

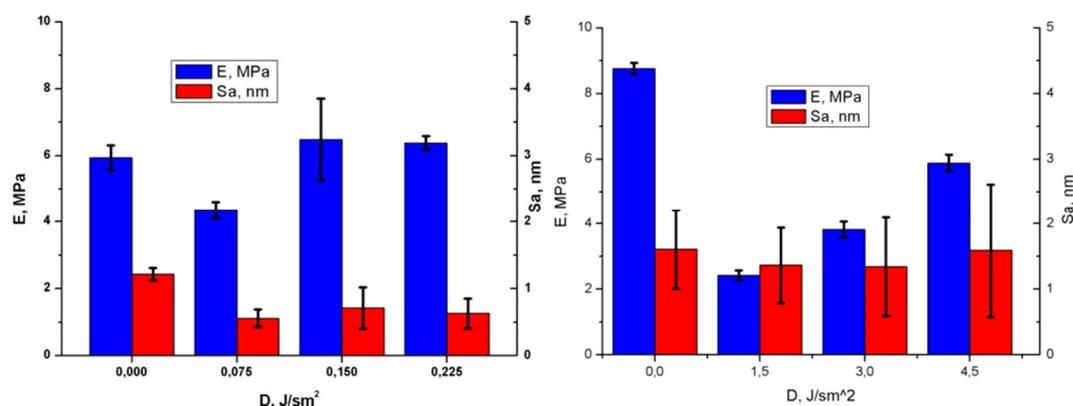
The effect of laser radiation on the morphology and nanomechanical properties of the membranes of erythrocytes

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In this paper we investigate a change in means of roughness and Young's modulus of erythrocytes upon exposure He-Ne laser. Investigations were performed on fixed red blood cells in liquid by SPM.



Pic 1 Dynamics of changes in the elastic modulus and the mean-square roughness of the membrane of erythrocytes when it is exposed by low (left) and large (right) doses of radiation of He-Ne laser

Influence of low radiation doses leads to a nonmonotonic change of the morphofunctional state of the erythrocytes membrane by the reason of the influence of two competitive processes: lipid peroxidation and stimulating of enzymes production for antioxidant defense [1, 2].

A significant reduction in the modulus of elasticity at a dose of 1.5 J/cm² indicates a significant predominance of the process of lipid peroxidation over the processes produce antioxidant enzymes. Further monotonic increasing of the modulus of elasticity points out a significant change of morphofunctional state of the membrane of erythrocytes by the reason of accumulation of large volume of lipid peroxidation products that leads to a restructuring of the membrane with formation of inactive lipid clusters, limited the mobility of the integrated in membrane protein complexes. Fixation of protein complexes that are attachment points cytoskeletal elements contributes to reducing the elasticity of the membrane and the ability of the cell to change its form. This assumption is supported by the lack of change in surface roughness of the membrane with increasing doses of radiation. Be noted that with increasing irradiation dose increases scatter of values average roughness of the membrane, as indicating on the inhomogeneous shift of the protein complexes in lipid clusters in structurally reorganized erythrocyte membrane.

References.

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- [2] S.D. Zakharov, A.V. Ivanov., *Svetokislородnyy effekt – fizicheskiy mekhanizm aktivatsii biosistem kvazimonokhromaticheskim izlucheniym*, 50 (2006). (in Russian)