Center for Theoretical Biological Physics

SEMINAR

"Parallel Molecular Evolution in Pathogenic Bacteria"

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Abstract: Bacterial populations are excellent models for the experimental study of evolution. However most systems use shaken flasks and ignore the spatial structure that is the hallmark of natural cell populations such as bacterial biofilms and solid tumors. We developed a new experimental model of evolution in spatially structured populations based on swarming motility, a form of collective cell migration in the bacterium *Pseudomonas aeruginosa*. Repeated rounds of swarming led to striking parallel molecular adaptations. Hyper-swarming mutants that evolved in 24 independent experiments all harbored point mutations in a flagellar synthesis regulator causing *P. aeruginosa*, a single-flagellum (monotrichous) bacterium, to become multi-flagellated (lophotrichous) and gain huge advantages in swarming. This advantage came at a trade-off: evolved clones are outcompeted in biofilms, explaining why hyper-swarming is absent in the wild. Our work bridges molecular and evolutionary biology with implications to the treatment of infectious disease: New therapeutic strategies may exploit the trade-off between motility and biofilm formation to fight biofilm-related infections.