1058-92-51 **chuan xue***, 1735 Neil Ave Rm 378, Columbus, OH 43210. *Mathematical models of pattern formation in baterium Proteus mirabilis colonies.*

Proteus mirabilis cells can grow, move and colonize hard surfaces after they are inoculated. During the expansion of the colony, they form radial and spiral streams moving inward toward the inoculation site and a number of other complex patterns. To understand the underlying mechanism of these complicated patterns, we developed a hybrid cell-based model which incorporates a simplified single cell signal transduction model with both the adaptation and excitation components. By assuming that swimmer cells respond to a chemoattractant that they produce, we are able to predict the formation of radial streams as a result of the modulation of the local attractant concentration by the cells. We further predict the spiral streams by incorporating a swimming bias of the cells near the surface of the medium. The hybrid cell-based model becomes computationally expensive because of the large number of cells due to cell division, therefore a higer level description is needed. We also present a moment-closure method for deriving macroscopic evolution equations from the hybrid cell-based model using perturbation analysis, and compare the solutions of the cell-based model and the derived continuum model.

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