4. SYMPOSIUM ON SCIENCE BEYOND ACADEMIA

DATE AND VENUE: 30th March 2023 at DJB Basement Auditorium

GUEST SPEAKERS: Dr. Aparna Kasinath

Dr. Kesavardana Sannula

Ms. Ashwathi V

FACULTY- Department of Microbiology: Dr. Sarayu Mohana (HOD)

Ms. Anu Mariam Kurian (Associate Professor)

Ms. Shaheda Taj (Assistant Professor)

Attendees: First, second and third-year students of Microbiology

On the 30th of March 2023, the Department of Microbiology organised a Symposium on Science Beyond Academia: Research and Industry. The symposium had 3 guest speakers focusing on the topics of their expertise. The symposium began with an invocation dance and a Bible Reading. The speakers of the day were Dr. Aparna Kasinath, Dr. Kesavardana Sannula and Ms. Ashwathi V.

Dr. Aparna Kasinath, TFM and Head at Regulated Bioanalytical Laboratories (Clinical Development Syngene) was the first speaker. She spoke about the methods of serological assay that her and her team developed in the laboratory against the initial strain of SARS- CoV2. When the pandemic began, the only method in use was real time- Polymerase Chain Reaction and her team tried to develop alternate methods of detecting presence of antibodies in affected individuals. Three different assays were developed. Namely, S1 protein assay, Pseudovirion assay and Surrogate assay. In the first step of viral replication, the spike S1 protein of the virus recognises and binds to Angiotensin Converting Enzyme-2 (ACE-2) receptor found in type I and II pneumocytes, epithelial cells and bronchial epithelial cells. In S1 protein assay, monoclonal antibodies are coated on an ELISA plate, which binds to the S1 protein of the virus present in the plasma. Therefore, this acts as an infection detection method. Neutralising antibodies are antibodies naturally formed by the B cells of our body in response to an infection or vaccination. They are different from binding antibodies because they act by affecting how molecules on the pathogen's surface interact with cells in our body. This may be done by blocking the ability of the viruses to attach to host cells or by preventing change in conformation of virus thereby affecting replication. Pseudovirions are chimeric viruses that contains the viral core of a Lentivirus in this case and the surface glycoprotein of SARS-CoV-2. The pseudovirion also contains luciferase activity. The pseudovirion on entry acts as the native virus by binding to the ACE-2 over expressed cells, but the inhibition of viral activity by Neutralising antibodies triggers Luciferase activity. Therefore, samples that contain neutralising antibodies in the serum tend to exhibit more Luciferase activity, which makes it a good method of detection. The last method explained was the Surrogate Assay method. As mentioned earlier, it is to the ACE-2 that the receptor binding domain of the virus attaches to. In this method recombinant ACE-2 is coated in ELISA plates and the serum sample is tested for presence of viral particles. If the virus in present in the serum sample, it will readily bind to the hACE-2, whereas in the presence of neutralising antibodies in the sample, this binding does not occur. To mimic this viral property, a receptor binding domain and HRP protein was chosen. It was demonstrated that in the presence of neutralising antibodies, the binding of RBD to hACE-2 is blocked, making this yet another effective method of detection of neutralising antibodies. In conclusion Dr. Aparna's talk was extremely informative and introduced us to new terms and helped us understand SARS-CoV-2 pathogenesis in a better manner.

The second speaker Dr. Kesavardana Sannula spoke on a very prominent and prevalent topic of zoonotic diseases and how they form a vicious cycle of animal to human transmission and vice versa. Dr. Kesavardhana is an Infosys Young Investigator and works in the Department of Biochemistry at the Indian Institute of Science, Bangalore. The topic he chose was particularly interesting keeping in mind the Covid-19 pandemic and controversies regarding its source. The talk shed light on how most diseases that have caused pandemics and those with pandemic potential are caused by RNA viruses. Despite their very small genome as compared to DNA, they are capable of widespread infection and variation. He also specifically spoke about SARS-CoV-2 which has evolved from bat viruses, with pangolins as intermediate hosts. Scientists arrived at this conclusion by sequencing the virus from bats, pangolins as well as humans. Most pandemic pathogens affect the upper respiratory tract. With antigenic variation, the viruses can cause symptoms of varying severity. The influenza virus is one that has been around for centuries, constantly evolving and forming subtypes in A, B and C forms. Bird flu caused by an influenza virus does not seem to cause infection in humans as it does not affect the upper respiratory tract, but in the possibility that it reaches the lower respiratory tract, the world could reach a health crisis. This is also why, when there are local outbreaks of bird flu, culling is practiced very widely to prevent its spread to mankind as there are no management and treatment strategies in place. The talk raised a very important question as to why animal to human disease transmission is important. It is important because viruses will continue to evolve with time and the more we study their properties in different species, the easier it will be to predict the nature of a future variant. It also helps the healthcare system as a whole to be prepared in terms of vaccine preparation, treatment protocols, novel drug designs and infection detection methods.

Last but not the least we had Ms. Ashwathi V, a Research Associate at Tata Institute of Genetics and Society Centre at InStem NCBS. She enlightened us on how proteins are manufactured in labs. She briefly introduced us to the genetic code, gene sequencing and protein expression and how genetic engineering is used in multiple ways in today's scientific world including manufacturing proteins in-vitro. Different methods are employed for purification of proteins like affinity chromatography, ion exchange chromatography and size exclusion chromatography. The workflow employed for protein manufacturing was explained, which included protein expression, purification and quality control. Isolation of a plasmid of interest can drive the expression of gene. For example, IPTG and p-ET based expression sequence. She also explained the characterisation of diabody against Pfs25, which is a malaria vaccine candidate. Methods like cross linking assay and the protein folding types of alpha helix and beta pleat were also explained as being integral to protein manufacturing. This talk was particularly interesting and encouraging in a way because ma'am herself is a Mount Carmel College Microbiology alumnus which inspired us to have faith and to believe in our ability to scale heights.

Along with the three major talks, there was also a prize distribution for select students of the final year, who were awarded for their excellent practical skills. The award for Best Outgoing student went to Princia Maria D'Souza.

The Symposium was a great introduction into the world of research and the possible applications of concepts we learn in class. It also revealed how Microbiology is an extremely prominent and advanced avenue in Biological Sciences and certainly motivated us to look for opportunities to apply and acquire new knowledge.


SYMPOSIUM ON SCIENCE BEYOND ACADEMIA:
RESEARCH AND INDUSTRY