

A REPORT ON

WASTE STEM CELLS TO WEALTH

&

PRIMING THE BRAIN FOR NEURODEGENERATION

INVITED TALK-2025
19TH August



Centurion
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*Shaping Lives...
Empowering Communities...*



Department of Environmental Sciences
&
Research Centre for Waste to Wealth Management
School of Applied Sciences (SoAS)
Centurion University of Technology and Management (CUTM)
Bhubaneswar-752050, Odisha, India
Odisha, India



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Department of Environmental Sciences & Research Centre for Waste to Wealth Management
School of Applied Sciences (SoAS)



Centurion University of Technology and Management (CUTM), Bhubaneswar-752050, Odisha



ANNOUNCEMENT

Induced Pluripotent Stem Cell (iPSC) research is a field focused on generating patient-specific cells for disease modelling, drug discovery, and regenerative medicine. iPSCs are created by reprogramming adult cells back into a pluripotent state, similar to embryonic stem cells. This technology allows scientists to study diseases in a dish, test potential therapies, and even develop cell-based therapies for regenerative purposes.



Dr. Phalguni Rath
University of Oxford

The concept of "**Waste Stem Cells to Wealth**" refers to the practice of repurposing discarded biological materials, often from medical or industrial sources, to extract and utilize stem cells for therapeutic purposes. This approach offers a potential solution to the increasing demand for stem cells in regenerative medicine while simultaneously addressing the challenges of waste management and reducing healthcare costs.

Department of Environmental Sciences, School of Applied Sciences (SoAS) & Research Centre for Waste to Wealth Management, is organising an **Invited Talk on "PRIMING THE BRAIN FOR NEURODEGENERATION"** by Dr. Phalguni Rath. This will be useful for different sections of students, research scholars and faculties especially School of Applied Sciences (SoAS), School of Allied & Healthcare Sciences (SoAHS), School of Biotechnology (SoBT) and School of Pharmacy & Life Sciences (SoPLS).

**Invited Talk Venue: Hall No. 6, Aryabhatta Building, CUTM
Bhubaneswar-752050, Odisha, India
Date: 19.08.2025, Time: 10.30 AM – 12.30PM**

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3 GOOD HEALTH
AND WELL-BEING



4 QUALITY
EDUCATION



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



17 PARTNERSHIPS
FOR THE GOALS



PRIMING THE BRAIN FOR NEURODEGENERATION

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AGENDA

Time	Activity
10.30-10.35AM	Welcome address by HoD, Env.Sc., SoAS Dr. Abanikanta Bhadra
10.35-10.40AM	Lighting of Lamp by the Dignitaries
10.40-10.45AM	Address by Associate Dean, SoAS Dr. Gagan Kumar Panigrahi
10.45-10.50AM	Address by Director, SoAS Prof. (Dr.) Susanta Kumar Biswal
10.50-10.55AM	Address by the Director, CUTM, Bhubaneswar Prof. Jagannath Padhi
10.55-11.00AM	Address by the Pro Vice Chancellor Prof. (Dr.) Biswajit Mishra
11.00-11.10AM	Address on "Waste Stem Cells to Wealth" by Dr. Phalguni Rath Head of iPSC Research Facility Centre for Human Genetics, University of Oxford, UK
11.10AM -12.00Noon	Invited Talk on "Priming the Brain for Neurodegeneration" by Dr. Phalguni Rath Head of iPSC Research Facility Centre for Human Genetics, University of Oxford, UK
12.00Noon-12.15PM	Question-Answer and Brain Storming By Students, Research Scholars and Faculties
12.15-12.20PM	Vote of Thanks by Dr. Saismrutiranjana Mohanty Assistant Professor, Env. Sc., SoAS
12.20-12.30PM	Tea, snacks and departure

Welcome Address by Head of the Department, Environmental Sciences, SoAS

A very good morning to one and all present over here.

Honorable Chief Speaker, Dr. Phalguni Rath, Head, iPSC Research Facility,
Centre for Human Genetics, University of Oxford, UK

Honorable Pro Vice Chancellor Sir, Prof. (Dr.) Biswajit Mishra

Honorable Associate Dean Sir, SoAS, Dr. Gagan Kumar Panigrahi

It is my great pleasure to extend a warm and heartfelt welcome to our esteemed guest speaker, dignitaries, faculty colleagues, scholars, students, and participants from across disciplines on behalf of the Department of Environmental Sciences. Your presence here today demonstrates your commitment to exploring new frontiers in science and environmental stewardship.

We are truly honoured to have this insightful and timely invited talk jointly themed **“Waste Stem Cells to Wealth”** and **“Priming the Brain for Neurodegeneration”**. The theme "Waste Stem Cells to Wealth" — a topic that bridges the worlds of biomedical innovation, sustainability, and circular economy which are at the heart of environmental science. Turning biomedical waste into regenerative tools offers not only a scientific breakthrough but a sustainable solution to reduce waste and generate wealth. We are gathered here today to explore two thought-provoking topics that, while diverse in scope, converge on a shared vision: unlocking the potential of science to solve complex health and environmental challenges.

The idea of converting waste stem cells—often considered biological by-products—into valuable therapeutic or industrial resources is not just innovative, but visionary. It resonates deeply with the ethos of environmental science: reducing waste, promoting resource efficiency, and creating value from what is typically discarded. This approach aligns with global sustainable development goals and opens up new interdisciplinary avenues for research, collaboration, and entrepreneurship.

The theme, “Priming the Brain for Neurodegeneration,” addresses a pressing global health concern. With the rise in neurodegenerative disorders such as Alzheimer’s and Parkinson’s, it is vital that we understand how early changes in the brain can be detected, managed, and potentially reversed. This opens the door to preventive care, early intervention, and deeper insights into the brain-environment interface — an area that we, as environmental scientists, should increasingly explore.

Our department firmly believes in fostering such forward-looking conversations that challenge conventional thinking and spark meaningful change. Today's event is a testament to the growing recognition that solutions to environmental and health challenges can be found at the intersection of biology, technology, and sustainability.

Today’s invited talk stands as an example to the power of interdisciplinary collaboration—where biology, neuroscience, environmental sustainability, and innovation come together. I am confident that the discussions and presentations ahead will not only enrich our understanding but also inspire new pathways for research and impact.

As we proceed with the session today, I encourage everyone to engage, ask questions, and think critically. Let this invited talk be not just an academic exchange, but a launch pad for ideas that could shape the future of regenerative science and sustainable innovation. Let us use this platform to exchange ideas, challenge perspectives, and ignite a shared passion for advancing knowledge that benefits both humanity and the planet.

Once again, I welcome you all and wish the interactions have great success.

Thank You

With this I invite the Honorable Dignitaries to light the lamp with Noble thoughts and beginning.

Welcome Address by the Head of the Department, Env. Sc., SoAS





Lighting of Lamp by the Dignitaries





Address by the Associate Dean, Dr. Gagan Kumar Panigrahi

Having Dr Phalguni Rath, from our own soil Odisha working at one of the elite Universities, Oxford is really a proud moment for all of us. Conventionally waste to wealth focuses primarily on different environmental aspects, however today's theme on waste stem cells to wealth management brings a complete biological aspect and I am confident that Dr. Rath will highlight the cutting edge research and advancements in the field of neurons and associated neurodegenerative disorders. It is a golden opportunity for our students to interact with Dr. Phalguni and discuss the way forward to reach at such a great place like the Oxford University.

Address by the Pro Vice Chancellor Prof. (Dr.) Biswajit Mishra

Honorable Pro Vice Chancellor Prof.(Dr.) Biswajit Mishra stated that nothing is a waste on the Planet earth unless until there is a place to keep it. For environmental security and safety as well as resource generation, each waste must be utilized in an innovative way. The 5 R's of waste management "Refuse, Reduce, Reuse, Recycle and Repurpose" must be applied by individuals and organizations in minimizing the waste generation and promoting a more sustainable approach to resource management. Waste stem cells are sourced from otherwise discarded human tissues like liposuction fats, umbilical cord, placenta, and amniotic fluid. Their utilization focuses on regenerative medicine, such as growing new tissues, treating autoimmune diseases and repairing damaged organs. They are also used in research for disease modelling, drug testing, and to understand genetic defects. Sourcing stem cells from discarded tissues offers a more sustainable approach compared to other methods.

Address and invited talk by Chief Speaker Dr. Phalguni Rath

Neuronal development critically relies on the microtubule cytoskeleton, which plays essential roles in cell division, migration, and signal transduction¹. The microtubule-associated protein Tau (MAPT) is predominantly expressed in axons, where it stabilizes microtubules and promotes tubulin polymerization². Tau plays a central role in neurodegenerative diseases collectively known as tauopathies, including Alzheimer's disease and frontotemporal dementia³.

Mutations in Tau have been shown to destabilize the microtubule network, impair axonal transport and neuronal migration³. Adding to the complexity, the MAPT-AS1 and MAPT-IT1 long noncoding RNAs have been shown to be expressed in neurons and associated with Tau expression. However, the precise roles of these non-coding RNAs and mechanisms linking Tau mutations to altered microtubule dynamics and impaired neuronal development remain incompletely understood.

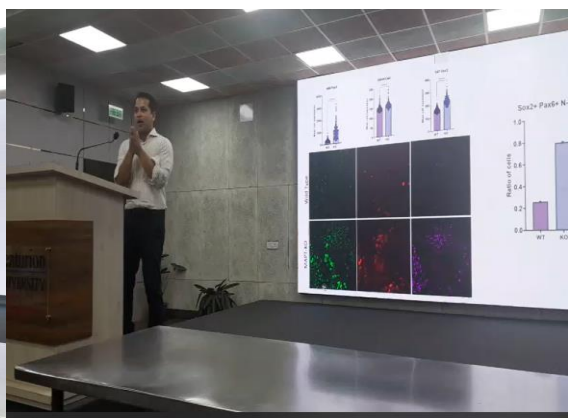
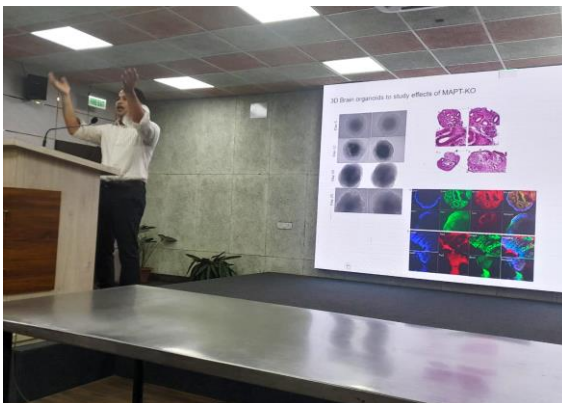
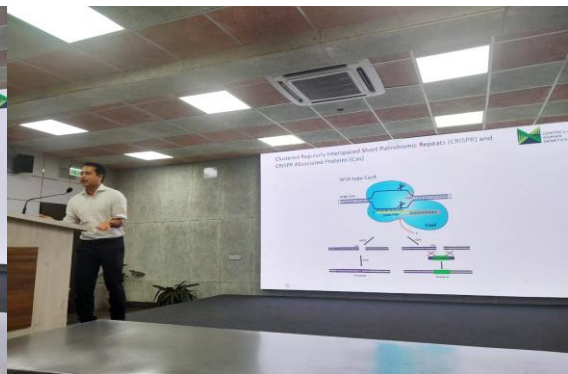
We have reported human iPSC-derived neurosphere models⁴ to assay neural progenitor proliferation and active migration. To model Tau-related developmental defects in a human context, we generated MAPT knockout (MAPT-KO), and MAPT IT1 knockout (MAPT-IT1-KO) induced pluripotent stem cell (iPSC) lines. The iPSCs were differentiated into neuronal progenitor cells (NPCs) and matured as both 2D monolayer cortical neurons and 3D neurospheres. While 2D cultures maintained consistent NPC marker expression, both the MAPT-knockout neurospheres demonstrated impaired growth and aberrant morphology, suggesting that the 3D culture more effectively reveals MAPT-associated phenotypic defects. Live imaging of the neurospheres exhibited significantly reduced tyrosinated tubulin levels in MAPT-IT1-KO cells, indicating a reduction in dynamic microtubules. This finding was corroborated by the knock-out cells' increased resistance to Nocodazole, which selectively depolymerizes dynamic microtubules.

These results highlight the significance of using 3D neurosphere models in studying neuronal proliferation and migration. Preliminary data suggest that the absence of functional Tau may lead to microtubule over-stabilization and reduced dynamicity. Further investigations are necessary to validate these findings and explore their implications for understanding Tau-associated neurodegenerative diseases.

1. Kapitein, L. C., & Hoogenraad, C. C. (2015). Building the Neuronal Microtubule Cytoskeleton. *Neuron*, 87(3), 492–506.
<https://doi.org/10.1016/j.neuron.2015.05.046>
2. Barbier, P., Zejneli, O., Martinho, M., Lasorsa, A., Belle, V., Smet-Nocca, C., Tsvetkov, P. O., Devred, F., & Landrieu, I. (2019). Role of Tau as a Microtubule







Question-Answer and Brain Storming



Felicitation by Dr. Rukmini Mishra



-Associated Protein: Structural and Functional Aspects. *Frontiers in Aging Neuroscience*, 11.

<https://doi.org/10.3389/fnagi.2019.00204>

3. Strang, K. H., Golde, T. E., & Giasson, B. I. (2019). MAPT mutations, tauopathy, and mechanisms of neurodegeneration. *Laboratory Investigation*, 99(7), 912–928.

<https://doi.org/10.1038/s41374-019-0197-x>

4. Drydale, E., Rath, P., Holden, K., Holt, G., Havins, L., Johnson, T., Bancroft, J., & Handunnetthi, L. (2023). Stem-cell derived neurosphere assay highlights the effects of viral infection on human cortical development. *Brain, Behavior, and Immunity*.

<https://doi.org/10.1016/j.bbi.2023.11.017>

Vote of thanks by Dr. Saismrutiranjana Mohanty

Dr. Saismrutiranjana Mohanty, faculty from Department of Environmental Sciences, offered vote of thanks to the chief speaker, Pro Vice Chancellor, faculties, students and staffs after the Chief speaker delivered his invited talk and felicitated by Dr. Rukmini Mishra. He also sincerely acknowledged support from HR Department, Media Resource Centre (MRC), Research scholars, students and Hospitality Team to successfully cooperate in the arrangement and conduction of the program. Department of Environmental Sciences is obliged to Pro Vice Chancellor Prof. (Dr.) Biswajit Mishra; Director of CUTM, Bhubaneswar, Prof. Jagannath Padhi; Director of SoAS, Prof. (Dr.) S. K. Biswal and Associate Dean of SoAS, Dr. G. K. Panigrahi for organizing the event successfully. Vice Chancellor of Centurion University was duly acknowledged for the support in organizing the insightful invited talk.
