

UCLA Center for Biological Physics Seminar

The dynamics of horizontal gene transfer within microbial communities

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USC



Horizontal gene transfer enables the sharing of genes within populations of bacteria, impacting the composition and functional capabilities of such communities of cells. Understanding the dynamics of gene transfer and in which contexts these horizontally transferred genes persist within bacterial populations is a fundamental problem in environmental microbiology and synthetic biology. Our recent work has examined horizontal gene transfer within communities of bacteria using both theoretical models and experimental measurements. Models have examined gene exchange within multispecies populations, revealing how different mechanisms of HGT modulate patterns of gene exchange. This analysis pointed to the potential importance of vesicle-mediated gene exchange, vesiduction, in multispecies gene transfer. To develop a deeper understanding of vesicle-mediated DNA transfer, subsequent work characterized the processes of vesicles production, loading of genetic cargo, and rates of vesicle uptake. These results supported

conjecture that vesicles are a ubiquitous, yet slow, process that enables promiscuous gene exchange within communities. More recent work has shifted focus towards the interplay between gene transfer, selection, and interspecies competition, analyzing a role for reservoir species in the maintenance and spread and conjugative plasmids within communities.

James Boedicker is a Professor of Physics and Biology at the University of Southern California. His research group uses synthetic biology and biophysical tools and models to understand the interactions between bacterial cells and the collective behavior of bacterial populations, with the overall goal of engineering bacteria for applications and controlling natural populations of cells. Prior work has focused on signal exchange within bacterial communities, cell pattern formation, collective cell migration, dynamics of gene exchange, and engineering cells for material synthesis.

**Friday, April 17th at 11am
4-330 PAB**

Hosted by Shenshen Wang