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Bacterial haptotaxis: Effect of auto-attraction and bacterial motility on microcolony formation BERNARD BECKERMAN, Northwestern University, KUN ZHAO, Tianjin University, GERARD C. L. WONG, University of California, Los Angeles, ERIK LUIJTEN, Northwestern University — Recent work[1] has demonstrated that surface-adhered Pseudomonas aeruginosa tend to self-organize into microcolonies using a positive-feedback mechanism mediated by the exopolysaccharide Psl, which the bacteria secrete as they traverse the surface. We elucidate this colony-nucleation process and explore how it is influenced by the deposition rate of Psl and by bacterial motility. A detailed analysis of the data presented in our earlier study, in combination with additional simulations, provides further insight into the exploratory strategy of P. aeruginosa. Specifically, the isogenic bacterial population is found to exhibit polyphenic motility. As a result, the bacterial population splits into two distinct subpopulations when depositing Psl, those that become trapped in their self-deposited Psl and those that move sufficiently quickly to escape their Psl beds and explore the surface. We perform computer simulations in which we adjust the relative prevalence of these subpopulations by varying the Psl deposition rate and find that there is a trade-off between surface exploration, microcolony diversity and microcolony fortification.

[1]K. Zhao *et al.*, Nature **497**, 388 (2013)

Bernard Beckerman
Northwestern University

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