

Abstract of the diploma thesis by Samsonova Yulia Sergeevna on

Investigation of microrheologic properties of blood by diffractometry and diffuse light scattering in norm and interaction with nanoparticles

The aim of our work was to study the effect of nanodiamonds (ND) on blood microrheology, in particular, on the ability of red blood cells (RBC) to deform in shear flow and parameters of aggregation.

In our experiments we used suspensions of ND with size of 100 nm, with no functional groups on the surface (ND) and having surface carboxyl group - COOH (cND), and suspensions of ND with size of 5 nm, with no functional groups on the surface (ND) and having protonated surface (HND). We performed several series of *in vitro* measurements of the deformability index and several parameters of aggregation kinetics using laser measurement techniques based on the detection of diffraction patterns from dilute suspensions of RBC and diffuse reflection of light from layers of whole blood. We found that incubation of RBC in the solutions of nanoparticles at different concentrations in whole blood samples results neither deformability index, nor aggregation kinetics of RBC. But nanodiamonds with protonated surface 5HND in smaller concentrations decrease the time of formation of both linear and 3D RBC aggregates and enhance the amplitude of spontaneous RBC aggregation in whole blood, which are overall negative physiologic effects. The effect of nanodiamonds 5HND on the deformability of RBC in shear flow is negative as well: the cell deformability index is reduced all through the range of tested shear stresses. The reduction of the deformability index is more pronounced at higher concentrations of the nanoparticles.

Based on the theoretical model we estimated the value of the energy of interaction of red blood cells with to each other and the value of the interaction energy of nanodiamonds and erythrocyte. We estimated numerical calculation of the tension of the erythrocyte membrane at different shear stresses. Based on these results we suggested a possible mechanism for the interaction of nanodiamonds with blood cells.

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