Abstract Submitted
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Dissipative particle dynamics modeling of blood flow in arterial bifurcations[1] XUEJIN LI, Division of Applied Mathematics, Brown University, Providence, RI 02912, USA, KIRILL LYKOV, IGOR V. PIVKIN, Institute of Computational Science, University of Lugano, Lugano 6904, Switzerland, GEORGE EM KARNIADAKIS, Division of Applied Mathematics, Brown University, Providence, RI 02912, USA — The motion of a suspension of red blood cells (RBCs) flowing in bifurcations is investigated using both low-dimensional RBC (LD-RBC) and multiscale RBC (MS-RBC) models based on dissipative particle dynamics (DPD). The blood flow is first simulated in a symmetric geometry between the diverging and converging channels to satisfy the periodic flow assumption along the flow direction. The results show that the flowrate ratio of the daughter channels and the feed hematocrit level has considerable influence on blood-plasma separation. We also propose a new method to model the inflow and outflow boundaries for the blood flow simulations: the inflow at the inlet is duplicated from a fully developed flow generated by DPD fluid with periodic boundary conditions; the outflow in two adjacent regions near the outlet is controlled by adaptive forces to keep the flowrate and velocity gradient equal, while the particles leaving the microfluidic channel at the outlet at each time step are removed from the system. The simulation results of the developing flow match analytical solutions from continuum theory. Plasma skimming and the *all-or-nothing* phenomenon of RBCs in bifurcation have been investigated in the simulations. The simulation results are consistent with previous experimental results and theoretical predictions.

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