

“The synergistic effect of host immunity with phage and probiotic therapy against bacterial pathogens”

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Time: 2:30pm to 3:30pm

Venue: John Chan Lecture Theatre (LT-11),
Yeung Kin Man Academic Yuen Building

Abstract

The rise of antibiotic resistance in common bacterial pathogens is a major public health concern. As such, there is growing interest in the development of effective alternatives to antibiotics. A number of alternative antimicrobial therapies exist, including the use of phage (viruses that exclusively infect bacteria) and beneficial or probiotic bacteria. However, these therapies have not demonstrated consistent efficacy on par with antibiotics. A possible reason for this inconsistency is heterogeneity in the host immune response against the pathogen. Using a combination of nonlinear population models and animal experiments, we have shown that host immunity works synergistically with phage therapy to cure an acute respiratory infection [1, 2]. As a result of this synergy, the combined action of phage and host immune response can eliminate multidrug-resistant bacteria, even when neither of them can do so when acting alone. We extend our modeling framework to consider interactions between host immunity and probiotic therapy by incorporating competition between the pathogen and probiotic bacteria. Our model predicts that host immunity can also act in synergy with probiotics to eliminate bacterial pathogens by tipping the balance of the competition between pathogenic and probiotic bacteria. Our results highlight the need to characterize the host immune status when evaluating the effectiveness of novel antimicrobial therapies.

[1] D. R. Roach and C. Y. Leung et al., *Cell Host Microbe* 22, 38 (2017).

[2] C. Y. Leung and J. S. Weitz, *J. Theor. Biol.* 429, 241 (2017).

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