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Cell-cell interactions impacts on the rate of swarm expansion and the edge shape of a colony swarming *Pseudomonas aeruginosa* ABOUTALEB AMIRI, University of Notre Dame, Physics Deprtment, GIORDANO TIERRA, Charles University in Prague, Mathematical Institute, ZHILIANG XU, University of Notre Dame, Applied computational Mathematics and Statistics , JOSHUA SHROUT, University of Notre Dame, Department of Civil and Environmental Engineering , MARK ALBER, University of Notre Dame, Physics Department, Department of Applied Computational Mathematics and Statistics — Collective motion has been observed by several bacterial species including the pathogenic bacterium *P. aeruginosa*. A flagellum at the pole is known to generate a self-propulsion motion. However, the role of type IV pili (TFP), distributed on the cell membrane, during swarming needs to be investigated in more details. In this work we introduce a model that combines the hydrodynamic and biophysical interactions in order to study the impact of the TFP interactions on swarming behavior of the colony. The model describes the motion and interactions of rod-shaped self propelled bacteria inside a thin liquid film. It also includes the equations describing the production and diffusion of surfactant rhamnolipids that is responsible for extraction of water from substrate, and Marangoni driven expansion of the thin liquid film by altering the surface tension. We show that TFP interactions are responsible for slower expansion rate of colonies of TFP deficient mutants compared to wild type. Experimental observations were used to calibrate the model and verify the model assumptions and predictions.

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