**Simulation of erythrocyte deformation and drug delivery using the Boltzmann network method**

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**Abstract.**

In this paper, a combination of the Boltzmann network method and the immersion boundary simulates the behavior and deformation of erythrocytes with different primary shapes. Initially, erythrocytes were simulated with an elliptical geometry in a shear flow, and the deformation obtained was compared with the results of other researchers. Then, different geometries of red blood cells in shear flow and during their movement and displacement, simulation, and their gradual deformation have been observed and analyzed. In the following, the flow of fluid inside a blood vessel is modeled, and with its help, phenomena such as blockage of the blood vessel and drug delivery are studied. Analysis of the results shows that damage to the artery wall or deposition of fat masses will cause vortex blood flow and blood clot formation. Also, the quality of drug injection in this two-pronged artery is very influential in how it is delivered. Finally, comparing the results with the results of others shows that this simulation has acceptable accuracy.

Keywords: Red blood cell, Boltzmann network method, Immersion boundary, Blood vessel occlusion, Drug delivery.