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Role of Social Motility in Facilitating Collective Motion of Myxobacteria YILIN WU, NAN CHEN, MATTHEW RISSLER, University of Notre Dame, YI JIANG, Los Alamos National Laboratory, DALE KAISER, Stanford University, MARK ALBER, University of Notre Dame — Social motility is a unique form of behavior exhibited by a wide range of bacteria, including most pathogens that cause plant and animal disease. It is operated by type IV pili that attach to other cells' surfaces and pull; the retracting force pulls the cell forward. Experiments have demonstrated that social motility is important for the collective motion of bacteria colonies, and it facilitates the colonization of pathogens in hosts. We use a cell-based model to study the role of social motility in swarming of bacteria colonies. Mycococcus xathus, a species of myxobacteria, is our model bacteria because it exhibits typical social motility and has been well studied. Our simulation results suggest that social motility has an effect on alignment of neighboring cells, resulting in a highly ordered collective motion. We also show that social motility can significantly improve the swarming efficiency of bacteria. We track GFP labeled Mycococcus xathus cell cultures and derive model parameters from the cell motion data. Our work may shed light on the infection process of many diseases.

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