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Swimming of *E. coli* near micro-structured surfaces VASILY KANTSLER, JORN DUNKEL, RAYMOND E. GOLDSTEIN, DAMTP, University of Cambridge — Understanding the mechanisms that govern surface accumulation of swimming bacteria is a key challenge for controlling biofilm formation. Here, we report detailed measurements of density and orientation distributions for *Escherichia coli* bacteria as a function of the distance from a solid surface. Experiments were performed for wild-type and non-tumbling strains in both quasi-2D and 3D microfluidic chambers. We find that, for both geometries, the density profile in dilute suspensions decays sharply within a few microns from flat surfaces approaching a constant value in the bulk. Our measurements of the orientation distributions show that bacteria preserve memory of aligning collisions with surfaces for surprisingly long periods of time even after escaping into the bulk fluid. These experimental results agree well with numerical simulations of a minimal mechanistic model that accounts for steric interactions between bacteria and surfaces. We further demonstrate that optimal micro-scale surface patterning can substantially decrease accumulation of swimming bacteria, thereby providing a novel mechanism for preventing biofilm formation.

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