Programme Outcomes, Programme Specific Outcomes
For PhD Programmes

Programme Name: Ph.D. in Zoology

Department of Zoology
University of North Bengal
West Bengal, INDIA

Cell and Molecular Biology Laboratory (Supervisor: Prof. Soumen Bhattachrjee)

Programme Outcomes

- In-depth analysis of modern aspects of PCR technology.
- Inculcate critical thinking to carry out scientific based on various platforms of Quantitative PCR.
- Latest usage of computer programmes dedicated to nucleotide sequence analysis with special emphasis on Phylogeny of organisms and pathogens.

Programme Specific Outcomes

- The research scholars develop independent outlook to identify a problem and design experiments.

Genetics and Molecular Biology Laboratory (Supervisor: Prof. Min Bahadur)

Programme Outcomes

- Studies on heterochromatin and mtDNA polymorphism in *Mus tericolor*
- Biochemical and molecular studies on pesticide exposed human population as well as Rat model
- Genetic characterization of HytaNPV (nucleopyhedrovirus pathogenic to Hyposidra talaca) genome
- Studies on immunomodulation in *Hyposidra talaca* in response to pesticides and nucleopyhedrovirus
- Cellular and molecular assessment of genotoxicity in fish model
- Enzyme based detection of pesticide tolerance in tea pest.

Programme Specific Outcomes

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Insect Biochemistry and Molecular Biology Laboratory (Supervisor: Dr. Dhiraj Saha)

Programme Specific Outcomes

- Management of agricultural pests with study on resistance development in the pest population against various pesticides used for the control of pests.
- Information on abundance of mosquito vectors related to major diseases like Dengue, malaria, filariasis and Chikungunya on a particular region and measures on avoiding their multiplication and dispersal.
- Report on the insecticide susceptibility/resistance status of major agricultural pests and mosquito vectors that forms the baseline data for developing control strategies for the management of pest and vector populations and disease transmission.
- Knowledge on the association of various mechanisms of resistance in the development of insecticide resistance in agricultural pest and mosquito vectors.

- Phytochemical analysis of medicinal plants and its implementation on mosquito vector control.
- Efficient vector control strategies with the use of self-sustainable and eco-friendly methods that are non-hazardous to the environment.

Immunology Laboratory (Supervisor: Dr. Tilak Saha):

Programme Outcomes

- Inculcate critical thinking to carry out scientific investigation objectively without being biased with preconceived notions.
- Develop specific knowledge relevant to their own research interests, including theories and methods of intervention.
- Equip the student with skills to conceive research ideas, to analyze problems, evaluate and validate results, and draw reasonable conclusions thereof.
- The team is engaged in finding out the intricate relationship of gut microbes in relation to disease in animal model.
- Role of certain short chain fatty acids and bacterial metabolites are being investigated by his team of researchers.

Programme Specific Outcomes

- Demonstrated ability to make original and significant contributions to the scientific knowledge base in their area of research.
- Demonstrated ability to engage in a productive research career, including publications, grant writing and conference presentations.
- Demonstrated ability to teach and provide valuable educational experience to students in academic settings.

Fish biology and Endocrinology Laboratory (Supervisor: Dr. Sourav Mukherjee):

Programme Outcomes

- The recently established lab is attempting to investigate the role of melatonin in the field of fish physiology and reproductive biology.
- At present, the supervisor and his scholars are engaged to characterize the function of the tiny hormone melatonin from the fish gut.
- The hypothesis that melatonin produced by the gut, in the response of external factor(s), has any role in ovarian development is yet to be tested.
- If we found any significant role of the gut melatonin in the process of improvement of the gonadal growth/maturation or enhancement of flesh quality or in overall growth, it would be a breakthrough not only in the field of melatonin research but also in aquaculture indeed.
- Efforts are also being made to investigate the role of gut melatonin in the regulation of oxidative stress management in gut and gonads to search for any role of gut melatonin in the regulation of digestive physiology and reproduction, respectively.

Programme Specific Outcomes

- Research scholars are trained during their Ph.D. on how to think and how to carry out research to address a particular question, which has not been raised earlier. Emphasis is being provided on the vital question, which is being raised during the specific assignment for a Ph.D. thesis. This ultimately leads to amplify the reasoning power, analyzing skills, and design of experiments.
- Research scholars also get experience in the field of aquaculture and fish endocrinology starting from fish maintenance, successful execution of different experiments to many relevant basic steps required to run different sophisticated techniques to analyze the molecule of his/her target of interest.

Fish Biology and Vector Biology Laboratory (Dr. Ritwik Mandal)

Programme Outcomes

- Investigation in the field of fish biology, aquaculture, and fisheries.
- To search the correlation with the fish population density and different limnological parameters of the major river located in the Northern part of West Bengal.
- Study on the advanced techniques used in aquaculture and fisheries to increase the rate of production of the cultured as well as capture species according to the increasing demand of the market.

Programme Specific Outcomes

Mitochondrial Biology and Experimental Therapeutic Laboratory (Supervisor: Dr. Arpan Kumar Maiti):

Programme Outcomes

- To identify the role of mitochondria in the occurrence of different medical conditions as mitochondria plays a central role in cell life and life processes.
- To ascertain whether mitochondria can be used as a target for treating specific medical conditions where mitochondria is known to play a role in the occurrence of the same.

Programme Specific Outcomes

- The research scholars will focus on identifying the impact of mitochondria-targeted antioxidants and mitochondria-derived peptides as these can act as therapeutics for treating different medical conditions mediated by mitochondrial dysfunction.

Ph.D. Course Work Outcomes

SEMESTER I		
Course 1	Review of Published Research (Research methodology)	**Knowledge gained** • Intensive knowledge in particular field and tools and techniques. • For Example, "Assessment and effect of genotoxic substances on animal and human health". • Genetic and molecular basis of genotoxicity. **Skill gained** • Equipped to compile scientific resources published in journals motivated for Researches or Higher studies. **Competence Developed** • Competent to design and develop research ideas in relevant field. • Equipped to pursue researches/ Higher studies in reputed academic institution/ industries.
Course 2	Research Ethics	**Knowledge gained** • Plagiarism, sampling and collection. • Ethics for animal handling. • IPR, Breeders right, Ethics and regulation of germ plasm exchange, GM crop, Transgenic animals. **Skill gained** • Motivated for maintaining high ethics in science. • Patenting, environmental concerns and safety related to transgenic animals. **Competence Developed** • Competent to sampling and data collection from field. • Ethical issues of animal breeding and handling.
Course 4	Advance course in Zoology	**Knowledge gained** • Principles and applications of different instruments and procedures. • Chromatography. • Electrophoresis. • Microscopy. • Immunological techniques. • PCR based molecular techniques. • Taxonomy, Biodiversity. **Skill gained** • Equipped to use and handle various tools and techniques taught. **Competence Developed** • Competent to utilize various tools and techniques during research according to need.