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Bacterial accumulation in viscosity gradients NICOLAS WAISBORD, JEFFREY GUASTO, Tufts University — Cell motility is greatly modified by fluid rheology. In particular, the physical environments in which cells function, are often characterized by gradients of viscous biopolymers, such as mucus and extracellular matrix, which impact processes ranging from reproduction to digestion to biofilm formation. To understand how spatial heterogeneity of fluid rheology affects the motility and transport of swimming cells, we use hydrogel microfluidic devices to generate viscosity gradients in a simple, polymeric, Newtonian fluid. Using video microscopy, we characterize the random walk motility patterns of model bacteria (*Bacillus subtilis*), showing that both wild-type ('run-and-tumble') cells and smooth-swimming mutants accumulate in the viscous region of the fluid. Through statistical analysis of individual cell trajectories and body kinematics in both homogeneous and heterogeneous viscous environments, we discriminate passive, physical effects from active sensing processes to explain the observed cell accumulation at the ensemble level.

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