



Infectious
Diseases Labs

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Tuesday 22nd July 2025

11:00 AM to 12:00 PM (SGT)

Venue: Codon A & B, Matrix Level 5

Virulence potential of hypervirulent *Klebsiella pneumoniae* and their evolution towards carbapenem-resistance

Hypervirulent *Klebsiella pneumoniae* is the leading cause of mono-microbial induced liver abscess in Asia and beyond. Majority of the liver abscess isolates belong to clonal group 23 (CG23) sublineage 1, which is characterized by the presence of a large virulence plasmid as well as two chromosomally integrated mobile genetic elements, genomic island E492 (GIE492) and integrative conjugative element ICEKp10. The CG23-I lineage has rapidly disseminated across the world and can cause disease in healthy individuals. We have examined the contribution of capsule, the large virulence plasmid and the associated siderophore genes, GIE492 and ICEKp10 to bacterial pathogenesis in the mammalian host. We discover how these factors are intertwined in contributing to the survival and fitness of the bacteria in different niches. In recent years, we have also documented the ease in which hypervirulent *K. pneumoniae* acquire carbapenem-resistance through broad-host range plasmids, with the potential creation of "superbugs". We document a novel clade of IncP plasmids with a backbone that allows enhanced carbapenem-resistance plasmid transmission in the mammalian gut despite the presence of capsule, normally thought to impede plasmid transfer. The acquisition of these mobile genetic elements in *K. pneumoniae* has reengineered the normally nosocomial bacterium to become a potential deadly pathogen that warrants attention.

Dr Gan graduated from Purdue University with a B.Sc. (Honours) in Molecular Biology and University of Wisconsin-Madison with a Ph.D. in medical microbiology and immunology. Her current research focuses on *Klebsiella* induced liver abscess, a prominent disease in Asia, particularly in regions of China, Taiwan, Hong Kong, Singapore and South Korea. Her work involves identifying bacterial virulence factors of hypervirulent *Klebsiella pneumoniae* responsible for causing liver abscess. Her team examines host and bacterial factors that affect gut colonization and translocation. Her recent works have identified the alarming trend of the convergence of multidrug resistance and hypervirulence in *K. pneumoniae* in Singapore's hospital settings. Her ongoing research investigates how antibiotic resistance genes on highly evolved and adapted plasmids dominant in clinical bacterial isolates are spreading among bacterial populations, and strategies to stop the spread. She has also established multidisciplinary collaborations with chemists, clinicians and computational biologists to examine novel strategies to treat antibiotic resistant *Enterobacteriaceae* bacteria. One of such strategies is to establish a synthetic commensal community of bacteria to be used as probiotics for decolonization from the gut. Another strategy is to partner with AI scientists to employ synergy testing of FDA-approved compounds, including those with no known antibacterial activity on their own, on multidrug resistant bacteria.

Hosted by: Dr Teo Teck Hui

Seminar is open to all. No registration required.

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

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