

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Deformation of a single red blood cell in bounded Poiseuille flows¹

LINGLING SHI, TSORNG-WHAY PAN, ROLAND GLOWINSKI, University of Houston — An immersed boundary method (IBM) combined with the elastic spring model is applied to investigate the deformation of a single red blood cell (RBC) in two-dimensional bounded Poiseuille flows. The equilibrium shape of the cell under flow depends on the swelling ratio (s^*), the initial angle of the long axis of the cell at the centerline (φ), the maximum velocity of the flow (u_{\max}), the membrane bending stiffness of the RBC (k_b), and the height of the microchannel (H). Two motions of oscillation and vacillating breathing of the RBC are observed in narrow channel considered here. The strength of the vacillating-breathing motion depends on degree of confinement and u_{\max} . For the different k_b , the RBC obtains the same equilibrium shape for the same capillary number. Parachute shape and bullet-like shape, depending on the angle φ , coexist for the elliptic shape cell with lower u_{\max} in a narrower channel.

¹NSF Grant No. DMS-0914788

Lingling Shi
University of Houston

Date submitted: 24 Jul 2012

Electronic form version 1.4