



10. **Dr Janna Nawroth (Helmholtz Pioneer Campus, Munich)** delivered a lecture titled “Defining ‘Organotypic’: Quantitative Benchmarks of *In Vitro* Human Airway Models.” She delved into the intricate structural and functional dynamics of mucociliary clearance within the human airway. Dr Nawroth’s research focuses on developing organotypic lung models that closely mimic the complexity of human lung tissue *in vitro*. She highlighted the importance of comparing human and rat lung models to establish quantitative benchmarks for evaluating the fidelity of *in vitro* human airway models, advancing respiratory research and drug development.

Workshops and networking

The event included a city rally for networking and team building, and a workshop for PhD students on “Self-presentation in academia.” Participants received training in short pitches and presentations. The camp concluded with a poster award ceremony, recognizing Maura Lynch-Miller (Research Group Infection Bio-

chemistry, University of Veterinary Medicine Hannover) for her work on microfluidic 3D cell culture systems to study lung infection and inflammation under pathophysiological oxygen levels.

Conclusion

We extend our gratitude to the organizers, particularly Dorothea Mühe, as well as to the speakers and participants for an enriching and fruitful three days of scientific discussions on alternatives to animal experiments.

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Meeting Report

National Workshop on Alternatives to Higher Animals in Toxicology and Biomedical Science

doi:10.14573/altex.2403151

The Indian Society for Alternatives to Animal Experiments (SAAE-I) organized a national workshop titled “*Alternatives to Higher Animals in Toxicology and Biomedical Science*” on November 22 to 29, 2023 at the Department of Zoology, Aligarh Muslim University, Aligarh (UP). Dr Yasir Hasan Siddique, Professor of Zoology, was the Organizing Secretary. There were 26 participants, including postgraduate students and research scholars.

Less sentient animals, which do not evoke ethical issues and are not protected by animal welfare legislation, are alternatives to mammalian models for research such as rodents. Ideally, they are easily accessible, plentiful, have a simple body plan and short life cycle, are easy to maintain and not expensive. Classic examples include *Hydra*, *Drosophila*, and *Caenorhabditis*. They can be used, e.g., to model human diseases and investigate potential treatments (Akbarsha et al., 2013; Patwardhan and Ghaskadbi, 2013; Ghaskadbi, 2020; Siddique et al., 2014, 2015, 2022) or as a bio-indicator of aquatic pollution (Prasad and Mookerjee, 1986; Zeeshan et al., 2016, 2017; Murugadas et al., 2016, 2019). The workshop was aimed at motivating the participants towards research using these organisms as models, as well as at developing laboratory skills. The

program included scientific lectures and laboratory exercises.

In his welcome address, the Organizing Chairman, Prof. **Mukhtar Ahmad Khan** (Chairperson, Department of Zoology), highlighted the relevance of the workshop and emphasized the value of the models. Prof. **Qudsia Tahseen**, Organizing Co-chairperson, deliberated upon the increasing use of invertebrate models such as *Caenorhabditis elegans*, *Drosophila*, and *Hydra* in biological research. She appreciated the effort to train the students in their use. Prof. **Mohammad Afzal** (Patron; Dean, Faculty of Life Sciences) appreciated the tremendous effort in organizing a much-needed workshop on research techniques. He briefly highlighted the achievements of the members and scholars of the Faculty of Life Sciences in general and the Department of Zoology in particular. Chief Guest, Prof. **Mohammad A. Akbarsha** (Founder of MGDC at Bharathidasan University, Tiruchirappalli, India, and Gandhi-Gruber-Doerenkamp Chair of Doerenkamp-Zbinden Foundation, Switzerland) appreciated the initiative taken by the organizers of the workshop for training the participants and highlighted the importance of using alternatives to higher animals in biological, toxicological, and medical research.



Prof. Mohammad A. Akbarsha (MGDC/SAAE-I/National College, Tiruchirappalli) delivered a talk on “*The place of alternative model organisms in new approach methodologies (NAMs)*”. New approach methodologies (NAMs) are defined as any technology, methodology, approach, or combination that can provide information on chemical hazard and risk assessment without the use of live mammalian models. This includes *in vitro*, *in silico*, and *in chemico* methods as well as alternative model organisms. The replacement of mammalian models with NAMs has been prioritized by FDA, EPA, and OECD. They can be applied in toxicological research, such as chemical safety testing, or aspects of biomedical research that examine biological mechanisms of disease and drug discovery.

Prof. **Surendra Ghaskadbi** (MACS-Agharkar Research Institute [ARI] Pune) addressed “*Hydra as a model system: An extraordinary research organism, a great teaching tool, and an alternative animal model for toxicity testing.*” *Hydra*, a freshwater diploblast, was the first aquatic organism to have been brought to the laboratory in 1744 by Abraham Trembley. Due to its extraordinary regenerative ability, the presence of stem cell populations, and the absence of organismal senescence, *Hydra* is used to study cellular and molecular regulation of diverse biological phenomena. In India, Prof. Sivatosh Mookerjee used *Hydra* extensively to understand pattern formation and regeneration during the 1960s to early 1980s (Prasad and Mookerjee, 1986). Dr Ghaskadbi was introduced to *Hydra* in 1983 and studied several signaling and DNA repair molecules over the years. In collaboration with scientists from MGDC/NCAAE, research was carried out to develop *Hydra* as a model organism for toxicity testing and human diseases. Further, his team has introduced *Hydra* as a teaching tool at schools, colleges, and universities and developed a *Hydra* kit, which is supplied to teaching and research institutions throughout India.

Prof. **Surajit Sarkar** (University of Delhi South Campus, New Delhi) spoke on “*The translational prospect of Drosophila: Lessons from fly models of human polyglutamine disorders.*” Polyglutamine or poly(Q) disorders such as Huntington’s disease and different types of ataxias are neurodegenerative diseases that result from the expansion of CAG repeats in the coding region of the affected gene. The mutated proteins form toxic aggregates in neuronal cells, leading to degeneration of specific brain regions. Upregulation of the insulin signaling cascade has been found to restrict human poly(Q)-mediated toxicity in *Drosophila*. A comprehensive analysis suggested that this is mediated by the S6K/4E-BP mediated growth-promoting branch of the insulin signaling pathway. This finding holds immense potential for *Drosophila* to be developed for novel intervention strategies against human poly(Q) disorders.

Dr **Ravi Ram Kristipati** (CSIR-Indian Institute of Toxicology Research, Lucknow) delivered a talk on “*Drosophila as an alternative animal model for the assessment of reproductive toxicity.*” Genetic factors and altered lifestyles contribute to certain reproductive abnormalities, which are increasing. *Drosophila melanogaster* offers an excellent model for reproductive toxicity assessments that facilitates high-throughput analyses. Studies have shown that *Drosophila* can recapitulate the mammalian hallmarks of reproductive toxicity. The *Drosophila* ecdysone receptor-based

gene-switch assay has relevance for the assessment of chemical-induced endocrine disruption in insects/lower organisms.

An insightful invited talk titled “*Drosophila melanogaster: A powerful alternative model to understand neurodegenerative diseases*” was delivered by Prof. **Suhel Parvez** (Department of Toxicology, Jamia Hamdard, New Delhi). Toxicity and neurodegeneration are major health concerns worldwide. Though traditional vertebrate models have provided valuable insights, they are expensive, labor-intensive, time-consuming, and ethically challenging. *Drosophila* is utilized for investigating toxicological effects of chemicals and understanding the mechanisms underlying neurodegenerative disorders. In his lab they develop transgenic flies that overexpress A β 42 in the brain to gain mechanistic insights into the mechanisms of neurodegenerative disorders such as Alzheimer’s disease and test neurotoxic pesticides to investigate their role in neurodegenerative diseases.

Prof. **Mohammad Afzal** (Department of Zoology, AMU) delivered a lecture on “Development of animal models for biological research.” Research using model organisms has revolutionized biological theories and practice. Lower model organisms such as *Hydra*, *Planarian*, and *Daphnia* have become powerful tools for more ethical research.

The participants were trained in the following laboratory exercises: Understanding the basics and biology of *Hydra*; preparation of the live feed for *Hydra*; handling and culture of *Hydra*; acute toxicity testing using *Hydra*; regeneration assay on *Hydra*; demonstration of bioremediation using *Hydra* as a model; identification of the various cell types in *Hydra*; reactive oxygen species as indicator of toxicity in *Hydra*; *Drosophila* life cycle and laboratory culture; ONPG assay on the third instar larva of transgenic *Drosophila* [hsp 70-lac Z] Bg9; X-gal staining on the third instar larvae of transgenic *Drosophila* [hsp 70-lac Z] Bg9⁺; Trypan Blue exclusion assay on the third instar larva of *Drosophila*; Comet assay on the mid-body part of *Hydra* and mid-gut cells of the third instar larva of *Drosophila*; lactate dehydrogenase (LDH) (allozymes) study in *Drosophila*; preparation of paraffin-embedded sections of *Hydra* and *Drosophila*; understanding the importance of GAL4 and UAS system in *Drosophila* model; use of *Drosophila* activity monitor [DAM] in studying circadian rhythm and activity pattern; study of olfactory response in adult flies using Y-maze; *Drosophila* as an air pollution indicator; isolation of DNA and RNA from various developmental stages of *Drosophila*; detection of apoptosis in *Drosophila*; SDS-PAGE analysis of samples from *Hydra* and *Drosophila*; utilization of sex comb to study the evolutionary aspects and distinguish males of different species of *Drosophila*; visit to the University Sophisticated Instruments Facility (USIF, AMU).

The participants received certificates of participation. They were all appreciative of the training, and desired that more such workshops may be conducted.

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Acknowledgments

This workshop was sponsored by Science and Engineering Research Board (SERB), New Delhi (SSY / 2023 / 000541); Doerenkamp-Zbinden Foundation, Switzerland; and Aligarh Muslim University, Aligarh, Uttar Pradesh, India. We are grateful to the Chairperson, Department of Zoology, Aligarh Muslim University, Aligarh, for providing the facilities.

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