



Infectious  
Diseases Labs

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## Dr Chris Sham

Infectious Diseases Translational Research  
Programme and Department of Microbiology and  
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**Thursday 27<sup>th</sup> March 2025**

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

**Venue: Codon A & B, Matrix Level 5**

### Profiling Genetic Interaction Landscape in Bacteria

Gene redundancy often complicates systematic approaches to characterizing gene functions because single gene deletions may not produce discernible phenotypes. Thus, despite the advent of next-generation sequencing, over 11 million microbial genes in the NCBI reference sequence database have no known function. In this study, we report Dual Tn-seq, a novel platform for comprehensively assaying the fitness of a large pool of double mutants in parallel. Dual Tn-seq couples random barcode transposon-site sequencing (RB Tn-seq) with the Cre-lox system, enabling deep sampling of ~1.4 billion double mutants in the human pathogen *Streptococcus pneumoniae*. This work captured 68% of the 1.3 million combinations of gene deletions that could theoretically be made in a single genome. The genetic interactions identified spanned a wide range of biochemical processes, revealing new factors in presumably well-studied pathways. Since Dual Tn-seq does not require the construction of an extensive array of single mutants, it can readily adapt to diverse microorganisms.

**Dr. (Chris) Lok-To Sham** is an Assistant Professor in the Department of Microbiology and Immunology at the National University of Singapore (NUS). He uncovered FtsEX, a widely conserved ABC transporter essential for regulating cell wall hydrolysis during bacterial cytokinesis, which is now being explored as a potential antimicrobial target. During his postdoctoral training, he identified MurJ as the elusive peptidoglycan flippase, resolving a long-standing question in bacterial cell wall biosynthesis. Since founding his research group in 2017, Chris has led a multidisciplinary program investigating the production and coordination of capsular polysaccharides (CPS) with other bacterial cell envelope layers. His team has established methods for genetic glycoengineering, contributing to the study of bacterial glycobiology and efforts in vaccine development.

His contributions have been recognized with the National Research Foundation Fellowship (Class of 2019), the 2024 Rising Star Award in Biological, Medicinal, and Pharmaceutical Chemistry from the American Chemical Society (ACS), and the 2024 Graduate Mentor of the Year Award from the Yong Loo Lin School of Medicine, NUS. He also serves as Vice President of the Singapore Society of Microbiology and Biotechnology and as Research Director of the Infectious Diseases Translational Research Programme at the Yong Loo Lin School of Medicine, where he works to promote research collaborations, mentorship, and scientific progress in infectious diseases.

**Hosted by: Prof Stephen Baker**

**Seminar is open to all. No registration required.**

Questions? Contact us at [seminars@idlabs.a-star.edu.sg](mailto:seminars@idlabs.a-star.edu.sg)

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