Abstract Submitted
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Expulsion of swimming bacteria by a circular flow.[1] ANDREY SOKOLOV, IGOR ARONSON, Argonne National Laboratory — Macroscopic shear flow alters swimming trajectories in a highly nontrivial way and results in dramatic reduction of viscosity and heterogeneous bacterial distributions. We report on experimental and theoretical studies of rapid expulsion of microswimmers, such as motile bacteria, by a circular flow created by a rotating microparticle. We observed a formation of a macroscopic depletion area in a high-shear region, in the vicinity of a microparticle. The rapid migration of bacteria from the shear-rich area is caused by a circular structure of the flow rather than intrinsic random fluctuations of bacteria orientations, in stark contrast to planar shear flow. Our mathematical model revealed that expulsion is a combined effect of motility and alignment by a vortical flow. Our findings offer a novel approach for manipulation of motile microorganisms and shed new light on bacteria-flow interactions.

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