Infectious Diseases Labs

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Wednesday 29th Oct 2025
1:00 PM to 2:00 PM (SGT)

Venue: Codon A & B, Matrix Level 5

Targeting the cell envelope: A versatile antibacterial strategy

The problem of antimicrobial resistance has escalated rapidly over the years with multidrug-resistant pathogens emerging to existing antibiotic therapy. Conventional antibiotics often target specific metabolic processes in bacteria, thereby often limiting their efficacy against metabolically dormant cells and show high propensity of resistance development. Antimicrobial peptides produced in the body in response to infection have a non-specific mechanism of action due to their amphipathic structure which results in interaction with the cell envelope in bacteria and other pathogens. However, the success of AMPs is limited by their high in-vivo toxicity, in-vivo degradation and high manufacturing costs. Taking inspiration from AMPs and to solve problems associated with them, my lab has developed amphipathic small molecules containing structural features of peptidomimetics and peptides like amino acids, amide bonds and a hydrophobic group using simple synthetic strategy and optimized their design to attain in-vivo stability and low toxicity. These small molecules have been employed as active membrane-active compounds or weak membrane-perturbing antibiotic adjuvants to revitalize obsolete antibiotics. The non-specific mechanism of action results in broad-spectrum activity against drug-resistant bacteria and fungi while also showing potential against adaptive resistance elements like biofilms, persisters and intracellular infection. Further, the antibiotic adjuvants exhibit properties like autophagy induction and antigen-responsive immunomodulation which are instrumental in tackling more complicated forms of infection and inflammation. The efficacy of optimized systems has been validated in-vivo and detailed mechanistic insights have been gathered to obtain a holistic understanding. In my talk, I'll be covering all these facets of broad-spectrum amphipathic small molecules, and highlight their immense potential in the fight against antimicrobial resistance. The novel approaches to overcome acquired, intrinsic and adoptive bacterial resistance towards glycopeptides, via semisynthetic modifications of vancomycin will also be discussed.

Dr. Jayanta Haldar is a Professor at the Antimicrobial Research Laboratory in the New Chemistry Unit (NCU) and School of Advanced Materials (SAMat), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India. He joined New Chemistry Unit at JNCASR as an Assistant Professor in 2009, and subsequently became an Associate Professor in 2015. He completed his PhD from the Indian Institute of Science, Bangalore in 2005. He then pursued his Postdoctoral Research at the Department of Chemistry, Massachusetts Institute of Technology, USA till 2009. He is the Editor-in-Chief of ACS Infectious Diseases and has served as a member of editorial boards of various international journals in the field of infectious diseases and medicinal chemistry, such as RSC Medicinal Chemistry (till July 2023), ACS Infectious Diseases (till July 2023), Biomacromolecules, Microbial Pathogenesis, Biochemistry (ACS), Bioconjugate Chemistry (ACS). He has received several awards and honours such as the Ramanujan Fellowship (Govt. of India), Sheik Saqr Career Award Fellowship, 8th National Award for Technology Innovation from Ministry of Chemicals & Fertilizers (Govt. of India), CDRI Excellence in Drug Research Award in Chemistry, Chemical Research Society of India (CRSI) Bronze Medal, Material Research Society of India (MRSI) Medal etc. He is an elected Fellow of Indian Academy of Sciences (IASc) Bangalore, Fellow of Royal Society of Chemistry (FRSC) UK, and Fellow of Indian National Science Academy (INSA) Delhi.

Hosted by: Dr Li Ning

Seminar is open to all. No registration required.

Questions? Contact us at **seminars@idlabs.a-star.edu.sg**

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