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Investigating the fluid mechanics behind red blood cell-induced lateral platelet motion LINDSAY CROWL ERICKSON, AARON FOGELSON, University of Utah — Platelets play an essential role in blood clotting; they adhere to damaged tissue and release chemicals that activate other platelets. Yet in order to adhere, platelets must first come into contact with the injured vessel wall. Under arterial flow conditions, platelets have an enhanced concentration near blood vessel walls. This non-uniform cell distribution depends on the fluid dynamics of blood as a heterogeneous medium. We use a parallelized lattice Boltzmann-immersed boundary method to solve the flow dynamics of red cells and platelets in a periodic 2D vessel with no-slip boundary conditions. Red cells are treated as biconcave immersed boundary objects with isotropic Skalak membrane tension and an internal viscosity five times that of the surrounding plasma. Using this method we analyze the influence of shear rate, hematocrit, and red cell membrane properties on lateral platelet motion. We find that the effective diffusion of platelets is significantly lower near the vessel wall compared to the center of the vessel. Insight gained from this work could lead to significant improvements to current models for platelet adhesion where the presence of red blood cells is neglected due to computational intensity.

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