

WEBINAR REPORT

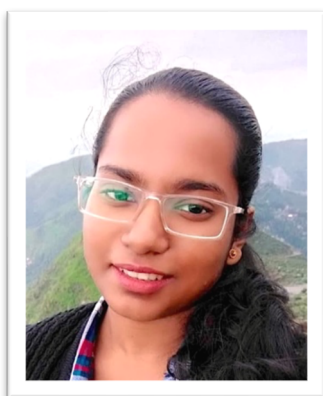
‘Research Methodology’

Organized by

SAAP Research and Publication Subcommittee

In association with

South Asian Centre of Excellence in Physiology Education and Research (SACE-ER)



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The South Asian Centre of Excellence in Physiology Education and Research (SACE-ER), in collaboration with the SAAP Research and Publication Subcommittee, organized a high-impact webinar on 9 August 2025 on the broad theme of ‘*Research Methodology*’. Designed primarily for postgraduate students, early-career researchers and faculty from across South Asia, the program highlighted three core pillars of contemporary biomedical and physiological research: *cell culture*, *animal models* and *electrocardiography (ECG)* in clinical research.

The session was hosted by Ms Pronisha Biswas, a postgraduate student in the Department of Physiology, Serampore College, affiliated to the University of Calcutta, West Bengal, India. With poise

and professionalism, she welcomed participants, outlined the objectives of the event, and introduced the distinguished speakers and SAAP leadership.

In the inaugural segment, Ms Biswas introduced Dr Kaushik Bharati, Chairman of the SAAP Research and Publication Subcommittee. In his opening remarks, Dr Bharati emphasized the centrality of robust research methodology to the growth of physiology and allied biomedical sciences in the region. He noted that sound methods, ethical practice and critical thinking are indispensable for producing credible, globally competitive research, and commended SACE-ER and the SAAP Research and Publication Subcommittee for spearheading capacity-building initiatives of this kind.

This message was further reinforced by Prof. Samina Malik, President of SAAP, and Prof. Nayma Sultana, Secretary General of SAAP, who delivered brief but inspiring addresses. They underlined SAAP's sustained commitment to nurturing young scientists through training in both basic and clinical research techniques, and highlighted the importance of cross-country collaboration in South Asia. Their words effectively set the stage for an evening of intensive learning spanning *in vitro*, *in vivo* and clinical domains.

Cell Culture in Biomedical Research: A Cornerstone of Modern Science

The first scientific presentation was delivered by *Dr Arnab Banerjee*, Resource Person at the Postgraduate Department of Physiology, Serampore College, University of Calcutta, India. Introduced by the host, Dr Banerjee spoke on '*Cell Culture in Biomedical Research*', offering a comprehensive, practice-oriented overview.

He began by defining cell culture as a foundational technique of modern biomedical science, enabling researchers to grow and maintain cells outside their natural environment. Dr Banerjee highlighted the wide-ranging applications of cell culture, including disease modeling, drug discovery, toxicology, vaccine development and emerging areas such as personalized medicine and regenerative therapies.

A substantial portion of his talk focused on the practicalities of establishing and maintaining healthy cell cultures. He described the layout and core equipment of a typical culture laboratory, drawing

attention to the critical importance of aseptic technique. He elaborated on how laminar airflow hoods, HEPA filtration, UV sterilization, personal protective measures and strict workflow discipline act together to prevent microbial contamination. Contamination, he cautioned, can ruin experiments and hamper entire research programs, making vigilance and good laboratory practices non-negotiable.

Dr Banerjee then discussed the composition and role of culture media, which are formulated to mimic the biochemical environment of bodily fluids. He also noted current trends towards serum-free and chemically defined media to enhance reproducibility and address ethical and scientific concerns associated with serum use.

He went on to explain routine culture maintenance, particularly for adherent cells, which require timely passaging once they reach suitable confluency. The steps of washing, enzymatic detachment (for example, using trypsin), neutralization, centrifugation and reseeding at appropriate densities were outlined in a clear, stepwise manner. For long-term preservation, he introduced participants to the basics of cryopreservation, including the use of cryoprotective agents such as DMSO, controlled-rate freezing and storage in liquid nitrogen.

Ethical and historical aspects were woven throughout the lecture. Dr Banerjee referred to the story of Henrietta Lacks and the HeLa cell line to illustrate both the enormous scientific value of immortalized cells and the serious ethical failings of earlier eras, particularly around consent

and patient rights. He urged that contemporary research must be grounded in respect, transparency and adherence to institutional and national guidelines.

In closing, he looked ahead to advanced developments including three-dimensional (3D) cultures and organoids that more closely recapitulate tissue architecture than traditional monolayer cultures. These systems, he noted, hold great promise for more human-relevant disease models and personalized drug screening, yet they still depend on rigorous adherence to basic principles of cell culture technique and ethics.

Animal Models in Biomedical Research: Balancing Scientific Need and Ethics

The second scientific session was delivered by *Dr Aniruddha Roy*, Associate Professor in the Department of Pharmacy at the Birla Institute of Technology and Science (BITS) Pilani, Rajasthan, India. Introduced by Ms Biswas, Dr Roy spoke on '*Animal Models in Biomedical Research*', addressing one of the most indispensable yet ethically complex components of the research enterprise.

Dr Roy began by underscoring why animal models remain central to biomedical research. Because of their biological similarity to humans, animals allow investigators to study disease mechanisms in the context of a whole organism, test new interventions, and assess pharmacokinetics, pharmacodynamics and toxicity before moving to human trials. Mice, in particular, are widely used owing to their small size, short generation time, well-

characterized genetics and availability of numerous disease models.

He pointed out, however, that this reliance on animals creates an ethical paradox: researchers justify animal use because of the similarities with humans that make results translatable, yet often seek to morally distance themselves from animals by emphasizing differences. This tension, he argued, demands a robust ethical framework for all animal experimentation.

At the heart of his talk were the principles of the *3Rs*, namely, *Replacement, Reduction and Refinement*, which form the cornerstone of responsible animal research. Replacement involves using alternatives to animal experimentation whenever scientifically feasible. Reduction focuses on using the minimum number of animals necessary to achieve reliable results. Refinement seeks to minimize pain, distress and suffering by improving experimental protocols.

Dr Roy then turned to the scientific considerations involved in choosing appropriate animal models. He stressed that model selection must be driven by the specific research question. In oncology, for instance, researchers may use syngeneic models, in which tumor cells are implanted into immunocompetent mice, to study tumor-immune system interactions in a cost-effective way. Alternatively, xenograft models, where human tumor cells are implanted into immunodeficient mice, offer better homology with human disease targets but sacrifice an intact immune system. For cutting-edge immunotherapies, more complex 'humanized' mouse models with components of the human immune

system are often necessary to generate clinically relevant data.

He illustrated how improper selection or poor characterization of animal models can contribute to failures in translating promising preclinical findings into successful clinical trials, particularly in fields such as cancer research. Techniques such as non-invasive imaging were highlighted as powerful tools for monitoring disease progression and treatment response over time in the same animal, thereby reducing the total number of animals needed and aligning with both refinement and reduction.

In his concluding remarks, Dr Roy looked to the future of biomedical research, noting the growing momentum behind sophisticated alternatives that may eventually lessen dependence on animal models. 3D 'tumoroids' and other advanced culture systems derived from patient tissue can recreate aspects of tumor architecture and microenvironment more faithfully than traditional 2D cultures. These platforms allow high-throughput drug screening and hold promise for personalized therapy selection using an individual's own cells. While acknowledging that animal models remain essential in many areas, he argued that their use must always be governed by strict adherence to the 3Rs, continuous validation of model relevance, and a proactive drive to develop and adopt human-relevant alternatives.

ECG and its Applications in Clinical Research

The final scientific presentation was delivered by *Dr Vinay Chitturi*, Associate Professor in the Department of Physiology

at the All India Institute of Medical Sciences (AIIMS), Rajkot, Gujarat, India. Introduced by the host, Dr Chitturi spoke on '*ECG and its Applications in Clinical Research*', providing a clinically grounded overview of one of the most widely used tools in cardiovascular medicine.

He began by defining electrocardiography (ECG) as a simple, non-invasive technique that records the heart's electrical activity in real time. Revisiting the classic waveform, he explained the physiological significance of the P wave (atrial depolarization), QRS complex (rapid ventricular depolarization) and T wave (ventricular repolarization), along with key intervals and segments. Proper interpretation of these components, he noted, allows clinicians and researchers to assess the integrity and function of the cardiac conduction system.

Dr Chitturi highlighted the importance of the standard 12-lead ECG, obtained using 10 electrodes that provide 12 distinct electrical perspectives on the heart. This multi-lead configuration yields comprehensive spatial information, enabling detection of regional abnormalities that may be missed with fewer leads. For participants interested in clinical research, he stressed that accurate electrode placement, standardized recording conditions and meticulous documentation are essential to generate high-quality, reproducible data.

He then discussed the broad clinical and research applications of ECG. Clinically, it is indispensable as a first-line diagnostic tool in acute cardiac emergencies, such as suspected myocardial infarction, where rapid identification of ST-segment elevation

can guide life-saving reperfusion therapy. ECG is also crucial in diagnosing and classifying arrhythmias, starting from benign premature beats to potentially lethal ventricular tachyarrhythmias, which informs treatment decisions and risk stratification.

From a systemic perspective, he noted that electrolyte disturbances, drug toxicities and structural cardiomyopathies all leave characteristic signatures on the ECG. In critical care and emergency settings, continuous ECG monitoring effectively serves as a vital sign, providing dynamic insight into a patient's evolving condition.

In the research context, Dr Chitturi highlighted the use of ECG endpoints in clinical trials of cardiovascular drugs, studies of autonomic function, and safety monitoring for medications that may affect cardiac repolarization, such as by prolonging the QT interval. He underscored that whenever ECG is used as a research tool, attention to standardized protocols, rigorous quality control and appropriate statistical analysis is crucial to ensure reliable and interpretable findings.

Discussion, Engagement, and Overall Impact

The formal presentations were followed by a lively Question-and-Answer session. Participants from various institutions posed thoughtful, practice-oriented questions that reflected the full breadth of the program. Queries directed to Dr Banerjee focused on troubleshooting contamination in cell cultures, selecting appropriate culture media and serum, and establishing basic cell culture facilities in resource-limited settings. Questions for Dr Roy

centered on the application of the 3Rs in specific experimental contexts, choosing between different types of animal models, and interpreting regulatory requirements for animal ethics approval. Participants also engaged Dr Chitturi on interpreting borderline ECG findings, standardizing ECG protocols in research, and incorporating ECG parameters as outcome measures in clinical and physiological studies.

The speakers responded with clarity, often drawing on examples from their own laboratories and clinical practice. This interactive segment transformed the webinar from a didactic event into a genuine learning exchange, helping attendees connect methodological concepts with the realities of day-to-day research and patient care.

In her closing remarks, the host, Ms Pronisha Biswas, expressed gratitude to the distinguished speakers, SAAP leadership and all participants for their active engagement. She reflected on how the three sessions, covering cell culture, animal models and ECG, collectively offered a coherent framework that spanned the full spectrum from bench-to-bedside. The webinar not only enhanced technical knowledge, but also foregrounded ethical reflection and methodological rigor as non-negotiable elements of modern research.

Overall, the SACE-ER and SAAP Research and Publication Subcommittee webinar on '*Research Methodology*' was a timely and well-conceived initiative. By bringing together experts in cell culture, animal experimentation and clinical electrocardiography, it showcased how diverse methodological tools can

complement one another to advance human health. For postgraduate students and young researchers in particular, the program provided both conceptual grounding and practical guidance that will support them in designing stronger studies, generating reliable data and upholding high ethical standards.

By continuing to organize such programs, SACE-ER and the SAAP Research and Publication Subcommittee are playing a pivotal role in cultivating a vibrant research culture in South Asia – one that is scientifically rigorous, ethically responsible and firmly oriented towards improving patient care and public health in the region.



**South Asian Centre of Excellence in Physiology
Education and Research (SACE-ER)**

WEBINAR ON “RESEARCH METHODOLOGY”
SAAP Research and Publication Subcommittee
Organizing Country - India



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