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Mesoscale simulation of blood flow in microvessels PROSENJIT BAGCHI, Rutgers University — Computational modeling of blood flow in microvessels (20–500 micron) is a major challenge. Blood in such vessels behaves as a multiphase suspension of deformable particles. Individual red blood cell (RBC), which is highly deformable, must be considered in the model. Multiple cells, often a few thousands in number, must also be considered. We present two dimensional computational simulation of blood flow in 20–300 micron vessels at discharge hematocrit of 10–60 percent taking into consideration the particulate nature of blood and cell deformation. The numerical model is based on the immersed boundary method, and the red blood cells are modeled as liquid capsules. A large RBC population of up to 2500 cells is simulated. Migration of the cells normal to the wall of the vessel and the formation of the cell- free layer are studied. Results on the trajectory and velocity traces of the RBCs are presented. Also presented are the plug flow velocity profile of blood, the apparent viscosity, and the Fahraeus-Lindqvist effect. The computational results are in good agreement with the experimental results of Bishop et al (2001, 2002) and Pries et al (1992).

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