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Deformation-induced Lift on Receptor-Ligand Mediated Cell Adhesion to Substrates Explored by a 3-D Computational Fluid Dynamics approach XIAOYI LI, KAUSIK SARKAR, University of Delaware — The adhesion of cells to substrates is a critical step in plenty of biological events. The effects of cell deformation on the adhesion process have been investigated using a direct fluid dynamics simulation based on front-tracking method. A model including membrane elasticity and stochastic receptor-ligand binding has been developed. The study reveals a surprising effect of cell deformation. An asymmetry in upstream-downstream flow field due to cell deformation results in a hydrodynamic lift. The lift force counterbalances the shear torque and causes reduced contact area and reduced number of bond formed, and leads to cell detachment at relatively *low* shear rate. The finding of lift could be used to partially explain the shear threshold phenomenon occurring at small shear stresses.

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