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Simulation of the Effect of Red Blood Cell Collisions on Platelet Adsorption SEAN FITZGIBBON, Stanford Chemical Engineering, HONG ZHAO, Stanford Mechanical Engineering, ERIC SHAQFEH, Stanford Chemical Engineering, Stanford Mechanical Engineering, Stanford Institute for Computational and Mathematical Engineering — The adsorption of platelets to the endothelial wall is an important first step in the clotting process, which is critical to stopping blood loss after trauma. Initial platelet arrest is controlled by very short range interaction between two proteins, von Willibrand Factor and GPIb, so the rate of platelet adsorption is expected to be strongly dependent on the rate at which the platelets sample the wall. With Peclet numbers in the range (10^3 - 10^5), simple diffusive arguments are not sufficient to explain the high rates of platelet adsorption. Using Stokes flow simulations, we show that the platelets' wall sampling rate is significantly increased by interactions with red blood cells. Our simulation models platelets as rigid bodies suspended in a Stokesian linear shear flow. We solve for the flow using standard boundary integral techniques with the appropriate single wall bounded Green's function. Receptor-ligand interactions are represented as Hookean springs with characteristic lifetimes, sizes, and stiffness coefficients. Drag forces are calculated with the reciprocal theorem, and RBC collisions are modelled as AR processes extracted from the large scale suspension simulations of Zhao et al.

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