Medical Biotechnology Research in the Department of Biotechnology, IITH

Dr. Basant Kumar Patel's laboratory focusses on understanding the mechanism of protein mis-folding. Protein mis-folding is an aberrant process that occurs due to several factors such as a genetic predisposition. Several diseases have protein mis-folding as one of the causative factors. His laboratory works on certain proteins implicated in the pathogenesis of renal amyloidosis disease (publication: Vishwanath et al., Biochimie, 2016) and amyotrophic lateral sclerosis disease (publication: Archana et al., Frontiers in Molecular Neuroscience, 2019). Dr Patel's lab is now engaged in the research in better understanding of the molecular mechanisms of these diseases.

Dr Ashish Misra's lab is involved in the development of intrinsic and acquired resistance to well-known anti-cancer drugs represent a major impediment to effective cancer therapy. There is an unmet and urgent clinical need for the development of new therapies targeting the drug-resistant tumours and primary goal of his lab is to identify genes and mechanisms underlying therapeutic resistance to known anti-cancer drugs. Therapy against various drug-resistant tumours will be more effective if compensating pathways that lead to drug resistance are defined, predicted by biomarkers, and targeted. In the long-term, his research aims at providing new, innovative and clinically actionable solutions for the treatment of drug-resistance cancers.

Dr Anamika Bhargava's lab is interested in identifying novel targets in triple-negative breast cancer. Currently, the lab is investigating the role of voltage-gated calcium channels in triple-negative breast cancer and whether they can be targets in triple-negative breast cancer. Voltage-gated calcium channels are highly druggable and have been targets in other diseases including cardiovascular disorders and disorders of the nervous system. In many cancers including triple-negative breast cancer, voltage-gated calcium channels are overexpressed but whether we can modulate them to suppress cancer remains debated. Another interesting area that Dr Bhargava's lab targets are the mechanisms of toxicities caused by chemicals of widespread use such as preservatives, pollutants and pesticides. Direct or indirect exposure to the contaminated environment may alter the biochemical and/or physiological processes of an organism at the tissue or cellular level and therefore it's important that the effect of these chemicals on living organisms is investigated. Recently Dr Bhargava's lab probed the mechanism of action of Glyphosate (the most common, broad-spectrum herbicide) and for the first time, we showed that it can affect calcium and nitric oxide signaling in the heart (Publication: Gaur et al, Biochemical and Biophysical Research Communications, 2019). Her lab continues to investigate the detailed mechanisms of toxicities and other disease mechanisms using a combination of several techniques such as molecular biology, biochemistry, fluorescence assays and electrophysiology in in-vitro and in vivo models.

Dr Rajakumara Eerappa's lab is involved in research related to structural Biology, X-ray Crystallography, Epigenetic and DNA repair, Protein/enzyme engineering for application in the organic or pharmaceutical industry and Structure-based drug design. Her lab also investigates the detailed mechanisms of Bacterial glycobiology.

Continued…

Dr Thenmalarchelvi Rathinavelan's lab is involved in research related to understanding the physical principles behind the biological phenomena by employing computational, biochemical and structural techniques.

Dr N. K. Raghavendra's lab Innate Immunity, cancer, HIV. The lab studies DNA-protein and protein-protein interactions that occur during the innate immune response to cancer and viral infection.

My laboratory (Dr Anindya Roy) studies the molecular biology of DNA. Genetic information is stored in a molecule known as DNA. However, many harmful chemicals alter the nature of the DNA. Interestingly, such chemicals are also commonly used as anticancer drugs. There are proteins inside every cell that protect DNA from such damage by a repair process. Thus, DNA repair has enormous implication in our wellbeing. It is very difficult to know the presence of most of the DNA damages in the DNA. In a recent project funded by Department of Biotechnology, Government of India, we developed and imaging technology using fluorescent probes to know precisely where the DNA is damaged (publication: Monisha et al., Nucleic Acid Research, 2019). Currently we are developing this method further to understand how fast these damages are removed from the DNA.

Prof. Anindya Roy
HoD - Biotechnology