



FriSBI

# Phage vs. Bacteria: The art of war among the unseen majority

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The phage pressure is believed to be an important factor to shape microbial community and a driving force of their evolution, and yet we are far from having a full picture of their warfare. In this talk, we discuss various facets of the phage-bacteria interactions. First, we analyze the competitive exclusion of phage-bacteria ecosystem using Lotka-Volterra equations [1]. The analysis is consistent with the observed strong correlation between the phage type richness and the bacteria type richness, and shows the narrowing parameter space of coexistence for larger richness. The coevolutionary arms race typically favor high growth rate but a phage that infects two bacterial strains differently can occasionally eliminate the fastest growing bacteria, resulting in abrupt resetting of the Red-Queens race and constrains the local diversity. We then extend our focus to spatially structured habitat [2,3]. Numerical simulation of phage attack on a microcolony predicts that bacteria growing as a dense colony provides a spatial refuge by exposing only the bacterial cells on the surface of the colony to a phage attack [3]. When the colony size is below a critical size at the time of exposure to phages, bacteria will be eliminated, while when the colony size is above the critical size, the colony can survive and grow despite the persistent phage attack on the surface. We show that experimental result using the virulent version of phage P1 and the host *Escherichia Coli* is consistent with this prediction. We study the parameter dependence of the critical size by numerical simulation, and predict that the phage with lower adsorption rate will actually kill a colony better. Our findings indicate that the spatial structure of the bacterial population plays an important role in phage-bacteria coexistence.

**Friday, May 18, 2018 03:00pm - 04:00pm**

Mondi Seminar Room 3, Central Building

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