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Transient aggregation and long-time diffusion of bacterial suspensions in time periodic flows BOYANG QIN, University of Pennsylvania, REBECCA WINTER, Drexel University, MADHURA GURJAR, DAVID GAGNON, ALISON PATTESON, PAULO ARRATIA, University of Pennsylvania — In this talk, the transport dynamics of swimming bacteria in time-periodic flows is investigated in experiments and simulations. Experiments are performed by introducing swimming bacteria (*Vibrio cholerae*) in a low Reynolds number, two-dimensional flow driven electromagnetically. We observe two distinct transport regimes: (i) entrapment of bacteria inside vortex and near elliptic points and (ii) aggregation and subsequent transport along the flow manifolds. These time-dependent behaviors are set by the interaction between swimmer kinematics (e.g. speed, tumbling frequency, etc) and flow properties. Numerical simulation using a stochastic Langevin model are able to capture the main experimental results including the entrapment of bacteria near elliptic points and the rapid spreading along manifolds. Results show a significant reduction in long-time effective diffusion of the swimmer as vortex strength is increased. The conditions for bacterial entrapment in vortex flows are discussed.

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