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The Fluid Dynamics of Nascent Biofilms NICOLA FARTHING, BEN SNOW, LAURENCE WILSON, MARTIN BEES, The University of York — Many anti-biofilm approaches target mature biofilms with biochemical or physio-chemical interventions. We investigate the mechanics of interventions at an early stage that aim to inhibit biofilm maturation, focusing on hydrodynamics as cells transition from planktonic to surface-attached. Surface-attached cells generate flow fields that are relatively long-range compared with cells that are freely-swimming. We look at the effect of these flows on the biofilm formation. In particular, we use digital inline holographic microscopy to determine the three-dimensional flow due to a surface-attached cell and the effect this flow has on both tracers and other cells in the fluid. We compare experimental data with two models of cells on boundaries. The first approach utilizes slender body theory and captures many of the features of the experimental field. The second model develops a simple description in terms of singularity solutions of Stokes' flow, which produces qualitatively similar dynamics to both the experiments and more complex model but with significant computational savings. The range of validity of multiple cell arrangements is investigated. These two descriptions can be used to investigate the efficacy of actives developed by Unilever on nascent biofilms.

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