Cytocam on the 1st and 9th postoperative (p.o.) days. On the 1st, 4th and 9th p.o. days, blood samples were collected to test for hematological parameters, red blood cell (RBC) deformability, and aggregation.

Results. The leukocyte counts significantly increased by the 4th p.o. day followed by a decrease on day 9. The platelet count was elevated on p.o. days 4 and 9. A steady and notable enhancement was seen in all RBC aggregation. In the tumor group, RBC deformability considerably deteriorated by the 9th p.o. day. The heterogeneous blood flow pattern and structural characteristics of the tumor tissue were seen when compared to the healthy or contralateral intact kidney. In records where flow parameters were enhanced, abnormally shaped and sized vessels were frequently identified, and RBC aggregates were seen.

Discussion. The malignant kidney tumor, which was expanding, resulted in aberrant vessels and impaired blood micro-rheology, which caused severe deterioration and heterogeneity in the microcirculation.

Conclusion. The model seems to be suitable for studying the further mesenchymal mesoblastic nephroma and related haemorheological, microcirculatory and parenchymal structural differences.

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The impact of interferon-alpha on RBC-endothelium interaction: optical tweezers study

Matvei Maksimov[a*], Petr Ermolinskiy[a], Danila Umerenkov[a],
Olga Scheglovitova[b], Andrei Lugovtsov[a], Alexander Priezzhev[a]
[a] Faculty of Physics, Lomonosov Moscow State University, 119991 Moscow, Russia.
[b] The Gamaleya national center, 123098, Moscow, Russia.

Interferon alpha-2b (IFN-α) is an approved antiviral drug against hepatitis C and B. Recently, IFN-α was used to treat patients with COVID-19. It is also known that IFN-α impacts endothelial cells, decreasing their permeability and reducing NO production. RBC-endothelium interaction, either adhesion or extracellular signaling, is known to determine blood rheology parameters at some circumstances. While endothelium is severely damaged in some cases of COVID-19, it is of interest, whether IFN-α alterates RBC-endothelium interaction, either direct (adhesion) or indirect (NO production).

Aim. The main aim of this study was to investigate *in vitro* RBC-endothelium interaction and endothelial impact on RBC aggregation at different concentrations of IFN-α.

Materials and methods. To achieve the goal, an optical tweezers trapping technique was applied to measure the forces of interaction between single RBCs and between RBC and the monolayer of endothelial cells.

Results and discussion. The results demonstrate statistically significant decrease of RBC aggregation in the presence of endothelium and IFN-α. The degree of the effect is higher if IFN-α was added in the plasma without preliminary incubation. On the contrary, samples with endothelium incubated with IFN-α for 24 hours, but lacking IFN-α in the plasma during the measurements, showed weaker tendencies in decreasing RBC aggregation. The force of RBC-endothelium adhesion demonstrated weak tendencies of decreasing with the raise in IFN-α concentration.

Conclusion. These results may be witnessed in favor of short-time IFN-α effect to the RBC-endothelium system. Further investigation of RBC-endothelium-IFN-α interplay may spread light on the underlying mechanisms and provide clues for new therapeutic targets.

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Assessing the microcirculation and microrheology of blood in patients with type 2 diabetes mellitus by different optical techniques

Danila Umerenkov, Petr Ermolinskiy, Yury Gurfinkel, Andrei Lugovtsov, Alexander Priezzhev
Faculty of Physics, Lomonosov Moscow State University, 119991 Moscow, Russia

Diabetes mellitus (DM) is a group of metabolic diseases in which chronic hyperglycemia leads to the development of pathology in the most organs and systems. The prevalence of DM is growing rapidly, so, according to the data of the World Health Organization, the global incidence of DM almost tripled from 1980 to 2020. One of the complications of DM are related with specific damage of the microvascular system.

Aim. The main aim of this study was to evaluate the microcirculation and microrheological parameters of red blood cells (RBCs) in patients with type 2 diabetes mellitus (T2DM), using *in vivo* and *in vitro* methods accordingly.

Materials and methods. To achieve the goal, *in vitro* measurements of the aggregation parameters of RBCs were carried out using the method of laser aggregometry, an optical tweezers trapping technique was applied to measure the forces of interaction between single RBCs *in vitro*. The method of digital capillaroscopy was used to study the parameters of blood flow *in vivo*.