Singapore-MIT Alliance for Research and Technology

BIOSYSTEMS AND MICROMECHANICS

From Biomolecules to Biofilms

Focused Seminar Series on Biomolecules and Biofilms

11 April - 13 June 2016, Level 5 Seminar Room, Enterprise Wing @ UTown, S'138602

Seminar 7: Chemical Biology Approaches for Biofilm Eradication

Prof. Yang Liang

Singapore Center for Environmental Life Sciences Engineering (SCELSE)

Date: 6 June 2016, Monday

Time: 4pm to 5pm

Venue: Perseverance Room, Enterprise Wing Level 5 @ UTown

Abstract

A bacterial biofilm is a surface attached community of microorganisms embedded in and protected by an extracellular matrix of self-made biomolecules. The US National Institute of Health (NIH) has estimated that 65-80% of all microbial infections involve bacterial biofilms. Biofilm-based bacteria can evade the otherwise detrimental actions of immune responses and develop into chronic infections. Because the present day's armory of conventional antimicrobials cannot efficiently eradicate biofilms, there is an urgent need to understand the fundamental mechanism of antibiotic resistance by biofilms. One major obstacle to study biofilm physiology is the heterogeneity in biofilms, which often confounds our efforts to target specific aspects of biofilm biology. Bis-(3'-5')-cyclic dimeric GMP (c-di-GMP) is a global, intracellular secondary messenger that controls biofilm differentiation. High intracellular levels of c-di-GMP stimulate bacteria to form biofilms by enhancing synthesis of adhesive structures and biofilm matrix components while low intracellular levels facilitate motility and chemotaxis. The heterogeneity in biofilms often hinders the application of systems biology tools (e.g. transcriptomics and proteomics) in studying biofilm physiology. Here, we applied stable isotope labelling by amino acids in cell culture (SILAC) technology to selectively label the proteome from different subpopulations of biofilms. We found that type IV pili and quorum sensing (QS) are essential for the development of colistin-tolerant cells within *P. aeruginosa* biofilms. Applying dispersal agents that can reduce intracellular c-di-GMP content significantly reduces the development of colistin-tolerant cells in *P. aeruginosa* biofilms.

Biography

Prof. Yang Liang received my bachelor's degree in Biological Sciences from Nankai University (2004) and my MSc, PhD degree in Chemistry, Biotechnology and Chemical Engineering from Technical University of Denmark (2009). After which, he worked in the Infection Microbiology Group headed by Prof. Søren Molin' at Technical University of Denmark and Dr. Holger Rohde's group at University of Hamburg as postdoc. In 2012, he joined SCELSE (Singapore Centre for Environmental Life Sciences Engineering, Singapore), headed by Prof. Staffan Kjelleberg, as an assistant professor in microbiology. His research is dedicated to bacterial pathogenesis, biofilm physiology, interspecies interactions, and microbial evolution.