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**"COLD IN BIOLOGY AND MEDICINE:
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TRANSPLANTOLOGY, AND
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The abstract book contains materials of scientific works on topical studies of the effects of low temperatures on various biological objects, the problems of modern cryobiology and cryomedicine.

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Dielectric characteristics of erythrocytes of patients with ischemic and hemorrhagic stroke under conditions of therapeutic action of hypothermia

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Therapeutic hypothermia is widely used in the treatment of various mechanisms of brain damage, including decreased metabolic activity, release of glutamate, inflammation, production of reactive oxygen species, release of mitochondrial cytochrome and others [Yenari, 2012]. Because therapeutic hypothermia affects many aspects of brain pathophysiology, it can be considered as a model of neuroprotection, and used to identify potential therapeutic goals [Morozova, 2019]. Although this therapy has shown great prospects, at the cellular level there are still problems that limit the possibility of routine treatment to each pathological condition. Given that the adaptation mechanisms and their violations in the body are accompanied by biochemical and biophysical changes, it should be assumed that this will affect the dielectric properties of the object under study, namely blood cells.

The aim of the work is to study the effect of therapeutic action of hypothermia (0–15 °C) and alteplase (thrombolytic agents of indirect mode of action) on the state of erythrocytes of 34 patients with ischemic and hemorrhagic stroke by dielectric Fourier spectroscopy. The experiment used blood samples from patients collected within 24 hours from the onset of symptoms and before the introduction of any drug. Alteplase was added to the erythrocyte suspension and incubated for 5 min at 0°C to 15°C. A short pulse of current (10^{-5} s) was passed through the suspension samples, followed by registration of the polarization decay function of the sample, and then a Fourier transform of this function was performed. The dielectric characteristics of samples of erythrocyte suspensions of donors and different groups, with the addition of alteplase, were described using three “Cole-parameters” (r_0 , x_0 , y_0) [Cole, 1968]. Significance of differences between samples was assessed by the non-parametric Mann-Whitney test.

The results indicate a statistically significant difference between the groups r_0 and x_0 for erythrocyte suspensions in patients with hemorrhagic and ischemic stroke in the temperature range from 5°C to 10°C under conditions of adding alteplase at a concentration of 0,0012 mg (0,25–0,5 mg/kg dose in vivo) to 5,0 ml of cell suspension. An increase in r_0 , x_0 , y_0 in the erythrocyte suspension in patients with ischemic stroke was obtained in comparison with the erythrocyte suspension in patients with hemorrhagic stroke. This effect disappears at a temperature of 14°C and above, which corresponds to the data on the increased rate of transmembrane transport of ions in cell membranes, which varies by about 15°C [Gimsa, 1994]. The inhibitory effect of thrombolytic agents of indirect mode of action disappears when the concentration of alteplase increases to 0,0015 mg, which leads to the alignment of all measurement points in the temperature range from 5°C to 10°C, and may be associated with increased cation exchange at low temperatures.