Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Blood flow and blood cell interactions and migration in microvessels DMITRY FEDOSOV, JULIA FORNLEITNER, Postdoc, GERHARD GOMPPER, Professor — Blood flow in microcirculation plays a fundamental role in a wide range of physiological processes and pathologies in the organism. To understand and, if necessary, manipulate the course of these processes it is essential to investigate blood flow under realistic conditions including deformability of blood cells, their interactions, and behavior in the complex microvascular network which is characteristic for the microcirculation. We employ the Dissipative Particle Dynamics method to model blood as a suspension of deformable cells represented by a viscoelastic spring-network which incorporates appropriate mechanical and rheological cell-membrane properties. Blood flow is investigated in idealized (e.g., channels, tubes) and complex (e.g., expansions, bifurcations) geometries. In particular, migration of blood cells and their distribution in blood flow are studied with respect to various conditions such as hematocrit, flow rate, red blood cell aggregation, and vessel geometry. Physical mechanisms which govern cell migration in microcirculation and, in particular, margination of white blood cells towards the vessel wall, will be discussed. In addition, we characterize blood flow dynamics and quantify hemodynamic resistance in the microvascular network.

Dmitry Fedosov
Postdoc

Date submitted: 05 Aug 2010 Electronic form version 1.4