

IISER Bhopal Swarnajayanti Fellow to work on bio-conjugation of proteins facilitating drug discovery

Dr. Vishal Rai from Indian Institute of Science Education and Research, Bhopal, a recipient of the prestigious Swarnajayanti Fellowship funded by the Department of Science & Technology, plans to work on bio-conjugation, a disruptive strategy for bioengineering of proteins that can transform drug discovery.

The research would involve procedures to link two molecules, at least one of which is a bio-molecule to form a stable covalent link between them. Dr. Rai proposes to develop a chemical platform that can render concentration-independent chemoselective, and site-selective methods for single-site modification of proteins.

Proteins impact diverse aspects of science at the interface of biology, chemistry, biomaterials, and therapeutics. Dr. Vishal Rai's group has developed chemical technologies for the precision engineering of proteins. Also, they are involved in the synthesis of homogeneous antibody-drug conjugates (ADCs), protein immobilization, and analytical tools for peptides and proteins. His research team wants to contribute towards the society by enabling directed therapeutics and making precision therapeutics possible in the future.

A toolbox for precise engineering of proteins could open the gateway for immense possibilities in this perspective. However, such technological demands remained unmet. Much like the dark side of the moon, it was far beyond the reach and understanding of the scientific community for a very long time. Many believed that such methods are not possible. The work from Dr. Rai's group has changed this school of thought. Their disruptive innovation provides a powerful technological platform for precise single-site modification of proteins.



For the first time, it empowers scientists to dictate the terms and conditions of reactivity and selectivity to the native proteins. It enables the researchers to install a reporter in a protein for a better understanding of the biological systems. Besides, the ability to target drugs specifically to

a diseased cell without disturbing the normal cells is an ideal case for medicines. The technologies from his group create such an opportunity through protein-based drugs.

Their work demonstrates how basic Science can lead to advanced technology that can contribute to the knowledge-driven economy of India. It has led to the foundation of a startup company named Plabeltech Private Limited. Strengthened with multiple patents, this technology-driven company is coming up with biotech products. Also, it will provide services related to custom protein engineering, protein-based therapeutics, biophysical tools, and biochemical tools.

Dr. Rai plans to strengthen the development of chemical technologies for engineering proteins with the assistance of the Swarnajayanti Fellowship. In his view, “It will enable the team to create a comprehensive technological platform that will provide access to homogeneous ADCs with unprecedented control. Also, it will accelerate the research of directed cancer chemotherapeutics. Besides, our team is excited as we can now dream of realizing precision therapeutics with small molecules for the first time. Such side-effect-free therapeutics would require a drug to target a specific protein at a single site with absolute precision. The state-of-the-art drugs target at least 30-100 known and several unknown proteins contributing to side effects. The success of this project will take us close to address this problem, and our future technologies can solve this massive challenge.”