delhi region of India, namely, OBS, SL, and RJ. Morphological study was done by microscopy combining live cell observations as well as staining methods and molecular analyses was done by extraction of total environmental DNA from freshwater samples, sequencing of V4 region of 18S rRNA gene followed by phylogenetic analysis. The microscopic observations suggested that maximum species diversity was observed from the OBS site (43 species), followed by SL (27 species), and RJ site (21 species). Four species belonging to the genus *Euplotes*, namely, *Euplotes lynni* nov. spec., *E. indica* nov. spec., *E. aediculatus*, and *E. woodruffi* were investigated using morphological and molecular markers. The phylogenetic relationships were inferred from small subunit ribosomal rRNA gene (SSU rRNA), internal transcribed spacer (ITS) region, and mitochondrial cytochrome c oxidase subunit I (COI) gene. Predicted secondary structure models for two new species using the hypervariable region of the SSU rRNA gene and ITS2 region support the distinctness of both species. An integrative approach combining morphological features, molecular analysis, and ecological characteristics was carried out to understand the phylogenetic position of the reported species within the different clades of the genus *Euplotes*.

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PROFILE

Dr. Sripoorna Somasundaram has completed her PhD in Ciliate Biology Laboratory, Acharya Narendra Dev College, University of Delhi in the year 2021. She worked as Assistant professor in Galgotias University between October 2021 to February 2022. Presently, she is pursuing her postdoctoral research at Animal Science building, Ohio State University, Columbus (Ohio). She has presented her research works in many National and International conferences and participated in workshops. She has also attended and presented her postdoctoral and PhD work in 37th Edward F. Hayes Advanced Research Forum at OSU, Ohio, USA (2023), in 2024 Congress on Gastrointestinal Function at Urbana-Champaign, USA (2024), 4th workshop sponsored by IRCN-BC held at Qingdao, China (2015), in Protist conference at Moscow (2016), and in ISOP/PSA at Vancouver, Canada (2018). During PhD tenure, she has also undergone hands-on training on ciliate taxonomy for two weeks at the laboratory of protozoology, Ocean University of China. Her PhD research work was on studying the response of freshwater ciliates towards heavy metals at both cellular and molecular level. Currently, she is working on the diversity of rumen ciliates, and on improving the nitrogen utilization in ruminants by altering the biological functions of the rumen ciliates. To her credit, she has published 17 research papers in esteemed journals.

Unveiling the complexity of rumen ciliates: Insights into diversity and lysosomal peptidase profile

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ABSTRACT

The rumen microbiome, composed of bacteria, archaea, fungi, ciliates, and viruses, plays a crucial role in feed digestion, ruminant nutrition, and animal productivity. Despite their importance, rumen ciliates are understudied, particularly regarding their impact on intraruminal protein recycling and dietary nitrogen efficiency. Lysosomal enzymes, especially peptidases, are key to microbial protein degradation in ciliates. While some studies show that inhibiting peptidases reduces ciliate growth and ammonia production, only a few lysosomal enzymes have been identified. This study, therefore aims to address this knowledge gap by focusing on two aspects, viz., rumen ciliate taxonomic resolution, and lysosomal peptidases analysis. To improve taxonomic resolution, we evaluated the 18S rRNA gene, ITS1, ITS2, and 28S rRNA gene as phylogenetic markers for rumen ciliates. We developed universal primers for these markers and validated them using metagenomic DNA from various samples obtained from Illumina MiSeq system and using both in-silico and PCR analyses. The inclusiveness rate for in-silico analysis ranged from 85% to 99% for rumen ciliates for all the four sets of primers (18S rRNA gene, ITS1, ITS2, and 28S rRNA gene). It is anticipated that the primer sets targeting the ITS regions or 28S rRNA gene would provide better resolution for rumen ciliate diversity analysis of microbiomes. Additionally, we investigated the peptidases encoded by genomes of 23 rumen ciliate strains across 10 species. Our bioinformatic analysis revealed that cysteine peptidases are the most predominant across all ciliate species, with certain protease families consistently prevalent. The strains of *Dasytricha ruminantium* appeared to have a lower predominance of cysteine peptidases (30–38%) than the other ciliates (46–61%). Besides, some protease families are consistently predominant in all the ciliates. These include C01 (papain), C02 (calpain), and C19 (ubiquitin-specific protease) of cysteine; M20 (carboxypeptidase) of metallo, and S09 (prolyl

oligopeptidase) of serine peptidases. Subcellular locations of the peptidase were predicted based on signal peptides and transmembrane domains. Notably, *Entodinium* species possess a higher abundance of lysosomal peptidases, correlating with their bacterivorous activities. This study enhances our understanding of ciliate diversity and lysosomal peptidases, providing insights for improving dietary nitrogen assimilation in ruminants through targeted enzyme inhibition.

Keywords: Internal transcribed spacers; protease family; ribosomal RNA genes; universal primers

ORAL PRESENTATION
FACULTY ABSTRACTS

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH

OF-1

Developing a rapid diagnostic tool using loop mediated isothermal amplification combined with lateral flow dipstick: insights for ciliate pathogen detection

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Rapid detection of tuberculosis (TB) is essential for effective patient management and community transmission prevention. The WHO-endorsed Xpert MTB/RIF assay, while effective, requires significant infrastructure, cost, and training. This work aimed to evaluate a Loop-mediated isothermal amplification (LAMP) assay combined with a lateral flow dipstick (LFD) as a more accessible point-of-care method for TB diagnosis and drug resistance screening. The LAMP-LFD assay, targeting the *sdaA* and *rpoB* genes of *Mycobacterium tuberculosis*, was tested on 125 clinical specimens, including 18 culture-confirmed pulmonary tuberculosis cases, demonstrating high diagnostic accuracy and ease of use. The assay showed strong concordance with the GeneXpert MTB/RIF assay in detecting TB, with 15 out of 107 specimens being positive with both methods. Additionally, the *rpoB* LAMP assay multiplexed with the *sdaA* LAMP assay successfully identified rifampicin resistance, addressing the global concern over increasing drug resistance. The LAMP-LFD method offers a sensitive, cost-effective alternative for TB diagnosis and drug resistance screening in resource-limited settings. This technique offers significant advantages over established molecular detection methods like PCR and real-time PCR due to its simplicity, speed, and cost-effectiveness, making it particularly suitable for point-of-care testing. The high sensitivity and specificity of LAMP, combined with its multiplexing capability, underscore the potential utility of the LAMP-LFD approach for detecting ciliates such as *Balantidium coli* and *Ichthyophthirius multifiliis*.

Keywords: Loop-mediated isothermal amplification (LAMP), Lateral flow dipstick (LFD), Molecular detection

OF-2

Habitat ecology of spotted owlet *Athene brama brama* (Temminck 1981) in rural area

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Owls are nocturnal raptorial birds. Raptors are the birds that primarily hunt and feed on vertebrates. They have keen eyesight for detecting food during flight or at distance, strong feet, have talons for grasping or killing prey and have powerful and curved beak for tearing flesh. Owls belong to Order Strigiformes, which includes about 220 species of mostly solitary and nocturnal birds of prey characterized by an upright stance, a large, broad head, binocular vision, binaural hearing, sharp talons and feathers adapted for silent flight. Owls have two major families, Tytonidae (the barn owls, ~20 spp.) and Strigidae (true owls, ~200 spp.) (Uva and others 2018). Tytonids are medium to large (187-1260 g), and generally have a mammalian diet, while Strigidae include typical owl that have large variation in their size. They have large head, cryptic plumage and round facial disc around the eyes. Out of 220 species, Indian continent is the habitat of 35 species, out of which 32 species are found in different regions of India. 30 species of Indian owls are listed under owing to a lack of information, are classified as a ‘‘Species of Least Concern’’ (International Union for Conservation of Nature 2016) by The IUCN Red List of Threatened Species from 2016-2021 while one species (*Otus alius*) comes under the near threatened in 2019 and one species (*Athene blewitti*) comes under the endangered categories. They are distributed in all regions of the Earth except Antarctica and some remote islands. Most of the species are cavity nesters as natural habitat but also associated with agricultural and human habitation where they mostly feed on insects and rodents. They have adapted to inhabit urban environments such as agricultural fields, empty buildings in villages, towns and cities and any open area with trees, enough to provide proper roosting place. The urban environment can decrease diversity through habitat removal and species homogenization. Habitat degradation and habitat fragmentation reduces the amount of suitable habitat by urban development and separates suitable patches by inhospitable terrain such as roads, neighborhoods, and open parks. Although this replacement of suitable habitat with unsuitable habitat will result in extinctions of native species but the adaptability of species in the urban habitat will reduce the chance of extinction.

Keywords: Spotted owlet, urban environment

OF-3

SARS-CoV-2 and Heart tissue pathology: Uncovering new insights into protein accumulation and cardiovascular impact

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The COVID-19 pandemic has raised important questions about its potential role in triggering or worsening cardiovascular diseases, including heart tissue abnormalities related to protein accumulation. One such condition is cardiac amyloidosis, characterized by the deposition of abnormal protein fibrils in heart tissue, which leads to thickened, stiffened ventricular walls and can result in heart failure and conduction disturbances. Recent research suggests that SARS-CoV-2 may accelerate the progression of existing protein deposits in the heart by inducing systemic inflammation, disrupting endothelial function, and directly affecting cardiac tissues. However, the precise impact of COVID-19 on the initiation or advancement of heart-related protein accumulation remains unclear. The clinical similarities between COVID-19 and protein-related heart diseases have raised the hypothesis that SARS-CoV-2 proteins might interact with host proteins, potentially triggering the deposition of amyloid-like proteins in cardiac tissue. Supporting evidence includes findings that SARS-CoV-2 proteins have been shown to accelerate protein aggregation in both serum Amyloid A protein and neurodegenerative proteins, such as alpha-synuclein. Our study highlights the concerning link between SARS-CoV-2 and the development or exacerbation of protein accumulation in heart tissues. Gaining a deeper understanding of these emerging pathogenic mechanisms will be crucial for the development of safer peptide-based vaccines, the refinement of treatment strategies, and the improvement of clinical outcomes for patients affected by these conditions.

Keywords: SARS-CoV-2, Cardiac amyloidosis, Protein accumulation, Heart tissue pathology, Systemic inflammation

OF-4

Protective efficacy of berberine against acetamiprid-mediated impaired electron transport system and mitochondrial ailments

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Acetamiprid (ACMP) is a new-generation neonicotinoid insecticide structurally similar to nicotine. Scientific evidence has confirmed its toxicity in various environmental resources and non-targeted organisms. While berberine is a plant-derived natural antioxidant with many prophylactic and therapeutic potentials. In the present study, using a rat model, we investigated the toxicity of ACMP exposure (21.7 mg/kg b.wt) and the protective efficacy of BBR pre-treatment (150 mg/kg b.wt) for 21 days on mitochondrial functions. Biochemical assays showed that ACMP exposure depleted the complex I, II, and IV activities, while BBR restored their level significantly. Further, the RT-PCR examination also confirmed the biochemical results. The ACMP-exposed group showed significant downregulation of ND1, ND2, COX1, and COX4, whereas BBR pretreatment upregulated the mitochondrial complex subunit expression. Thus, the present study indicates the promising ameliorative potential of BBR against ACMP-induced neurotoxicity via its antioxidative and modulatory activities.

Keywords: Mitochondria, Antioxidant, Berberine, Acetamiprid

OF-5

The vicious cycle of anthropogenic environmental pollutants and their biomagnification causing food insecurity

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Many factors can make a person susceptible to food insecurity, including inaccessible clean water and insufficient nutritious food. Our global, national, and local environments, the communities in which we live as well as the health of ecosystems and habitats play a large role in the maintenance of the biodiversity index of an area. Contaminants, toxins, and persistent organic pollutants, from human sources continuously accumulate in our marine habitats and have detrimental health effects on the animals residing there. Moreover, rising ocean acidity levels, dramatically increasing marine plastic pollution, and global marine habitat loss, are fuelling the biomagnification of toxic pollutants and resulting in food insecurity and human health problems. The rampant use of plastics and their dumping in water bodies are a major cause of leaching out of harmful endocrine disrupters like Bisphenol-A (BPA) and Phthalates causing severe harm to aquatic plankton and microorganisms, which serves as the food for the fishes. Depletion of these ciliate and protozoan populations is a direct bioindicator of environmental toxicity. On similar grounds, declining pollinators are the major cause of food scarcity. Enriching our soil and improving pollination help to increase crop production. Dipterans are the main pollinators and are the crusaders for food security. This work presents the interrelationship between environmental pollutants and food insecurity using ciliates, drosophila and a plant-based model (*Allium cepa*) as model organisms to delineate the role of endocrine disruptors (Bisphenol-A and Phthalate) on the land and water ecosystems. In this study, lethal and sublethal doses of xenoestrogens were investigated in the various model systems and we found that although lethal effects of BPA were seen at lower doses as compared to phthalate, phthalate appears to be more persistent than BPA, implicating long-term damage to the ecosystem.

Keywords: Bisphenol-A, Phathalate, Euplotes, *Drosophila*

OF-6

To study the spatial and temporal variations in the physical, chemical parameters and ciliate community structure from the forest area and the extreme environments

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Ciliates are a group of unicellular eukaryotes under the superphylum Alveolata in the supergroup SAR. Ciliates and bacteria are key players in nutrient recycling of soil, clarification of effluent from wastewater plants. Ciliates are grazers of bacteria and this grazing process is important for nutrient release which helps in growth of other microorganisms and also helps in improving soil quality for growth of plants. Physical, chemical parameters and community of soil ciliates affect the soil quality. Changes that happen in the external environment including physical and chemical parameters of soil promote rapid change in the ciliates community and their diversity. In this study, physical, chemical and ciliate diversity indices from the forest soil (Jahanpanah (J)), and extreme environments such as leachate contaminated soil from Okhla Landfill (L) and digested sludge from Okhla Sewage Treatment Plant (STP) were compared during various seasons (winter, spring, monsoon and autumn) for the year 2019 and 2021. Significant spatial and temporal variation were observed in various physical and chemical parameters. Heavy metals viz, Cr, Mn, Fe, Co, Ni, Cu, Zn, Cd and Pb showed significant spatial and temporal variations during both the years. The various ciliate diversity indices were found to be higher at forest site as compared to other sites. Spirotrichea is the only class that was found to be higher at all the sites in all the seasons during both the years. The present study suggests that how change in the physical, chemical parameters changes the community structure of ciliates in the soil thereby, affecting the soil productivity.

Keywords: Physical, Chemical, Ciliate, Spirotrichea, Sewage treatment plant

OF-7

Exploring the efficacy of plant extracts in the biological control of plant pathogenic fungi

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Plant extracts are increasingly recognized for their potential as natural agents in the biological control of plant pathogenic fungi, providing an eco-friendly and sustainable alternative to chemical fungicides. These extracts contain a variety of bioactive compounds, such as alkaloids, flavonoids, terpenoids, and phenolic acids, which can effectively stop fungal growth, damage fungal cell membranes, or interfere with key metabolic processes of the fungal pathogens. The mode of action for these extracts is variable and may range from prevention of spore germination, weakening the fungal cell wall to disruption of essential enzymes activity. Beyond directly inhibiting fungal growth, plant extracts can also support the plant's natural defense mechanisms, making it more resistant to fungal attacks. The success of plant extracts in controlling fungal infections depends on factors such as the plant species, the part of the plant used (such as leaves, roots, or seeds), the method of extraction, and the type of fungus being targeted. For example, extracts from plants like *Lantana* have shown strong antifungal properties, suggesting their potential as effective solutions for managing fungal diseases in crops. By using these plant-based treatments, farmers can reduce their dependence on chemical fungicides, which often have negative environmental impacts, while promoting more sustainable agricultural practices through integrated pest management approaches.

Keywords: Biological control, plant pathogens, plant extracts

OF-8

Bacterial bioluminescence: A rapid biosensing tool for ecotoxicological monitoring

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Anthropogenic activities have largely impacted our ecosystem through the intentional or unintentional disposal of hazardous materials in air, water, and land. Therefore, routine hazard assessment especially in drinking water, food commodities, and air is highly desired in designing relevant bioremediation methods for drafting efficient ecotoxicological mitigation regimes. Conventional methods for risk assessment involving hazardous metals such as Hg(II), As(III, V), Al(III), Pb(II) employ expensive instrumentation facilities such as atomic absorption spectrometer and inductively-coupled plasma atomic emission spectrometer (ICP-MS). Further, hazard monitoring using biological organisms such as Wistar rats, and rabbits raises ethical concerns. In vitro bioassays and oxidative stress biomarkers are often helpful but require dedicated laboratory facilities, expensive reagents, and skilled personnel. Alternative non-mammalian model organisms such as zebrafish, ciliates, *Caenorhabditis elegans*, and *Drosophila melanogaster* require considerable time in rearing and maintenance.

In this regard, bioluminescent bacteria (BB) have emerged as a rapid biosensing tool for hazard assessment at ultrasensitive levels. The underlying principle behind the use of BB for hazard assessment involves a decrease of in vivo luminescence (Bacterial luciferase, BLuc; reacts with a long-chain aliphatic aldehyde, R-CHO, C_{10}-C_{16}; in the presence of molecular oxygen, O_2; and flavin mononucleotide hydride, $FMNH_2$; to yield light in the visible range, blue-green, ca. 490 nm) when exposed to a toxic analyte. The BB is relatively easier to cultivate and maintain, and can also be field deployable with the aid of a hand-held inexpensive luminometer and immobilized whole-cells.

Keywords: Bioluminescent bacteria, Ecotoxicological assays, Whole-cell biosensor

OF-9

A comprehensive study on prevalance of parasitic infection in commonly edible freshwater fish *Channa striata* (Snakeheaded Murrel) from Meerut region

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Channa striata (commonly known as the striped snakehead fish), is very popular in India for its nutritional value and affordability. The flesh of *C. striatus* comprises amino acids that aids in wound healing and anti-inflammation properties, inducing stem cell proliferation, stimulating platelet aggregation, and enhancing cognitive functioning in infected patients thus helps in boosting immune response. Despite its economic significance its consumption is risky if eaten raw or poorly cooked as it has a heavy load of parasites including nematodes, trematodes, cestodes and acanthocephalans. Humans are at high risk by consuming infected and undercooked fish. There is paucity of molecular studies on parasites of *Channa striata* in India with majority of work done on the prevalence of the parasitic infestations, seasonal variation in parasites and ectoparasites. The present work will focus on the prevalence of parasitic worms in the fish to encipher the data availability.

Keywords: Nutrition, amino acids, immune response, undercooked, parasites, infected

ORAL PRESENTATION
STUDENTS ABSTRACTS

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH

OP-1

Optimization of recombinant interferon beta (IFN-ß) expression in *E.coli* through systematic variation of induction parameters

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Interferons are a group of signaling proteins produced and released by host cells as part of the body's defence mechanism against specific pathogens, especially viruses. As members of cytokine family, they play a vital role in cell signaling processes, stimulating immune cells, such as natural killer cells and macrophages, and enhancing host defences by increasing antigen presentation through the up-regulation of MHC expression. Interferons are categorized into three main types based on their receptor interactions and functional attributes: Type I interferons, which include interferon-alpha (IFN-α) and interferon-beta (IFN-β), are produced by most cell types in response to viral infections; Type II interferon, mainly interferon-gamma (IFN-γ), is secreted by immune cells such as T lymphocytes and natural killer cells ; and Type III interferons, such as interferon-lambda (IFN-λ), share functional similarities with Type I interferons.

Interferons play a major role as therapeutics against many diseases such as cancer, viral diseases, and metabolically dependent neurodegenerative disorders. Considering their relevance as therapies against many diseases, our research highlights the expression and large-scale production of a recombinant human interferon beta (IFN-β) protein using a bacterial expression system. Optimal expression conditions are essential for enhancing the yield and solubility of the recombinant protein. In this regard, we have optimized the inducting temperature, the required duration, and the concentration of the inducing agent, IPTG (isopropyl β-D-1-thiogalactopyranoside) which serve as a molecular mimic of allolactose and activates the expression of genes controlled by the lac operon. The production of IFN-β was further analyzed using SDS-PAGE. The research aims to maximize the efficiency of IFN-β production and further purification in a folded conformation, establishing a feasible and scalable method for the large-scale manufacture of this essential therapeutic protein. Prospective studies may concentrate on the biophysical characterization of the stable and folded conformation of IFN- β protein for potential applications in biopharmaceuticals.

Keywords: Interferons, neurological disorders, Recombinant IFN-β, IPTG, SDS-PAGE, biopharmaceuticals

OP-2

Impact of air pollution on leaf morphology in urban tree species of Delhi

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The rapid escalation of air pollution in Delhi-NCR poses a significant threat to urban vegetation, necessitating a deeper understanding of its impact on tree species' morphology and physiology. This study investigates the effects of pollution gradients and seasonal variations on key leaf traits of ten native urban tree species. The research provides critical insights into plant adaptive responses under varying environmental stresses by analyzing specific leaf area (SLA), leaf thickness, and leaf dry matter content (LDMC). Leaf traits play a pivotal role in understanding how plants adapt to air pollution in urban environments. These traits reflect the physiological and morphological adjustments that enable plants to mitigate the adverse effects of pollutants, optimize resource utilization, and maintain fitness in changing urban ecosystems. By revealing the extent of environmental stress and the strategies plants employ to cope, these traits provide critical insights into plant resilience, adaptation mechanisms, and their contributions to sustaining urban ecosystem functions in the face of air pollution.

The study was conducted across four sites in Delhi with differing pollution loads and land use patterns. Sampling was performed during the rainy (August-September 2023) and winter (November-December 2023) seasons, mature leaf samples were collected at human respiratory height (1.5–2 meters). Fully developed, healthy leaves were analyzed to assess pollution-induced morphological alterations. Significant variations were observed in SLA and leaf thickness, while no significant variations were found in LDMC, indicating its stability under environmental stress.

The findings underscore the adaptive strategies of urban trees in mitigating air pollution impacts, with implications for their role in carbon sequestration and urban ecosystem services. Seasonal adaptations in SLA and leaf thickness reflect the interplay between pollution stress and climatic factors, emphasizing the need for resilient urban green infrastructure to counteract environmental challenges. This study also links pollution-induced morphological changes to potential economic losses by reducing the ecological benefits of urban trees.

By elucidating the morphological responses of native tree species to pollution and seasonal shifts, this research contributes to sustainable urban planning and climate resilience strategies, reinforcing the importance of trees in maintaining urban ecosystem health.

Keywords: Air pollution, Urban tree species, Leaf morphology, Plant functional traits

OP-3

Biomechatronic robotic arm actuated by biological muscle tissue

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This study explores the integration of biological components with artificial devices in the field of bio mechatronics, focusing on a robotic arm actuated and explained using goat and chicken muscle tissues. The objective was to develop a proof-of-concept device that leverages the functional capabilities of biological muscle while utilizing an embedded microcontroller for control. The robotic arm successfully performed human-like actions, such as finger movements, at a frequency of 50-60 Hz using open-loop Electro Muscular Simulation. To maintain the viability of the muscle actuators over time, a specialized medium composed of electrolytic salts, antibiotics, creatine monohydrate, and culture medium was employed. The arm demonstrated a remarkable performance, achieving over 50 contractions per minute and functioning for a total of 3 hours, with a lifespan of 10 hours before a gradual decline in contraction rate was observed. This research represents a significant advancement in the development of functional biomechatronic prototypes that incorporate musculoskeletal tissues. These findings highlight the potential for creating controllable, adaptive, and robust biomechatronic robots and prostheses, paving the way for future innovations in rehabilitation and soft robotics. Continued exploration of biological actuators may lead to enhanced performance and longevity, further bridging the gap between biological and artificial systems.

Keywords: Bio mechatronics, Muscle Tissue, Robotic Arm, Electro Muscular Simulation, Biological Actuators, Hybrid Systems

OP-4

Synthesis and evaluation of Pangas Catfish (*Pangasius Pangasius*) tail-derived hydroxyapatite-based 3D porous scaffolds for bone regeneration

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One of the biggest challenges in bone tissue engineering has traditionally been treating bone deformities. Recently, tissue repair and regenerative medicine have shown a great deal of interest in the creation of novel bone grafting materials. This research introduces biomimetic Li^{+} and Sr^{2+} co-doped hydroxyapatite (HA) from the tail of Pangas catfish to enhance osteoblast differentiation and support new bone formation. HA samples, doped with varying ratios of Li^{+} and Sr^{2+} (1-2%), were synthesized via hydrothermal process at optimized conditions. Using XRD, FTIR, and FE-SEM, the crystalline structure of synthesized sample groups was validated. The XRD analysis showed a decrease in unit cell volume with increasing concentration of dopants indicating its impact on crystalline size. ATR-FTIR analysis revealed various stretching and bending vibrations, such as P-O and O-H, with aggregated and spherical morphology as confirmed by FE-SEM. Further, EDX analysis highlighted the changes in Ca/P ratio with doping. The fabricated 3D porous structure's pore size range (210-500 μm) achieved support for efficient diffusion and better osteogenic activity. The *in-vitro* study of synthesized sample group scaffolds performed with MTT assay against MG-63 osteoblast cell lines indicated the HA derived from fishtails is non-toxic and bioactive. The 1Li-2Sr-HA sample demonstrated maximum cell growth of 179.107% at day 7, showing effective cell survival and proliferation on the scaffold and ALP demonstrated that fish tail derived HA is capable of stronger cell–cell and cell–matrix interaction within its matrix. These findings suggest that the role of optimum dopants decides the biocompatibility and suitability for bone tissue regeneration.

Keywords: Fishtails, hydroxyapatite, doping, scaffold, bone tissue engineering

OP-5

Advancing ciliate diversity studies: insights from DNA barcoding in freshwater and terrestrial ecosystems

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DNA barcoding is an effective method for identifying and discovering species. It uses standardized short DNA segments for taxonomic identification. Advances in sequencing techniques, like Next-generation sequencing (NGS), have made DNA barcoding faster, more accurate, and dependable. This study explores the diversity of ciliates in India's freshwater and terrestrial ecosystems. Using a combination of traditional microscopic techniques and advanced molecular approaches like DNA barcoding, 123 ciliate species were identified, with 35 species successfully cultured in the laboratory. High-throughput sequencing and phylogenetic analysis of essential genetic markers, including 18S rRNA and the V4 hypervariable region, offered insights into species-level taxonomy and revealed a wide range of operational taxonomic units (OTUs) in various habitats. The study seeks to create a DNA barcode reference library for Indian freshwater and terrestrial ciliates. Key findings have been shared through peer-reviewed journals and conferences, supporting advances in ciliate diversity assessment and contributing to global environmental monitoring and conservation efforts.

Keywords: Barcoding, Ciliates, Diversity, Library, Molecular, Phylogenetic

OP-6

Unlocking SARS-CoV-2 secrets: In-Silico design of RT-PCR primers for rapid diagnosis and research

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The COVID-19 pandemic has underscored the urgent need for innovative molecular tools for accurate diagnostics and research. In response, this project focuses on the in-silico designing of RT-PCR primers targeting key SARS-CoV-2 genes, including the spike, membrane, and envelope proteins using advanced bioinformatics tools such as Primer3 Plus and Pdraw32. Our in-silico approach yielded unparalleled specific and efficient primers, poised to revolutionize SARS-CoV-2 research and diagnosis. Primers were meticulously designed to meet stringent criteria, including optimal melting temperatures, GC content, and specificity to avoid off-target effects. Sequence retrieval and validation were conducted through NCBI databases and BLAST analysis to ensure precise targeting of viral genes. These in-silico efforts resulted in highly specific primers, enabling their potential application in diagnostics and virology research. The project highlights the critical role of computational biology in addressing global health challenges by offering a foundation for further experimental validation and broader genomic investigations. While this study focuses on SARS-CoV-2, the bioinformatics approach can be applied to other organisms, including ciliates.

Keywords: in-silico primer designing, RT-PCR primer designing, bioinformatics, NCBI databases, SARS-CoV-2, diagnostics

OP-7

Assessing ciliate diversity as a bioindicator of heavy metal pollution and seasonal water quality changes in the Yamuna river

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The spatiotemporal distribution, diversity and abundance of ciliates, along with the physical-chemical variable, were analysed from five sampling sites (n=20) of diverse environmental stresses along Yamuna River, India, during two seasons, i.e., pre-monsoon (PRM), and post-monsoon (POM). The aim of this study is to evaluate the impact of heavy metal pollution on ciliate communities in different seasons, identifying tolerant species and offering insights for the bioremediation of heavy metals. Results revealed Wazirabad After Drain (WBAD) as the highly polluted site and exhibiting the lowest species diversity. The presence and high abundance of *Euplotes* sp. *Aspidisca* sp. and *vorticella* sp. in the highly polluted environment of Wazirabad After Drain and their absence in the unpolluted environment of Yamunotri suggest their potential as valuable bioindicators of Contamination. Their ability to survive and dominate in highly polluted environments suggests their role in heavy metal mitigation. Seasonal variations show interesting trends, with post-monsoon seasons exhibiting higher diversity and abundance, likely due to dilution effects and decreased pollution levels. Furthermore, significant negative correlations were found between heavy metal concentrations (Fe, Mn, Cr, Pb) and diversity indices, indicating potential tolerance and bioremediation efficacy of certain ciliate species. Overall, these findings offer valuable insights into the intricate relationship between heavy metal contamination and ciliate communities, highlighting the potential of ciliates in biomonitoring and bioremediation.

Keywords: Diversity, Contamination, Bioremediation, Heavy Metal, Biomonitoring

OP-8

Cancer resistance and mdm2: uncovering the molecular mechanisms

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Nature has offered cancer resistance (CR) to several life forms such as *Heterocephalus glaber*, *Loxodonta africana*, *Nannospalax galili* and *Balaena mysticetus* - all being very distant in phylogeny, popularly gave rise to the notion that these organisms evolved separate mechanisms of CR. However, this prevalent notion limited the exploration of another possibility, i.e. these organisms might have independently evolved similar mechanism for CR. Our present study is guided for investigation of any such possibility by comparative transcriptome and proteome analysis in these creatures. We catalogued the genes that have concordant differential expression (DE) profile in cancer resistant organisms (CROs) relative to human. Furthermore, hub genes were inferred based on interaction networks, correlation with cancer severity etc. These set of genes were enriched in functions and pathways related to cell cycle progression, DNA Repair, Angiogenesis etc. Interestingly downregulation of several oncogenes such as MDM2 a well-known oncogene, were detected in CROs and was among top 20 hub genes. These results invoked our curiosity to do comparative proteomic interaction study of MDM2 between CROs and human, where we identified two conserved residues in functionally important domain of MDM2 that is mutated in human. When these conserved substitutions were simulated on human MDM2, it curtailed its oncogenic interactions (MDM2/TP53 and MDM2/MDMX) as indicated by docking and long MD simulation results. Thus, our work present framework to delve into in-depth detailing of DE genes that could have role in CR.

Keywords: Cancer resistance, oncogene, GWAS

OP-9

Efficacy of zinc and copper nanoparticles in modulating seed germination

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Nanoparticles (NPs), with their distinct nanoscale dimensions, have emerged as a significant area of research due to their unique properties and wide-ranging applications across various fields, including agriculture. Recent trends highlight their increasing use to enhance agricultural productivity, particularly in seed germination—a critical phase in a plant's life cycle. Seed germination is the process by which a seed develops into a new plant.

Utilizing advanced techniques, copper nanoparticles were synthesized through the Chemical Reduction Method, while zinc nanoparticles were produced via the Chemical Precipitation Method. This study examines the effects of zinc (Zn) and copper (Cu) nanoparticles, applied at concentrations of 75, 100, 150, and 250 mg/L, on the germination and growth of moong (Vigna radiata) and urad (Vigna mungo) seeds. Key parameters analysed included germination percentage, shoot and root growth, and seed weight. These findings underline the dual role of nanoparticles in agriculture: as enhancers of plant growth at optimal doses and as potential inhibitors at higher concentrations.

Results demonstrated that the concentration of 150 mg/L was optimal for promoting seed germination and seedling Vigor, particularly in urad seeds treated with Zn NPs. At this concentration, Zn NPs enhanced root and shoot growth, suggesting their effectiveness in nutrient uptake and water absorption during the germination process. However, higher concentrations (250 mg/L) exhibited inhibitory effects on plant growth, attributed to potential toxicity, especially in moong seeds. Cu NPs, while beneficial at lower concentrations, displayed comparatively limited efficacy and occasional toxicity at higher doses, highlighting their narrower safe application range. The study also revealed that Zn NPs improved overall seedling performance more effectively than Cu NPs, likely due to their role in enzymatic activation and metabolic processes.

Nanoparticles offer transformative potential for sustainable agriculture, enhancing efficiency and eco-friendliness while addressing food security and environmental protection challenges.

Keywords: Nanoparticles, zinc, copper, seed germination, plant growth, sustainable agriculture

OP-10

Reclassification of *Spiroplasma atrichopogonis* Koerber *et al*. 2005 as a later heterotypic synonym of *Spiroplasma mirum* Tully *et al*. 1982 using genome-centric methodologies

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Early 21st century with the emergence of NGS technologies served as a pivotal impetus for a remarkable improvement in the acquisition of genomic sequences, coinciding with the proliferation of sophisticated computational resources, thereby rendering the genome-based taxonomy framework a viable alternative. This contemporary methodology is employed for the systematic classification of diverse taxa through the utilization of genomic datasets and evolutionary reconstructions, and it is currently operational within the domain of species taxonomy. This framework, in conjunction with advancements in the overall genome-related index (ORGI), significantly enhances the precision of taxonomic classifications, particularly at the species designation tier. This research presented here aims at elucidating the taxonomic hierarchy of two closely related *Spiroplasma* species. Genomic information pertaining to 26 type strains was accessible at the juncture of this investigation. Our results indicated that the two species, specifically *Spiroplasma atrichopogonis* (Koerber et al. 2005) and *Spiroplasma mirum* (Tully et al. 1982), are conspecific. The 16S rRNA gene sequences of the aforementioned species display a remarkable 99.78% sequence similarity. Furthermore, extensive whole-genome sequence analyses revealed that *S. atrichopogonis* GNAT3597^T (CP011855.1) GCA 001029245.1 and *S. mirum* ATCC 29335^T (CP002082.1) GCA 000517365.1 exhibited a 99.99% average nucleotide identity, a 99.99% average amino acid identity, and 100% digital DNA–DNA hybridization values. These metrics surpass the accepted threshold criteria for the delineation of bacterial species, thereby suggesting their classification within the same species. In light of these compelling evidence, we propose the reclassification of *S. atrichopogonis* Koerber et al. 2005 as a later heterotypic synonym of *S. mirum* Tully et al. 1982.

Keywords: *Spiroplasma*, IQ-TREE, Overall Genome Related Indices, Open Pangenome, digital DNA-DNA hybridization

OP-11

Resolving taxonomic ambiguities in *Williamsia* Species: A whole-genome approach

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The research work focuses on the utilization of whole-genome data to resolve the taxonomic relationship between two closely related species of the genus *Williamsia*: *Williamsia muralis* and *Williamsia marianensis*. Genomic data from 10 type strains of the genus *Williamsia* were analyzed, revealing that *Williamsia muralis* (Kämpfer et al. 1999) and *Williamsia marianensis* (Pathom-aree et al. 2006) are conspecific. The 16S rRNA gene sequences showed 99% similarity between these strains. Further whole-genome comparisons revealed high congruence, with *W. muralis* DSM 44343T and *W. marianensis* DSM 44944T sharing 98.07% average nucleotide identity, 98.29% average amino acid identity, and 84.80% digital DNA-DNA hybridization values—surpassing established species delineation thresholds. Phylogenomic analysis of core genomes confirmed this conclusion, with both strains clustering together in a monophyletic clade. A comprehensive analytical pipeline was developed, ensuring adherence to the latest genome classification guidelines and meeting all taxonomic criteria. Based on these findings, we propose reclassifying *Williamsia marianensis* as a later heterotypic synonym of *Williamsia muralis*. This analysis highlights the critical role of whole-genome approaches in resolving microbial taxonomy and offers a robust framework for accurate species identification within the *Williamsia* genus.

Keywords: heterotypic synonym, overall genome relatedness index, phylogenomics, reclassification and *Williamsia*

OP-12

Acetamiprid exposure mediates structural and molecular alterations in the liver tissue of rats

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Acetamiprid, a neonicotinoid insecticide, is broadly used in the public sector and household activities. Easy availability and water-soluble nature have increased its contamination of soil, water, and various food products. The toxic effects of acetamiprid insecticide in rats' liver tissue have been investigated by administering 1/10th LD50 of ACMP for 21 days. The biochemical findings confirmed redox imbalance and oxidative injuries to proteins and lipids. Molecular docking analysis of ACMP with Bax and Bcl-2 showed their strong interaction, thus confirming its apoptotic nature. Furthermore, the exposure to ACMP altered the histo-architecture of liver tissue, where the broadening of sinusoidal space, inflammatory cell infiltration, dilated central vein, and vacuolization in the liver tissues were prominently detected. Altogether, the present study confirmed the adverse effects of ACMP and emphasized the need for strict regulation and more mechanistic understanding to delineate the toxicity of ACMP in mammals.

Keywords: Acetamiprid, Berberine, Oxidative Stress, Apoptosis, Histopathology

OP-13

Bacteriophage-encoded endolysins as protein antibiotic candidates

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India accounts for a significant portion of the global TB burden. The recent spurt in drug-resistant TB in 2022 and an increase in non-tuberculous (NTM) infections are a cause of concern, which mandates exploring non-traditional therapeutics. The shortened BPaL/Mtb drug regimen is undoubtedly a positive development. However, the cost of the drugs, equitable access and the toxicity are still some of the challenges that require redressal.

Mycobacteriophages are genetically diverse viruses that specifically infect the Mycobacterial spp and Endolysins are the enzymes bacteriophages use to release their progeny from the bacterial host. Mycobacteriophages encode two endolysins: LysinA and LysinB, which target the peptidoglycan and ester bonds (linking m-arabinogalactan with peptidoglycan) in the mycobacterial cell wall, respectively. Their bacteriolytic potential makes them promising alternatives/complements to antibiotic therapy. Unlike broad-spectrum antibiotics, endolysins are i) specific to the target bacteria and, hence, do not harm the commensal microbiota, ii) can kill drug-resistant strains also, iii) offer additional advantages in targeting both growing and non-growing bacterial cells and most importantly bacterial resistance to lysins is rarely reported. They can either be used in native form or engineered to enhance their properties, which are desired in clinical applications or as biocontrol agents.

We isolate mycobacteriophages using *Mycobacterium smegmatis* Mc^2 155 as the bacterial host and identify novel endolysin gene sequences from the annotated phage genome sequences. The genes are amplified by PCR, followed by their purification as recombinant proteins. On *in silico* analysis, we find lysin sequences revealing considerable structural diversity with globular or modular domain architecture. Also, the experimental data show variable functional characteristics. This is promising since only a few mycobacterial spp-targeting endolysins are reported and an expanding repertoire of lysins can be screened for identifying lead proteins that can be potentially used as therapeutics. In this presentation, I will present the data on endolysins from our laboratory.

Keywords: Mycobacteriophages, Endolysins, *Mycobacterium smegmatis* Mc^2 155, NTM

OP-14

Assessing the impact of COVID-19 and its vaccination on the reactivation of varicella-zoster virus

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Background: The Varicella-zoster virus (VZV), also known as human herpesvirus 3, is a neurotropic virus that causes both chickenpox (varicella) and shingles (Herpes Zoster). Shingles is a secondary condition occurring when the dormant VZV, which initially causes chickenpox, reactivates later in life. Recently, there have been observations of an increase in shingles cases following COVID-19 and its vaccination.

Objective: This statistical study aimed to assess whether COVID-19 or its vaccination has any role in the reactivation of the VZV that can lead to the occurrence of Herpes Zoster (Shingles).

Methodology: A Google form-based analytical and semi-structured cross-sectional survey was conducted and data was collected from July 02, 2023, to August 01, 2024, with the informed consent of 646 subjects (18-70 years old) among the Indian population. A statistical correlation using MS Excel and R software was drawn between the cases of Shingles with or without a prehistory of COVID-19 or its vaccination, chicken pox, comorbidities, and their age group. p-value was calculated using the chi-square test.

Result: Out of 168 COVID-19 patients 34 (20.2%) got shingles while among the 478 non-COVID-19 subjects only 25 (5.23%) developed shingles. Interestingly, all the non-COVID-19 subjects who developed Shingles were vaccinated for COVID-19. 31 out of 34 COVID-19 patients with shingles and 22 out of 25 non-COVID-19 vaccinated subjects who developed Shingles, all had a history of chickenpox. Furthermore, the occurrence of Shingles could be positively correlated with the age of the subjects (p-value <0.05).

Conclusion: The COVID-19 virus (SARS-CoV2) can cause reactivation of VZV, particularly in patients above 50 years of age in such a form as to cause Shingles.

Keywords: Chickenpox, dormant, reactivation

OP-15

Metal mayhem: unveiling the toxic impact of heavy metals on *Paramecium sp.*

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Heavy metal contamination represents a significant environmental concern that poses considerable risks to aquatic ecosystems and microorganisms. *Paramecium* species are recognized as effective bioindicators for evaluating heavy metal toxicity due to their high sensitivity to environmental alterations. This study aims to investigate the toxic effects of heavy metals—specifically lead (Pb), cadmium (Cd), mercury (Hg), and arsenic (As)—on *Paramecium* species by examining various physiological, morphological, and behavioral changes. Exposure to heavy metals has a detrimental impact on *Paramecium* by disrupting essential cellular processes, including ciliary movement, osmoregulation, and reproduction. Elevated concentrations of heavy metals induce oxidative stress, which results in cellular damage, morphological deformities, growth inhibition, and decreased survival rates. Furthermore, sublethal concentrations compromise feeding and locomotion, potentially disrupting ecological functions. This research underscores the capacity of *Paramecium* to elucidate mechanisms of toxicity tolerance and adaptation. It highlights the organism's significance in ecotoxicology for environmental monitoring and emphasizes the pressing need for remediation strategies to mitigate heavy metal pollution in aquatic ecosystems.

Keywords: Bioindicators, Contamination, Heavy metal, *Paramecium*, Toxicity

OP-16

Magnetic nanoparticle-mediated immobilization of alpha-amylase from germinating barley seedlings

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Magnetic nanoparticles have attracted considerable attention for their potential in enzyme catalysis due to their high surface area, magnetic properties, and ease of functionalization. Alpha-amylase is an enzyme of significant industrial importance due to its role in starch degradation. This study investigated the hydrolytic activity of amylase extracted from germinating barley seedlings across various starch concentrations. Immobilization was carried out using Iron oxide (Fe_3O_4) magnetic nanoparticles (MNPs) to enhance the amylase enzyme's stability, reusability, and activity. The immobilization studies revealed that immobilized amylase exhibit significant activity compared to the non-immobilized enzyme. These findings highlight the efficiency and potential application of immobilization of enzymes with nanoparticles.

Keywords: efficiency, enzymes, immobilization, nanoparticles

OP-17

Impact of novaluron on the reproductive potential and gonotrophic cycles of *Aedes aegypti L.* (Diptera: Culicidae)

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Background: *Aedes aegypti* spreads many disease-causing viruses and parasites between people and other animals. About half of the world's population is at the risk of dengue and chikungunya. Massive use of conventional insecticides had caused harm to the environment and led to the development of resistance in these vectors. So, the need of hour is to use an alternative group of insecticides with different MOA i.e. IGRs.

Material and Methods: The early 4th instar larvae of *Ae. aegypti* were investigated for adult emergence inhibition assay (IE) using novaluron. The emergence inhibition concentrations at different levels were computed. Males and females emerged from untreated larvae or larvae treated with sublethal IE_{30} (0.00002 mg/L) and median lethal IE_{50} (0.00003mg/L) dosages, were crossed in different combinations to investigate the variations in the duration of three gonotrophic cycles, fecundity and egg hatch during.

Results: Higher impact of novaluron was recorded in cross between treated groups than control groups The duration of gonotrophic cycles prolonged when crosses were conducted between treated groups as compared to the untreated groups. In contrast, treated groups took lesser duration for oviposition, which might be a sign of delayed blood digestion and vitellogenesis. The decrease in the number of eggs laid per female was about 17%-26% during three gonotrophic cycles of treated groups when compared with control. It might be due to the effect of novaluron on gonadal functions and thus the reproductive capacity of adults. In addition, the about 10%-17% eggs laid in novaluron-treated combinations could not hatch indicating the effects on embryogenesis. The study also showed an increase in the ratio of survived female/male of *Aedes aegypti* which is to be investigated further. Experimental observations made novaluron an effective IGR to control the insect vector *Ae. aegypti.* In addition, it's environment-friendly nature, non-toxicity to non-target biota, cost-efficacy and efficacy at low doses make it a potential candidate in mosquito control programs.

Keywords: *Aedes aegypti*, Gonotrophic cycle, Fecundity, Egg hatch, IGR, Novaluron

POTER PRESENTATION
ABSTRACTS

INTERNATIONAL SYMPOSIUM ON
CILIATE BIOLOGY
& INTERDISCIPLINARY RESEARCH

PP-1

Effects of leachates from plastic-coated paper cups on luminescence emission from bioluminescent bacteria

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Plastic-coated paper cups on exposure to hot liquids emit plasticizers such as dibutyl phthalate (DBP), heavy metals such as lead, and endocrine-disrupting chemicals. Prolonged ingestion of such leachates may lead to reproductive defects, cancer, and even neurological disorders. Plasticizers confer malleability and ductility to rigid plastic sheets enabling them to be molded into items of common use. Traditionally, the detection of plasticizers is carried out by methods such as mass spectroscopy and HPLC. However, these methods are not apt for routine analysis due to associated necessities such as adept personnel, expensive instrumentation, and complex preliminary treatment of samples of interest. In the current study, we explored the utility of bioluminescent bacteria (BB) in the screening of leachates. BB has an innate bioluminescence emission intensity (I_0) which undergoes inhibition (I) on exposure to exogenous toxicants and is measured in terms of relative luminescence unit (RLU). In the present work, the effect of varying concentrations of a phthalate (DBP), and heavy metal (Pb) on the luminescence response of BB was examined and expressed in terms of % residual luminescence expressed as $[(I/I0) * 100]$. Pb (II) was tested at 100 ppm, 1000 ppm, and 10,000 ppm. At concentrations of 100 ppm and 1000 ppm, BB was able to recover luminescence emission. However, at 10,000 ppm, complete inhibition of luminescence response was observed. The effect of DBP on luminescence response was tested at 9604 ppm, 960.4 ppm, 96.04 ppm, and 9.604 ppm. No decrease in luminescence response was observed at 9.604 ppm and 96.04 ppm. Reduction in luminescence response was most pronounced at 9604 ppm, followed by 960.4 ppm. In both cases, BB was able to regain luminescence.

Keywords: Plasticizers, Dibutyl phthalate, Endocrine-disrupting chemicals, Bioluminescent bacteria, % Relative luminescence

PP-2

Studies on the effect of rancid oils on luminescence response from bioluminescent bacteria

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Oil, integral to numerous culinary traditions, becomes rancid with repeated use, elevated temperatures, and interaction with air and light. This oil further leads to the formation of secondary metabolites such as peroxides, hydroperoxides, aldehydes, and reactive oxygen species (ROS), which are linked to mutagenesis and lipid peroxidation, ultimately resulting in atherosclerosis and cancer-like conditions. Conventional methods for detecting rancid oils include the peroxide test, thiobarbituric acid test, anisidine value, spectroscopy, and chromatography methods, which are economically inefficient, time-consuming, inaccurate, and complex. Hence, more efficient methods are desired. Hazard analysis/toxicity profiling using bioluminescent bacteria (BB) has emerged as a rapid, inclusive, precise, and cost-effective method. It involves a decrease in the luminescence response (LR = I_0 before exposure) of BB when exposed to hazardous compounds (LR = I) and is dose- dependent. Therefore, bioluminescent inhibition expressed in terms of % Residual luminescence (%RL) [(I/I_0)*100] is used to estimate toxicity. In this study, we scrutinized the effect of rancid oils when exposed to BB. We performed time-dependent static and kinetic studies for LR from BB using a luminometer for rancidity measurement. This approach offers a novel, and precise framework for assessing oil degradation and its associated toxicity. In conditions like oxygen depletion or exposure to toxic compounds like H_2O_2, luminescence was regained after a decrease. But due to rancid oil (homogenous mixture) permanent damage was observed with residual luminescence of 85.26%, 72.75%, 76.57%, and 84.41% at 0, 10, 20, and 30 minutes respectively. This variation of %RL over time is presumably due to different reaction intermediates formed during the oil degradation. Similarly, the effect of non-rancid oil was tested, and residual luminescence reached 100% within 5 minutes. The results foresee a rapid, reliable, and sensitive on-site monitoring system for oil quality using the present approach.

Keywords: Bacterial bioluminescence, Bioluminescence inhibition, Luminescence kinetics, Oil, Rancidity

PP-3

Can bacterial bioluminescence-based bioassays predict the toxicological profile of incense sticks?

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Air pollution is a global concern, especially in Urban settings. Anthropogenic activities have greatly contributed to the rise in the air quality index over safe limits. Apart from vehicle exhaust and industrial emissions, sources of indoor air quality can be greatly impacted by incense sticks emitting polycyclic aromatic hydrocarbons (PAH) and heavy metals in their oxide forms. Further, the disposal of incense stick waste into the river and water bodies rich in heavy and alkali metals contributes to water pollution. Conventional analytical methods for quality control require a dedicated laboratory, skilled personnel, and expensive and sophisticated instrumentation facilities such as AAS, HPLC, and ICP-MS. Such methods for routine quality checks are cumbersome, time-consuming, cost-intensive, and impractical. In this regard, the utility of bioluminescent bacteria (BB) can be useful. On exposure to hazardous materials, BB having prior in vivo luminescence (I_0) undergoes a decrease (I) expressed as a percentage of Residual luminescence, %RL [(I/I0)*100]. The %RL values are concomitant with the quantity and hazard level of the analyte. In the present work, cultivation of BB was carried out and used in the form of culture suspension after diluting it up to OD_{600}: 1.00 for co-incubation with standard samples (serially diluted in appropriate diluent, *n*=3) viz. Zn(II), Cu(II), Hg(II), incense stick coating materials, and their respective incense stick ash for a specified duration. The %RL was plotted and important conclusions were deduced. The results indicated that a 30-minute incubation time decreased luminescence (up to 10 %) at ppm levels of Zn(II), while Hg(II) led to a strong inhibitory response even at ppb level. Further, the %RL data indicated that the expensive incense sticks were relatively more toxic than the inexpensive ones and are subject to further investigation.

Keywords: Air pollution, Bioluminescent bacteria, Heavy metals, Incense sticks

PP-4

Evaluation of in-silico antihyperglycemic potential of traditional anti-diabetic plants

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Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia, posing a significant global health challenge. Traditional medicinal plants have been extensively utilized for managing diabetes due to their affordability, accessibility, and minimal side effects. This study evaluates the in-silico antihyperglycemic potential of select traditional anti-diabetic plants using computational tools to identify bioactive compounds and their interactions with key therapeutic targets. A comprehensive literature review was conducted to identify plants traditionally used for diabetes management. Phytochemical databases were utilized to extract bioactive compounds, followed by molecular docking studies to evaluate their binding affinity against primary antihyperglycemic targets, including α-amylase and α-glucosidase. Additionally, ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) profiling was performed to predict pharmacokinetic properties. The study revealed that several bioactive compounds, such as flavonoids, alkaloids, and polyphenols, exhibited strong binding affinities toward key enzymes involved in glucose metabolism. Compounds like quercetin and berberine demonstrated promising inhibitory effects on α-amylase and α-glucosidase, comparable to standard drugs. ADMET analysis highlighted the drug-likeness and safety profiles of these compounds, making them potential candidates for further development.

Keywords: Diabetes mellitus, ADMET profiling, Pharmacokinetics, Glucose metabolism

PP-5

Seri Glow: Organic shine-boosting shampoo

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The study focuses on the development of an organic shampoo formulated with sericin, a by- product of silk production often discarded as waste. The aim was to utilize sericin's rich protein and amino acid profile to create a product that nourishes and strengthens hair while contributing to environmental sustainability. By repurposing sericin, the formulation not only addresses waste reduction but also demonstrates its potential as a valuable ingredient in hair care. The shampoo is composed entirely of natural and organic components, including herbal extracts, ensuring it is safe, eco-friendly, and suitable for all hair types. Sericin's inclusion offers several benefits, such as improved scalp hydration, enhanced hair texture, reduced hair breakage, and restored natural shine, making it a sustainable and effective alternative to conventional shampoos. While significant progress has been made, the product is not yet ready for commercialization due to challenges in sourcing adequate quantities of organic preservatives necessary for maintaining its shelf life. Ongoing efforts are focused on overcoming these limitations to bring the product to completion. This abstract highlight the innovation of utilizing sericin for sustainable hair care, emphasizing its effectiveness and environmental benefits. It presents a promising advancement in the development of high-quality, natural hair care solutions.

Keywords: Sericin, Silk production, herbal extracts, Protein profile

PP-6

Pollen nutrition as an effective bioindicator for assessing the outcomes of ecological restoration in urban ecosystems

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Pollution is a major environmental challenge that endangers the well-being and survival of living organisms. Urban green spaces serve as vital lifelines for cities, helping to mitigate pollution by functioning as biofilters that reduce particulate matter (PM) and other airborne pollutants. However, habitat destruction, rising population, and urban expansion have degraded green spaces. Restoring urban green spaces offers a sustainable approach to enhancing biodiversity and mitigating environmental challenges like pollution. Assessing ecological restoration requires a multidisciplinary approach to evaluate improvements in biodiversity, ecosystem functions, and environmental health. Pollen is a sensitive bioindicator, reflecting the health of plant communities, ecosystems, and the environment. Its composition, abundance, and nutritional quality provide insights into environmental factors, including pollution levels, habitat quality, and climate variability. This study investigated the nutritional composition of *Cassia fistula* pollen to assess habitat quality in restored ecosystems. Pollen profiles from restored sites were compared with those from polluted urban locations and a degraded forest site. Restored sites exhibited significantly higher pollen nutritional values than polluted urban areas and the degraded forest, demonstrating the effectiveness of restoration efforts. These findings suggest restoration enhances plant reproductive fitness by improving pollen quality, providing a more nutritious resource for floral foragers.

Keywords: Pollen nutrition, Reproductive fitness, Ecological restoration, Bioindicator

PP-7

Biodegradation of an emerging pollutant DnOP phthalate ester by a novel bacterium IITR S6/46 isolated from plastic dump site

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Phthalates are environmental pollutants widely used as plasticizers, posing risks due to their persistence and toxicity. Among these, Di n octyl phthalate (DnOP) is one of the most widely imported phthalates in India, making its degradation an emerging environmental challenge. This study investigates the biodegradation potential of a novel bacterial strain, IITR S6/46 from plastic dump site (Lucknow) to degrade DnOP. A multidisciplinary approach was employed, integrating microbiological, molecular, and analytical techniques to elucidate the biodegradation process. The bacterial isolate was identified using Gram staining, Biolog profiling, and MALDI-TOF analysis, followed by molecular characterization through DNA isolation and 16S rRNA sequencing confirmed its classification as *Achromobacter* sp. (IITR S6/46). Growth kinetics were assessed in the presence of DnOP as the sole carbon source, showing its metabolic activity in DnOP-enriched environments. DnOP degradation metabolites were analyzed using gas chromatography-mass spectrometry (GC-MS) indicating degradation of DnOP into non–toxic byproducts. These findings demonstrate the potential of IITR S6/46 to degrade DnOP, offering a promising candidate for bioremediation of phthalate-contaminated environments.

Keywords: Phthalate, DnOP, Bioremediation

PP-8

Apoptosis: The art of cellular self-destruction

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The process of programmed cell death, or apoptosis is generally characteristics by distinct morphological characteristics and energy-dependent biochemical mechanisms. Apoptosis is considered a vital component of various processes including normal cell turnover, proper development and functioning of the immune system, hormone-dependent atrophy, embryonic development and chemical-induced cell death. In this presentation we will see the signaling pathways of apoptosis that play major role in the process. The apoptotic pathway can be broadly categorized into intrinsic and extrinsic pathways. The intrinsic pathway is triggered by internal cellular stresses, such as DNA damage, oxidative stress, or loss of survival signals, leading to mitochondrial dysfunction and the release of pro-apoptotic factors like cytochrome c which binds to Apaf-1 (Apoptotic protease activating factor-1). This release activates caspases, which are proteases that drive the execution phase of apoptosis. The extrinsic pathway is initiated by the binding of extracellular death ligands (e.g., FasL, Tumer Necrosis Factors) to death receptors (DR-4 and DR-5) on the cell surface, which activates the caspase cascade and induces cell death. Dysregulation of apoptotic signaling and inappropriate apoptosis (either too little or too much) is a factor in many human conditions including neurodegenerative diseases, autoimmune disorders and many type of cancers. The understanding of the molecular mechanisms driving apoptosis has paved the way for innovative therapeutic approaches. These include cancer treatments that focus on targeting anti-apoptotic proteins, as well as neuroprotective strategies designed to combat degenerative diseases. The objective of this presentation is to provide comprehensive information of current knowledge on the process of apoptosis including morphology, biochemistry, mechanism, regulation and the role of apoptosis in health and disease as well as a discussion of potential alternative forms of apoptosis.

Keywords: Apoptosis, program cell death, intrinsic and extrinsic pathway, caspase

PP-9

Can soil ciliate protists be harmful to crops?

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Protists, particularly ciliates, are widely recognized for their beneficial roles in sustaining agricultural practices and maintaining soil and plant health. They are integral to nutrient cycling, facilitating the mineralization of organic fertilizers and residues, which in turn enhances plant growth. In this study, we report, for the first time, the negative impact of a specific soil ciliate species, *Blepharisma* sp., on chickpea (*Cicer arietinum*) seed germination and plant growth. Laboratory-cultured *Blepharisma* sp. cells were introduced to chickpea seeds to investigate their interaction under controlled conditions. The experimental design consisted of two phases: an initial study conducted in natural mineral water with incremental concentrations of *Blepharisma* cells across multiple petri plates, followed by a 'growth' phase, chickpea seeds previously exposed to increasing levels of *Blepharisma* sp. cell attack and with varying degrees of damage were tested for their ability to develop into young plantlets in natural soil. We tested *Blepharisma* sp. concentrations ranging from 2000 to 10000. Each phase was replicated three times to ensure data reliability and statistical robustness. In the first phase, *Blepharisma* cells formed aggregations on the seed surface, causing visible scarring and feeding on soft, germinated seed tissues. A progressive inhibition of seedling growth was observed with increasing ciliate concentrations. However, in the second 'growth' phase, the seeds regardless of their level of damage, showed normal growth
once transplanted into the soil and freed from all the *Blepharisma* cells. This study provides new insights into the dual role of ciliates in soil ecosystems (beneficial or detrimental), highlighting potential negative interactions between certain ciliate species and crops.

Keywords: *Blepharisma* sp., chickpea seed germination, negative plant-microbe interaction, nutrient cycling, soil ciliate

PP-10

Ion implantation engineering of optical properties of ZnO thin films

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Ion beam engineering has been applied to metal oxide semiconductor nanostructures to improve their optical properties for energy-related applications. Zinc Oxide (ZnO) is one of the emerging wide band gap semiconductor materials with outstanding optoelectronic characteristics that has attracted the interest of the scientific community for numerous energy applications. The low energy ion beam implantation method has been extensively applied to modify the optical characteristics of devices based on ZnO thin films. The significance of effective ion beam interactions with the ZnO nanostructures at various polar angles has been demonstrated while keeping another beam parameters constant. We experimentally demonstrate a method for the engineering of the optical properties of the ZnO nanostructured thin films involving low-energy (50 keV) and nonmagnetic C ion implantations at various polar angles. At a specific angle, this leads to a reduction in optical direct bandgap energy and alter the transmittance, while also showing a significant change in dislocation density, grain size, and roughness. An electromagnetic force between the atoms and the incoming ion at the critical angle induces lattice defects and enhances magnetic moments, leading to a notable decrease in the optical transmittance.

Keywords: ZnO nanostructures, Band gap, Semiconductor

PP-11

Effect of nanoplastics on ciliates: an ecological perspective

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Nanoplastics, a pervasive environmental pollutant, significantly impact the growth and feeding efficiency of ciliated protozoans that constitute an essential component of aquatic ecosystems. This presentation explores the effects of nanoplastics on ciliates, focusing on their growth rates, feeding behavior, and associated physiological responses. Earlier research indicated that exposure to nanoplastics leads to reduced growth rates in ciliates, attributed to cellular damage and metabolic disruptions caused by the ingestion of these particles. Recent studies have also shown that ciliates exhibit decreased reproductive viability and increased malformations in offspring when exposed to nanoplastics. Furthermore, feeding efficiency is compromised as ciliates struggle to form food vacuoles when competing with nanoplastics for ingestion. This competition alters their feeding dynamics, leading to slower egestion rates and reduced nutrient uptake.The physical properties of nanoplastics, such as size and shape, influence their ingestion patterns, with smaller and more spherical particles being more readily consumed. These interactions not only affect individual ciliate health but also have broader implications for microbial food webs and nutrient cycling in freshwater environments. Overall, understanding the effects of nanoplastics on ciliates is crucial for assessing ecological risks and developing strategies to mitigate plastic pollution in aquatic ecosystems.

Keywords: Nanoplastics, Ciliates, Environmental pollutant

PP-12

Microbiology at Homelab: Exploring microbial cultures of dairy products such as curd/yogurt or milk on boiled potato slices

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Microbes are everywhere and can cause diseases, but vast collections of microorganisms living in and on our bodies, known as the human microbiome, play a crucial role in maintaining health. Dairy products play a significant role in maintaining and promoting a healthy microbiome. Curd contains many bacteria from genera *Lactobacillus, Lactococcus, Streptococcus*, and other lactic acid bacteria (LAB), acting as probiotics. Nutrient agar media is typically used in laboratory to grow microorganisms. However, in our homelabs, we and other collaborators across India have experimented with culturing curd bacteria on boiled potato slices. To initiate the process, we first sterilize the potato slices by boiling them in water for few minutes. Next, we streak the curd inoculum on sterilized potato slices using a toothpick. Streaking is a microbiological technique used to obtain isolated colonies. Each bacterial species has distinct colony morphology, such as shape, colour, and size. By growing these colonies on boiled potato slices, we could visually differentiate between various bacterial types present in the curd. Through this hands-on approach, we deepened our understanding of each steps importance. This simple yet effective microbial culture experiment at our homelab highlights that with creativity and collaboration, scientific exploration is accessible to everyone, reinforcing the idea that science can be practiced and appreciated outside traditional laboratories. Through collaborative efforts, we continue to develop new ways of conducting research, driven by curiosity and a passion for discovery.

Keywords: Probiotic, lactic acid bacteria, streaking, isolated colonies, colony morphology

PP-13

Understanding the diversity and ecology of ciliated protozoa in water bodies of Saurashtra, Gujarat – A taxonomic approach

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Ciliated protozoans play a crucial role in aquatic ecosystems, influencing energy flow, material circulation, and serving as indicators of water quality. Despite their significance, studies on the taxonomy and diversity of freshwater ciliates, particularly in regions specific study, remains. This study addresses this gap by investigating the prevalence and role of ciliated protozoans in various water bodies, aiming to establish their potential as bioindicators. Water samples were collected in triplicates in the morning, during January to December 2024 seasonally, samples were collected randomly. For the physicochemical analysis samples were collected and various water parameters examined using APHA standards. Identification and classification of ciliate done by morphological and microscopic study. Our findings reveal a substantial diversity of ciliate species, which are identified up to the genus level. These ciliates exhibit a vast range of morphological features, as documented through detailed morphological data and microscopic analysis. The study further incorporates the seasonal physicochemical parameters of the water, providing a comprehensive understanding of the environmental context of these organisms. The significance of this research lies in its contribution to the scientific understanding of ciliated protozoan diversity and their ecological roles. The identification key and database generated will serve as a valuable resource for future research and ecological assessments. The study also aims to determine water potability by analysing key physicochemical parameters, leveraging the presence and diversity of ciliates as indicators of water quality. This research provides valuable insights into the understudied land of freshwater ciliates, contributing to a better understanding of aquatic ecosystem health and the potential use of ciliates in environmental monitoring. Ultimately, the study seeks to expand ciliate diversity, its habitat knowledge of these vital microorganisms and their function in maintaining the balance of aquatic environments.

Keywords: Protozoa, Ciliate, Bioindicators, Diversity, Aquatic environments, Ecological assessments

PP-14

Elucidation of cellular damage by Phthalates using ciliates as environmental biomarkers

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Anthropogenic activities have caused accumulation of organic and metallic pollutants in the environment as well as biomagnification in the food chain thus causing significant ecological and health problems. Phthalates: -diethyl phthalate (DEP) -di-(2-ethylhexyl) phthalate (DEHP) –di isononyl phthalate (DINP) are usually found in Cosmetics and personal care products, PVC (polyvinyl chloride), and plastics. This study investigates the effect Phthalates on marine protozoans (*Euplotes crassus*) and investigate parameters that cause cellular disruptions like DNA damage, mitochondrial disfunctions, cell death and cell cycle anomalies. The present study showed that Phthalates had a profound cellular damage on the ciliates at different doses and time-intervals. Although, cell death was not that evident but phthalate showed more pronounced cellular damage like lysosomal, mitochondrial and DNA damage. Ciliates could survive at a higher dose of Phthalate even with severe cellular damage demonstrating that this Endocrine Disrupter Chemical has more deleterious effect in terms of biomagnification, indicating long term damage to the biodiversity.

Keywords: Phthalates, ciliates, environment, cellular anomalies

PP-15

Bisphenol-A in water bodies: Total cellular damage in small aquatic protozoans leading to severe ecological disbalance

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One of the most potent endocrine disrupters is Bisphenol -A (BPA) which is the poly- carbonate plastics used in food and drink packages, epoxy-resins in metal cans, sports and toys, medical equipment (dental monomers; eye-lenses, plastic tubes, and pipes used in hospitals), and consumer electronics. *Euplotes crassus*, an interstitial marine ciliated protozoan is a promising bioindicator for evaluating the toxicity of various aquatic environmental communities like sediments, fresh waters and waste waters. *Euplotes* was used in our study for analysing the effect of BPA as one of the major environmental pollutants on aquatic ecosystems. Our results demonstrate a widespread contamination of water with BPA cause potent cellular damage in this protozoan sentinel. Lethal and sublethal exposures of BPA were tested on cell mortality, replication rate, lysosomal membrane stability and endocytosis rate of Euplotes. Overall, the results indicate that a broader range of both freshwater and marine water bodies that may be contaminated with BPA cause severe damage to the entire biosystems by directly hitting the food chain; thus, contributing vastly to food insecurity to humans as well.

Keywords: Bisphenol-A, ciliates, environment, cellular anomalies

PP-16

Isolation and Characterization of Bacteria from Different Rhizospheric Soils of Hindu College, Delhi University

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The rhizosphere, a highly dynamic microenvironment surrounding plant roots, serves as a critical interface for complex interactions between roots, soil, and microorganisms. This biologically active region contains a diversified microbiome essential for enhancing soil health and facilitating plant growth. Comprehending the microbial diversity in rhizospheric soils is thus crucial for improving soil fertility and promoting sustainable agriculture practices. The current study aims to explore the microbial diversity of the rhizosphere of a century-old Banyan tree at Hindu College, University of Delhi. Soil samples were collected from around the banyan tree and subjected to serial dilution and plating on Nutrient Agar medium. Pure bacterial isolates were obtained by picking selective colonies and replating on Nutrient agar. The isolates were studied using morphological and molecular approaches, including 16S rRNA sequencing and partial genome sequencing, to ascertain their taxonomic identity and diversity. Colonies of primarily two bacteria - *Brevibacterium linens* and *Stenotrophomonas sp.* - were identified. Studying these can underscore the significance of rhizospheric soil as a reservoir of beneficial bacteria with considerable ecological and agricultural implications. Further research on these isolates could contribute to developing biofertilizers and bioremediation strategies, promoting sustainable soil and crop management practices.

Keywords: Rhizosphere, Bacteria, Bioremediation, Microbial diversity

PP-17

Characterization of differentially regulated carboxypeptidase (Metallopeptidase M32) protein in miltefosine resistant *Leishmania donovani* parasites

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Carboxypeptidase, a member of the metallopeptidase M32 family, catalyses the C-terminal hydrolysis of a variety of peptides and proteins in the presence of metal ions. M32 family proteins are found in prokaryotes but absent in eukaryotes, except trypanosomatids. Therefore, *Leishmania donovani* carboxypeptidase (*Ld*CP) could be essential for their survival and drug resistance. In the present study, we analysed the expression of *Ld*CP in Miltefosine (MIL) - resistant clinical isolates and sensitive parasites. The expression of *Ld*CP protein and its enzyme activity showed two to three-fold higher in MIL-resistant parasites. Its expression was conserved in both promastigotes and intracellular amastigotes. CD spectroscopy revealed that *Ld*CP has high α-helical content at physiological pH and temperature. The protein is quite thermostable with a T_m of 63 ℃ and susceptible to chemical denaturation, with 50% unfolding induced by 3.59 M urea and/or 0.31 M guanidine hydrochloride. LC-MS/MS studies revealed *Ld*CP interacting with protein involved in ATP binding, protein phosphorylation and membrane proteins. Episomal overexpression of *Ld*CP protein in MIL-sensitive parasites was found to increase MIL resistance in sensitive parasites. *Ld*CP overexpressed parasites have high ATP level and high growth rate and can encounter the effect of Reactive oxygen species (ROS) after treatment with MIL. Hence, *Ld*CP will be a better drug target to treat the drug- resistant *Leishmania* parasite infection.

Keywords: Miltefosine resistance, *Leishmania donovani*; Carboxypeptidase (Metallopeptidase M32); Circular Dichroism, Mass Spectrometry

PP-18

Role of cilia in human health

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Cilia are hair- like structure that extend from the cell body. Cilia on cells have properties that are not only associated with the movement of the cell, it is also a site that contain higher than average density of selected signal modules and coordinate signal transduction that control a variety of cellular processes. Ciliopathy refers to the group of diseases caused by defects in ciliary assembly or function. Cilia in the brain is responsible for circulating cerebrospinal fluid, respiratory cilia move mucus and inhaled particulate up and out of the lungs, oviduct cilia sweeps the ovum from ovary towards the uterus, cilia in the node of embryo are crucial for correct placement of organs during development, non-motile cilia in kidney detects the fluid flow and help the kidney cells maintain proper patterns of cell division, rod and cone photoreceptor cells in the retina are modified cilia, olfactory cilia are responsible for our sense of smell, and cilia on the cells of developing the heart are crucial for heart morphogenesis. As we can see there is a wide distribution of cilia throughout the body so it explains why multiple organ systems are affected in the syndromic ciliary diseases. To date, all diseases caused by defective cilia is a result of mutations in nuclear genome therefore all the diseases are inherited and many are manifested in the embryo or the newborn. Immotile cilia syndrome or Primary Ciliary Dyskinesia (PCD), which is caused by defects in motile cilia. Patients with PCD have chronic bronchitis, sinusitis, sinus invertase (about half of the patients suffer), hydrocephalus and male patients are infertile because of impaired sperm motility. Polycystic Kidney Disease (PKD), is the most common life- threatening disease inherited by human. The disease comes in two major forms: Autosomal Dominant PKD(ADPKD) and Autosomal Recessive PKD (ARPKD).

Keywords: Ciliopathy, Sinus Invertase, sinusitis, bronchitis

PP-19

Evaluating the impact of economic development on environmental contamination using machine learning

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The contamination of soil, water, and air is a significant global issue, often caused by hazardous substances such as chemicals, heavy metals, and other xenobiotics. These pollutants primarily stem from industrial activities, agricultural practices, improper waste disposal, and other human-induced factors. Contamination poses severe risks to public health, both directly through exposure or inhalation and indirectly through polluted air and water supplies. Comprehensive research into environmental contamination is crucial for developing remediation strategies that protect public health and promote sustainable development. While economic growth often relies on activities that may contribute to environmental pollution, addressing these challenges places a considerable financial strain on governments and institutions. In some cases, these efforts lead to overall losses or minimal gains when weighed against the significant health risks to citizens. This study analyzes trends in soil, water, and air contamination in Delhi and their connection to economic growth by employing machine learning models to this data and predicting future environmental contamination with respect to economic development. The study predicts contamination levels, uncovers patterns, and provides insights for informed policy development. It emphasizes the importance of targeted environmental policies that address persistent contamination while balancing economic growth leading to sustainable development.

Keywords: Environmental contamination, sustainable development, machine learning, public health risk and Environmental Economics

PP-20

Computational insights into the interaction of Morin with Keap-1, Nrf-2, and Caspase-6: A molecular docking and simulation study

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Morin, a natural flavonoid with potent antioxidant properties, has shown promising therapeutic potential to target oxidative stress-related pathways and regulate apoptosis. This study investigates the molecular interactions of morin with key proteins, including Keap-1 (Kelch-like ECH-associated protein 1), Nrf-2 (Nuclear factor erythroid 2–related factor 2), and caspase-6, using advanced molecular docking and simulation approaches. Keap-1/Nrf-2 signalling plays a critical role in cellular defence mechanisms against oxidative stress, while caspase-6 is pivotal in apoptosis and neurodegeneration. Docking studies revealed strong binding affinities of morin to the active sites of these proteins, with key hydrogen bonding and hydrophobic interactions stabilising the complexes. Molecular dynamics (MD) simulations were employed to assess morin-protein complexes' stability and conformational behaviour over time, providing insights into binding free energies and structural dynamics. Results demonstrated morin's ability to modulate Keap-1/Nrf-2 signalling by disrupting the Keap-1/Nrf-2 interaction, potentially enhancing antioxidant response. Furthermore, morin's binding to caspase-6 indicated its potential role in apoptosis inhibition, supporting its neuroprotective applications.

Keywords: Homology modelling, molecular docking, molecular dynamics, simulation, apoptosis, antioxidant, Morin

PP-21

To study the impact of medical waste (Hydrogen peroxide) on morphology and physiology of *Euplotes woodruffi*

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Ciliates, unicellular eukaryotes, are integral to aquatic ecosystems, contributing to the decomposition of organic matter and energy transfer to higher trophic levels. Recognized as sensitive biological indicators, they respond rapidly to environmental changes, including chemical pollution. With the rising degradation of water bodies caused by urbanization, industrial activities, agricultural runoff, and improper waste disposal, there is an urgent need to evaluate the impact of pollutants on these organisms. Hydrogen peroxide, a commonly used oxidizing agent in medical and industrial applications, produces reactive hydroxyl radicals that damage DNA, membrane lipids, and proteins. While considered less toxic than other decontaminants due to its breakdown into water and oxygen, its effects on ciliates remain inadequately studied. Given their rapid growth, ease of cultivation, and sensitivity to environmental stressors, ciliates serve as ideal models for ecotoxicological research. This study investigates the effects of hydrogen peroxide on ciliates, focusing on their cellular and physiological responses. By exposing ciliates to varying concentrations of hydrogen peroxide, we aim to assess its impact on their growth rate, cell morphology, and overall physiological functions. The study will also compare the tolerance levels across different ciliate species to understand their adaptability and resilience to oxidative stress. The findings will emphasize the importance of ciliates in standard ecotoxicological protocols to enhance environmental risk assessments. This research highlights the critical role of ciliates in ecosystem health and the need to mitigate chemical pollution to safeguard aquatic biodiversity.

Keywords: Ciliates, aquatic ecosystems, hydrogen peroxide, oxidative stress, ecotoxicology, environmental monitoring

PP-22

Isolation and screening of plastic-degrading bacteria from dumped soil area

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The escalating accumulation of plastic waste has emerged as a critical environmental issue. With India generating over 3.5 million tonnes of plastic waste annually, the need for sustainable solutions is pressing. Plastics, due to their high molecular weight, unique chemical bonds, and resistance to microbial attack, persist in the environment for prolonged periods, leading to severe ecological and environmental challenges. This study focuses on isolating and screening plastic-degrading bacteria from dumped soil, aiming to explore eco-friendly bioremediation strategies. Despite the alarming rise in plastic pollution, limited research exists on harnessing indigenous microbial communities from Indian soil for plastic degradation. This study aims to address this gap by identifying and characterizing bacterial strains capable of degrading polymers effectively. Objectives are to isolate and identify bacterial strains from dumped soil capable of degrading plastic waste and to analyze the biodegradation potential of these strains using biochemical and spectroscopic methods. Soil samples from dumped areas were subjected to serial dilution for isolating heterotrophic bacteria. Polymer degradation was assessed through weight loss measurements and spectroscopic analysis. The study successfully identified bacterial strains with significant potential for plastic biodegradation. Weight loss in polymers and spectroscopic analysis will confirm the microbial activity. The study successfully isolated eight bacterial strains from soil samples collected at the Okhla landfill, each showing unique traits. The colonies varied in size, shape, and color, ranging from white and cream to yellow and orange. Gram staining revealed that four strains were Gram-positive, and four were Gram-negative, with most being coccus-shaped and a few bacillus-shaped. This research highlights the potential of indigenous bacterial strains in addressing plastic pollution. By utilizing bioremediation techniques, the study provides a sustainable and eco-friendly approach to waste management, paving the way for large-scale applications in tackling plastic pollution in India. This study contributes to the ongoing efforts to develop effective, environment-friendly solutions for plastic waste management.

Keywords: Biodegradation, Gram-negative, microbial, sustainable

PP-23

The role of posture in thermoregulation in birds: A review

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In birds, thermoregulation is the process, which maintains its internal body temperature within a certain range, despite external temperature variations. This is crucial for the proper functioning of the organism's biochemical and physiological processes. Animals can adjust these temperature change by behavioral thermoregulation. This review evaluates the study, which explores how Indian peafowl balance thermoregulation and antipredator behaviour. The research demonstrates that head-tuck and leg-tuck postures conserve heat effectively, particularly in colder conditions. However, the head-tuck posture compromises predator detection, as birds in this posture allow closer approaches from threats compared to those with heads upright. In this paper researcher use temperature sensor and thermal imaging and provides statistical analysis, while limitations arise from the controlled experimental setting and lack of sleep-state monitoring. This study highlights the trade-offs animals face in adapting to environmental challenges and provides valuable insights into behavioral ecology.

Keywords: Antipredator, ecology, environmental, thermoregulation

PP-24

Investigating the toxicological impact of Lead (Pb) in *Euplotes aediculates*

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Heavy metal pollution is a growing concern worldwide due to its detrimental effects on human health, ecosystems, and the environment. Heavy metals, including lead, mercury, cadmium, arsenic, and chromium, have found their way into the environment through various industrial, agricultural, and natural processes. Ciliates are single-celled eukaryotic microbes and have been used as a model organism for ecotoxicological studies as they are highly sensitive to heavy metals due to lack of cell wall. In the present study, the effects of Lead (Pb) on *Euplotes* sp. were evaluated. The LC 30, LC 50, and LC 70 values were determined to be 17, 39, and 55 µg/ml, respectively and fluorescence microscopy showed Lead (Pb) accumulation in the cells. It was observed that lead exposure led to various morphological and behavioural changes in *Euplotes aediculates* such as a change in shape, slow movement, and intracellular vacuolization. In conclusion, the study demonstrated that lead exposure, particularly at higher concentrations, significantly affected the morphology and physiology of *Euplotes aedicualtes*. The observed changes in cell shape, movement, rotation, and vacuolization highlight the sensitivity of ciliates to heavy metal pollution. These findings contribute to our understanding of the potential impacts of heavy metals on aquatic ecosystems and the use of *Euplotes aediculates* as a valuable cellular tool in ecotoxicological studies.

Keywords: Heavy metals, ecosystem, LC values, *Euplotes aediculates*, Lead

PP-25

Tackling water pollution in resource-limited regions through ciliate-based biosensors: A sustainable and interdisciplinary approach

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Water pollution remains a pressing environmental and public health challenge, particularly in resource-limited regions where traditional monitoring systems are inaccessible due to high costs and infrastructure limitations. This review presents an innovative, cost-effective solution: a ciliate-based biosensor designed for real-time, on-site detection of water pollutants. By harnessing the biological sensitivity of ciliates, which are highly responsive to environmental toxins such as heavy metals, pesticides, and organic pollutants, the biosensor provides an early-warning system to address contamination before it reaches critical levels. Case studies from field tests demonstrate the biosensor's portability, affordability, and user-friendliness, making it an effective tool for deployment in remote and underserved areas. Integrating nanotechnology and cloud-based data platforms enhances its precision, scalability, and accessibility. This innovation aligns with Sustainable Development Goals (SDG 6: Clean Water and Sanitation, and SDG 3: Good Health and Well-Being) by enabling communities to monitor and manage water quality. This research highlights the importance of interdisciplinary collaboration in addressing water pollution and emphasizes the biosensor's potential to transform environmental monitoring. By combining biological sensitivity with cutting-edge engineering, this work offers a scalable, sustainable, and impactful solution to one of the most critical global challenges, paving the way for a cleaner and healthier future.

Keywords: Water pollution, biosensors, environmental monitoring, nanotechnology, public health

PP-26

Ciliates in extreme environment

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Ciliates, a diverse group of unicellular eukaryotes characterized by the presence of cilia, exhibit remarkable adaptability and resilience, allowing them to flourish in extreme environments. These extreme environments include temperature, pH, and salinity and physical formations such as hydrothermal vents, geothermal springs, soda lakes, acid mine drains, solar salterns, and the cryosphere (glaciers and permafrost). The investigation of microorganisms that live in harsh conditions has uncovered numerous phylogenetically new and metabolically varied microbial lineages. The studies on protists are very little, despite the fact that extreme environments are very crucial to understand the microbiology, ecology, and evolution of organisms. In this review, we comprehend how important the study of extreme environments is to fill gaps in the eukaryotic tree of life and to increase our understanding of the ecology, metabolism, genome architecture, and evolution of eukaryotic life. We also summarized the ciliates' ecological, physiological, and biogeochemical functions in these hostile environments, emphasizing how their evolutionary adaptations allow them to survive in these harsh conditions. Furthermore, we discuss the potential implications of understanding ciliate resilience in extreme conditions for broader ecological theories and applications in biotechnology. By elucidating the roles of ciliates in extreme environments, this review emphasizes the importance of preserving these unique ecosystems and provides insights.

Keywords: Ecology, eukaryotes, hydrothermal, microbiology

PP-27

Ciliate collection, culturing, and applications

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Sample Collection Ciliates can be collected from environments like ponds, lakes, aquaculture tanks, decaying organic matter, or sediment. Use pipettes, syringes, or sterile containers to gather samples, optionally filtering with a plankton net. Focus on areas with organic debris, microbial activity, or biofilms. Store samples in cool, dark conditions to maintain viability during transport. Culturing Ciliates Replicate natural conditions by using filtered site water or prepared media (boiled rice, wheat, or lettuce for bacterial growth). To culture, inoculate prepared media with collected samples, cover loosely, and maintain at room temperature (22–28°C) with a 12-hour light/dark cycle for phototrophic species. Observe under a microscope after 24–48 hours, ensuring contamination is minimal. Sub-Culturing and Aeration Transfer ciliates to fresh media every 5–7 days. Gentle aeration supports aerobic species. Regular microscopy checks confirm healthy populations and species identification. Applications Ciliates serve as live feed for larval fish and crustaceans in aquaculture, improve water quality, and act as bioindicators of environmental health. Their roles extend to wastewater treatment, ecological research, and education. As model organisms, ciliates contribute to advances in genetics, cell biology, and toxicology, while enriching food chains in aquaculture.

Keywords: Ciliates, Sample Collection, Aquaculture, Bioindicators, Culturing and Microscopy

PP-28

Diversity and distribution of dinoflagellates from Lakshadweep archipelago

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This study reports on dinoflagellates collected during a summer survey of the Lakshadweep archipelago in February 2024. Water samples for microzooplankton were collected from eight stations: Agatti, Bangaram, Tinnakara, Parali, Kavaratti, Pitti, Kadmat, and Amini islands. A total of 25 species of dinoflagellates were identified, belonging to five families and three orders within the class Dinophyceae Fritsch, 1927. Six genera were observed, with *Tripos* Bory, 1823 being the most abundant. Among the species, *Phalacroma doryphorum* Stein, 1883 was found in the highest numbers.

Physico-chemical parameters were also recorded at all stations. The pH ranged from 7.80 to 8.56, showing only slight variation across the study areas. Salinity ranged from 31 to 43, with the highest salinity observed near Tinnakara island and the lowest near Pitti island. The study showed that there is a clear influence of Physico-chemical parameter on the diversity and distribution of dinoflagellates in Lakshadweep Archipelago.

Keywords: Lakshadweep, Microzooplankton, Dinoflagellates, Diversity, Distribution

PP-29

Notes on the genus *Sphenoderia* Schlumberger, 1845 (Euglyphida: Sphenoderiidae) and genus *Hyalosphenia* stein, 1857 (Arcellinida: Hyalospheniidae) from India with four new records

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The testate amoebae genus *Sphenoderia* Schlumberger, 1845 (Euglyphida: Sphenoderiidae) has been recorded for the first time in India. *Sphenoderia lenta* Schlumberger, 1845 is noticed in the aquatic habitat of Meghalaya and Arunachal Pradesh. Another Genus *Hyalosphenia* (Arcellinida: Hyalospheniidae) has also been recorded in India. Three species of *Hyalosphenia* (Arcellinida: Hyalospheniidae) *viz. Hyalosphenia nobilis* (Stein, 1857) Schulze 1877, *Hyalosphenia elegans* Leidy, 1874, and *Hyalosphenia subflava* Cash and Hopkinson, 1909 were collected from the forest biotopes in Assam state, during 2013 - 2014. Both genera have been documented from the Northeastern region of India, highlighting the rich biodiversity found in this area. For each species, detailed descriptions and distribution in the world are provided based on the examinations of specimens of the present study.

Keywords: Testate amoebae, *Sphenoderia*, *Hyalosphenia*, New record, Northeast, India.

PP-30

Molecular mechanisms of lysosome-related organelle biogenesis in *Tetrahymena thermophila*

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Secretory granules/organelles are found in a subset of animal tissues and eukaryotic lineages with few having been analyzed at the molecular level. In ciliates, formation of secretory organelles (mucocyst/ trichocysts) shares striking similarities to insulin granule formation in mammalian pancreatic β-cells. However, recent studies have suggested unexpected similarities between secretory granules and lysosome-related organelles (LROs), making the study of LROs even more important for advancing human health. Although mucocysts have historically been considered as secretory granules, recent studies indicated that mucocyst formation relies on mechanisms that function in lysosome formation. Thus, mucocysts belong to the very broad family of LROs, comparable to secretory LROs like Weibel-Palade bodies in mammalian cells, and detailed studies of mucocyst biogenesis hold great promises to advance our understanding of this class of organelles. Historically, most studies of mucocysts began with biochemical or candidate gene approaches. To complement these approaches, we have explored the use of expression profiling, taking advantage of an online database of *Tetrahymena* gene expression. This approach is based on the discovery that a large set of genes involved in mucocyst biogenesis is coordinately transcribed. Using this technology, we showed that the mucocyst processing enzymes could be identified based on their expression profiles, which differ from >98% of the protease-encoding genes in *Tetrahymena*. We therefore propose exploit expression profiling to identify other key components of mucocyst biogenesis, starting with the V-ATPases.

Keywords: *Tetrahymena*, mucocyst, LROs, V-ATPase-a1.

PP-31

Understanding the role of CORVET complexes in the delivery of proteins to LROs in *Tetrahymena thermophila*

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Lysosome-related organelles (LROs) characterise a diverse collection of intracellular compartments that have important physiological functions. Classical LROs comprise diverse membrane organelles serving many functions including regulated exocytosis, and all LROs rely on receptors and cytoplasmic adaptors for cargo sorting. To complement ongoing work on LRO biogenesis in animal models, we have sought alternative models in which it can be studied. Mucocysts which serve as specialized secretory organelles in ciliated protozoan *Tetrahymena thermophila*, belongs to the large family of LROs.

This study is based on the idea that the wide set of tools and approaches available in *Tetrahymena*, which has been developed over several decades as a powerful model system, offer a unique opportunity to deepen our understanding of pathways leading to mucocyst formation. In this study, the aims are designed to understand fundamental aspects of how proteins are transported to LROs in the *Tetrahymena*. To understand the pathways that lead to mucocyst formation in *Tetrahymena*, we will examine protein transport pathways in the endolysosomal network, which connect endocytosis and hydrolytic compartments, and specifically the role of tethers in the CORVET (class C core vacuole/endosome tethering) family, which underwent a large and unique expansion in ciliates. Fundamentally, we will test the hypothesis that distinct CORVET complexes are involved in protein delivery to LROs. This study will advance the frontier area of evolutionary cell biology by determining the roles of CORVET tethers in the endolysosomal network and analysing the architecture of this network in a ciliate.

Keywords: *Tetrahymena thermophila,* LROs, mucocysts, secretory pathway, CORVET complex

PP-32

Bionanocomposites for efficient removal of residual antibiotic from water bodies

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Residual antibiotics in water bodies, such as ciprofloxacin, present serious environmental and public health challenges, including the emergence of antibiotic-resistant microorganisms and ecological disruption. Conventional removal methods, like activated carbon adsorption, membrane filtration, and advanced oxidation processes, are hindered by high costs, incomplete degradation, and secondary pollution. Bionanocomposites have emerged as a promising solution, offering eco-friendly, cost-effective, and efficient antibiotic removal. In the study, we use Xanthan Gum with nanomaterials like graphene oxide, metal-organic frameworks (MOFs), or magnetic nanoparticles, leveraging the biopolymers' surface functionality and the nanoparticles' high surface area and active sites to achieve superior adsorption, biodegradability, and reusability while reducing environmental toxicity. This study focuses on a novel bio-nanocomposite synthesized from chitosan and graphene oxide functionalized with magnetic iron oxide nanoparticles, employing sustainable methods like solution mixing, chemical cross-linking, and green synthesis to ensure stability and eco-friendliness. The material is characterized through FTIR, FESEM, TGA analysis to confirm its structural, morphological, and surface properties. Batch adsorption experiments assess its ciprofloxacin removal efficiency under varying pH, initial concentration, and contact time. Results reveal rapid adsorption rates and high removal capacity, facilitated by hydrogen bonding and π-π interactions, with the magnetic properties enabling easy recovery and the biocompatible composition minimizing ecological impact. Compared to conventional techniques, this bionanocomposite demonstrates enhanced efficiency, reduced costs, and scalability potential for practical applications. The findings highlight the potential of bionanocomposites in addressing water contamination and antibiotic resistance, supporting global sustainability goals for improved water quality management.

Keywords: Biodegradability, bionanocomposites, toxicity

PP-33

Bridging the gap among different level of sericulture workforce through a digital application 'SILKROUTE'

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Sericulture, the cultivation of silkworms for silk production, generates significant waste, including sericin, pupae, dead larvae, pierced cocoons, and floss. These byproducts are often discarded or dumped by farmers, contributing to solid waste challenges. Due to limited resources, information, and awareness, many farmers fail to utilize these materials, despite their potential benefits.

This project proposes the development of a digital application, *SILKROUTE*, to bridge the gap between silkworm rearers, reelers, textile industries, and experts. The platform aims to connect producers, trainers, experts, and consumers, fostering collaboration across the sericulture ecosystem. By uniting various stakeholders, *SILKROUTE* will provide opportunities for cottage industry talents and create new employment avenues.

The app will enable effective waste management by transforming waste into valuable resources, turning "trash into treasures." It highlights the role of digital innovation in creating economic value while promoting sustainable practices. With an intuitive, user-friendly interface, *SILKROUTE* will cater to all user types—from farmers to waste processors—enhancing the efficiency and effectiveness of silk waste management. This initiative will reduce environmental impact, optimize resource utilization, and establish sustainability throughout the silk industry supply chain.

Keywords: SILKROUTE, silk industry, silk waste, silk producers, digital application

PP-34

Extraction of silkworm pupae oil from desilked silkworm pupae

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Silkworm pupae, are the by-product of the commercial silk industry, present a significant opportunity for value addition through the extraction of silkworm pupae oil (SPO). The primary objective of this project is to optimize the extraction process of silkworm pupae oil from the pupae, characterize the extracted oil in terms of chemical composition, molecular weight, and functional properties and to evaluate the potential applications of silkworm pupae oil in different industries.

Process involves collection and preparation of desilked pupae. This involves thawing if they were frozen and removing any impurities or foreign materials. The extraction process will be standardized by analyzing the efficacy of extraction by mechanical pressing of the silkworm pupae or soxhlet extraction method. Once extracted, it will be subjected o characterization to study its composition and properties.

Studies suggest that that desilked silkworm pupae offer a rich source of oil. The oil predominantly contains unsaturated fatty acids, including linoleic acid and oleic acid. Silkworm pupae oil is gaining attention due to its high nutritional value, functional properties, and potential applications in food, cosmetics, and pharmaceuticals.

The proposed project aims to unlock the potential of pupae oil, a valuable oil extracted from silk waste. Through systematic extraction and characterization, this project will contribute to a deeper understanding of silkworm pupae oil's properties and potential applications in various industries. The outcomes of this project will pave the way for innovative and sustainable uses of silkworm pupae oil, reducing waste and promoting economic and environmental benefits.

Keywords: Desilked pupa, **s**ilkworm pupa oil, oil extraction, pupa oil

PP-35

Role of Ciliates in Coral Reef Ecosystems

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Coral reefs are among the most diverse and valuable ecosystems on Earth, often referred to as the "rainforests of the sea" due to their rich biodiversity. However, they are under constant threat due to the increased levels of CO_2 in the atmosphere. Elevated temperature, acidification, and stratification in marine ecosystems adversely affect biodiversity and key ecosystem services. Furthermore, it leads to coral bleaching resulting in decalcification of coral reefs. Climate change has greatly impacted the physico-chemical properties of marine life, thereby interfering with the trophic interactions as well as the microbial community. The effect of climate change on the microbial community, including the class of ciliates, remains intricate, given that thermal adaptation may be in conflict with other sets of stressors, such as food availability and predation pressure. Understanding these interactions is important for predicting the resilience offered by aquatic ecosystems in a rapidly climate-altering world. Ciliates enhance coral reef health by reducing pathogenic bacteria, improving nutrient cycling, and supporting beneficial microbes. As bioindicators, they respond to water quality changes, while some form symbiotic associations with corals, aiding energy production and stress resistance. Understanding these roles is vital for coral conservation. Even thermal responses of some freshwater ciliates provide important clues regarding how protists may cope in increasing warm environments. Many species tested operate close to a thermal safety margin, poorly capable of survival at temperatures above 30 degrees Celsius. Ecological and evolutionary trade-offs restrict thermal adaptations that may affect their contribution to nutrient cycling and stability of food webs. This study assesses the climate change induced disruptions and ecological consequences on the marine ecosystem focusing particularly on coral reefs and the role of ciliates in potentially protecting them.

Key words: Coral reefs, climate change, coral bleaching, ciliates, conservation

PP-36

Formulation of herbal concoction using unused mulberry leaves and other medicinal herbs and ingredients

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This project aims to formulate a novel herbal concoction utilizing unused mulberry leaves (*Morus alba*) from sericulture units and other medicinal herbs and ingredients. Mulberry leaves, an often-discarded by-product of mulberry farming, are rich in bioactive compounds such as flavonoids and alkaloids with notable anti-inflammatory, antioxidant, and anti-diabetic properties. By combining them with complementary medicinal herbs like turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), and holy basil (*Ocimum sanctum*), the concoction will provide synergistic therapeutic benefits for oxidative stress, inflammation, and metabolic health.

The methodology involves phytochemical screening and extraction of bioactive compounds using Soxhlet extraction methods. The final formulation will be assessed for its stability and therapeutic properties through in vitro and in vivo studies, including antioxidant and anti-inflammatory assays. This research will also focus on promoting sustainable agricultural practices by repurposing unused plant materials.

Expected outcomes include a scientifically validated herbal product with potential commercial applications as a health supplement, offering benefits for metabolic disorders and general well-being. This project also aims to contribute to sustainability by reducing sericultural waste and encouraging circular economy practices in the herbal medicine industry. Future perspectives include the commercialization of the product, expansion into other underutilized plants, and further clinical studies to explore its broader health benefits.

Keywords: Herbal concoction, waste mulberry, mulberry concoction, sustainable practices in sericulture, sericultural by-product

PP-37

From cocoon to colour: Harnessing the power of silk in hair dye

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The cosmetics industry is increasingly embracing sustainability, driving the exploration of natural ingredients in product formulations. This project, "*From Cocoon to Colour: Harnessing the Power of Silk in Hair Dye*" focuses on utilizing sericin protein, derived from the cocoons of silkworm, in creating organic, non-toxic hair dyes. A by-product of silk manufacturing, sericin is recognized for its biocompatibility, antioxidative properties, and moisture-retention abilities. These attributes, combined with its potential to bind to keratin, make it a promising additive for hair dyes.

The study aims to formulate hair dyes by integrating sericin with natural colorants. The methodology involves extracting sericin through degumming, hydrolysis, and purification. The sericin is then mixed with distilled water to create a conditioning mixture. Natural colorants like amla, indigo, Heena and beetroot are incorporated with lukewarm water. The sericin-based conditioner and natural pigments are combined to create an organic hair solution. Lemon juice and rosemary extract are added for pH adjustment and refreshing aroma. Aloe vera gel is added to achieve desired consistency and user-friendly application.

Expected outcomes include the development of eco-friendly, biodegradable hair dyes that deliver vibrant, long-lasting color while reducing hair damage. This project addresses the limitations of chemical-based dyes, offering a sustainable alternative that aligns with the growing demand for organic beauty products and contribute to environmental conservation.

Keywords: Sericin, silk protein, sericin extract, hair colour, hair dye, organic hair dye

PP-38

Pheromones in Ciliates

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Pheromones refers to the chemicals used to communicate among members of same species. As in animals and other multicellular organisms, protozoan cilliates communicate via diffusible signalling pheromones. These micro organisms synthesise substances which fully satisfy the definition of pheromones, and are secreted outside by an individual and received by a second individual of the same species in which they release a specific reaction. Cilliates are of two types- 1. Pheromone secreting species, 2. Pheromone retaining species. Cilliates use Pheromones to control their reproduction, including mating and growth. Pheromones have efficiently been isolated and their structures determined of complexity only in five species namely *B. Japonicum*, *E raikovi*, *E nobili*, *E octocarinatus* & *E crassus*. The two B. Japonicum pheromones characterized are Gamone -1 and Gamone-2.These pheromones are unique in their structures but work together to facilitate mating.Gamone-1 is a highly unstable glycoprotein of 272 amino acids and six covalently linked sugars. Gamone -2 is a very stable tryptophan derivative. In case of E raikovi pheromones nine distinct amino acid sequences, designated as Er-1, Er-2, Er-7, Er-10, Er-1, Er-20, Er 21, Er-22 &Er-23 have been determined. Euplomones are secreted through out the cell life cycle regardless of the developmental or physiological cell competence to mate. The E-raikovi pheromone family finds a fully matching counter part with E nobili Pheromone family. Seven E-nobili pheromones are known for primary amino acid sequences. Both E raikovi pheromones and E nobili have structures based on an up-down-up three helix bundle stabilized by closely spaced disulfide bonds. *E. nobilli* pheromones are thermodynamically less stable than E-raikovi pheromones. In comparison to E-raikovi and E-nobilli pheromones much less information is available on the structures of *E. octocarnitus* and *E. crassus* pheromones due to their difficulty in isolation as they are synthesised in less concentration. Nine pheromone amino acid sequences have been determined in *E. octacarinatus*, which is a lacustrine species not closely allied to *E. raikovi*, *E. nobilii* and *E. crassus*. Three complete sequences (Ec-1,Ec-2 and Ec-3)of 45 amino acids with 10 cysteines have been determined for *E. crassus*. Ciliate Pheromones show how simple organisms developed chemical communication, providing insights into the evolution of signalling.

Keywords: Evolution, pheromones, signalling

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