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Bacterial Trapping in Porous Media Flows[1] AMIN DEHKHARGHANI, NICOLAS WAISBORD, Tufts University, JÖRN DUNKEL, MIT, JEFFREY GUASTO, Tufts University — Swimming bacteria inhabit heterogeneous, microstructured environments that are often characterized by complex, ambient flows. Understanding the physical mechanisms underlying cell transport in these systems is key to controlling important processes such as bioremediation in porous soils and infections in human tissues. We study the transport of swimming bacteria (*Bacillus subtilis*) in quasi-two-dimensional porous microfluidic channels with a range of periodic microstructures and flow strengths. Measured cell trajectories and the local cell number density reveal the formation of filamentous cell concentration patterns within the porous structures. The local cell densification is maximized at shear rates in the range 1-10 s^{-1}, but widely varies with pore geometry and flow topology. Experimental observations are complemented by Langevin simulations to demonstrate that the filamentous patterns result from a coupling of bacterial motility to the complex flow fields via Jeffery orbits, which effectively 'trap' the bacteria on streamlines. The resulting microscopic heterogeneity observed here suppresses bacterial transport and likely has implications for both mixing and cell nutrient uptake in porous media flows.

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