Expert Lecture Organized at HBTU Kanpur on "The S-Curve: Nurturing a Therapeutics Engine"

The **Department of Biochemical Engineering, Harcourt Butler Technical University (HBTU), Kanpur** organized an expert lecture on the topic *"The S-Curve: Nurturing a Therapeutics Engine."* The lecture was delivered by **Dr. Vinayak Singh**, Head of the Singh Research Group (SinRG), **University of Cape Town, South Africa**, an internationally recognized expert in tuberculosis (TB) drug discovery and antimicrobial resistance.

At the outset, the speaker was warmly welcomed by **Dr. Ajay Kumar Singh, Head, Department of Biochemical Engineering**, along with **Prof. P. K. S. Yadav, Dean, School of Technology**. The session witnessed active participation from faculty members, research scholars, and students, creating a highly engaging academic environment.

In his lecture, Dr. Singh elaborated on the **S-curve framework in drug discovery**, emphasizing how scientific progress moves through phases of slow initial discovery, rapid growth driven by innovation, and eventual saturation—necessitating the transition to new paradigms. He highlighted that successful therapeutic development requires not only strong basic science but also **integration of chemistry, biology, pharmacology, and translational research**.

A key focus of the lecture was on **tuberculosis (TB)**, one of the world's most persistent infectious diseases. Dr. Singh discussed different categories of TB, including **drug-sensitive TB and multidrug-resistant TB (MDR-TB)**, and emphasized the urgent need for **novel drug targets and combination therapies**. He also discussed global efforts aimed at **shortening TB treatment duration**, with emerging strategies targeting **4-week treatment regimens**, which could revolutionize TB management.

Dr. Singh provided deeper insights into the **pathophysiology of TB**, particularly the formation of **granulomas**, which act as protective niches where *Mycobacterium tuberculosis* survives within the host. He explained that these granulomas create **heterogeneous microenvironments**, including regions of **hypoxia, nutrient limitation, and immune pressure**, which significantly affect drug penetration and bacterial response.

He further elaborated on the **role of hypoxia in modulating bacterial metabolism**, where *M. tuberculosis* shifts to a dormant or slow-growing state. This metabolic adaptation poses a major challenge for drug development, as many conventional antibiotics target actively dividing bacteria. Dr. Singh highlighted the importance of

designing **drugs that are effective under hypoxic and non-replicating conditions**, thereby improving treatment efficacy.

Another important aspect discussed was the **interaction between TB and metabolic disorders such as diabetes**, which increases disease severity and complicates treatment outcomes. He stressed the need for **personalized and host-directed therapeutic approaches** in such cases.

Dr. Singh shared several compelling research stories from his laboratory, demonstrating how **mechanistic understanding of bacterial metabolism leads to identification of novel drug targets and therapeutic candidates**. He also highlighted the development of a **tuberculosis mouse efficacy model in Africa**, which serves as a critical platform for evaluating drug candidates in physiologically relevant conditions. His research efforts have been recognized globally, including support from the **Bill & Melinda Gates Foundation in 2022**.

He further emphasized the importance of **interdisciplinary collaboration, global partnerships, and translational research frameworks** in accelerating drug discovery pipelines. He encouraged students and young researchers to engage in **problem-driven research**, develop strong fundamentals, and actively explore opportunities in **global health and pharmaceutical sciences**.

The lecture was highly interactive, with students asking insightful questions related to **drug resistance mechanisms, research methodologies, international collaborations, and career opportunities in drug discovery and infectious disease research**. The discussion reflected strong student interest in emerging areas of biomedical research.

The program was attended by **Dr. Ajay Kumar Singh, Head, Department of Biochemical Engineering**, **Prof. P. K. S. Yadav, Dean, School of Technology**, **Prof. Lalit Kumar Singh**, **Dr. Sachin Kumar**, **Mr. Brajesh Singh**, **Dr. Rajkamal**, **Dr. Roma**, and **Dr. Shravan**, along with other faculty members and students.

During the felicitation ceremony, **Dr. Sachin Kumar** presented a **bouquet** to the speaker. **Prof. Lalit Kumar Singh** honored him with a **shawl**, while **Prof. P. K. S. Yadav and Dr. Ajay Kumar Singh** presented a **memento and certificate** as a token of appreciation.

The event concluded with a **vote of thanks delivered by Dr. Ajay Kumar Singh**, who expressed sincere gratitude to the speaker for his valuable insights and to all participants for their enthusiastic involvement.

Some glimpse of the events


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Dr. Vinayak Singh