UNIVERSITY OF DELAWARE

CENTER FOR BIOINFORMATICS & COMPUTATIONAL BIOLOGY

BIOINFORMATICS SEMINAR

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CBCB SEMINAR

10/22/2018

3:30 PM

DELAWARE BIOTECHNOLOGY INSTITUTE

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Systems-level investigation of multi-species bacterial interactions

Microorganisms typically exist in multispecies communities, where species present in close proximity interact with each other. Such interactions affect the fitness and survival of the interacting species, but the mechanisms underlying such interactions, and potential adaptive pathways, remain largely uncharacterized. Most previous studies of multispecies systems have focused on the effect of a specific molecule or pathway of interest on exogenous species. Here, I utilized an unbiased genome-scale approach to identify and characterize multifaceted competition in a model two-species system containing Pseudomonas aeruginosa and Escherichia coli. I discovered both forms of ecological competition in the antagonism of E. coli by P. aeruginosa – sequestration of iron led to exploitative competition, while phenazine exposure engendered interference competition. I also identified adaptive evolutionary trajectories of E. coli that increase resistance to P. aeruginosa toxins using laboratory evolution studies, observing parallel molecular evolution and adaptive convergence at the gene-level. My study thus reveals the molecular complexity of a simple two-species interaction, and is an important first-step in the application of systems biology to detailed molecular dissection of interactions within native multispecies systems.

BIOGRAPHY

Anupama Khare is a Stadtman Investigator in the Lab of Molecular Biology, at NCI, NIH. She did her doctoral research at Baylor College of Medicine, Houston where she studied mechanisms of cheating and cheater resistance in the social amoeba Dictyostelium discoideum. She then joined the lab of Dr. Saeed Tavazoie as a postdoc, first at Princeton University and then at Columbia University, where she worked on understanding the molecular mechanisms of multispecies interactions and antibiotic persistence. At the NIH, research in her lab is focused on mechanisms of interactions between co-infecting pathogens, as well as antibiotic resistance and persistence in pathogenic bacteria.

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