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Numerical Analysis of Blood Flow in Arteriole by Lattice Boltzmann Method[1] DONGSIK JANG, Graduate school of Univ. of Tokyo, MARIE OSHIMA, IIS, Univ. of Tokyo — In the arteriole with the internal diameter of 10$\sim$100μm, blood flow has various flow characteristics such as decreasing of a hematocrit, decreasing of the blood viscosity, and axial migration. These phenomena are caused by the interaction between red blood cells (RBCs) and plasma in the arteriole. Thus a numerical method requires to consider such interactions in the arteriole. RBCs in the arteriole deform depending on the shear rate and the hematocrit, which is a volumetric rate of RBCs to blood is relatively high. Since the conventional discritaization method such as FDM or FEM is difficult to track a large amount of deforming particles in the flow, a lattice Boltzmann method (LBM) is used to predict the behavior of the RBCs in the arteriole. In the analysis, the arteriole is assumed as a 2D channel and the RBCs are assumed as the solid particles which are modeled by Ladd's theory or droplets which are modeled by immiscible multi-component LBM. In the Poiseuille flow, each analysis method shows that particles migrate to the equilibrium position. However, the equilibrium positions of the droplets are located closer to the axis than that of the solid particle. In the conclusion, since the droplet can deform as opposed to the solid particle, the droplet can reproduce the behavior of the RBC in the plasma better than the solid particle.

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