THE STATE OF THE WATER IN BRAIN TISSUE IN PRESENCE OF TS-100 NANOPARTICLES

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By the method of low-temperature $^1$H NMR spectroscopy the structure of the hydrate layers of water associated with brain cells, the changes of these parameters during necrotic lesions (stroke) and in the presence of trifluoroacetic acid, which allows differentiating intracellular water clusters according to their ability to dissolve the acid, were studied. Also the impact of silica TS-100 nanoparticles on the state of water in brain tissue, namely on the water binding parameters in the air and in the presence of a weakly polar solvent was considered.

The distributions by the radii and change of Gibbs free energy for clusters of strongly bound interfacial water were obtained. It was shown that the hydration properties of the native brain tissue differ from the hydration properties of necrotic damaged tissue by the structure of weakly bound water clusters. In intact tissue all the water is associated and is a part of clusters and domains, most of which have a radii $R = 2$ and 20 nm. The media with chloroform stabilizes water polyanides with the radius up to $R = 100$ nm and trifluoroacetic acid stabilizes water polyanides with radii $R = 7−20$ nm. It was found that the partial dehydration of the investigated tissue samples is accompanied by decreasing of weakly bound water amount and some increasing of strongly bound water that indicates a change of molecular interactions between the components of cells-nanoparticles composite system. The ischemic necrosis area presence leads to a decrease of water binding due to the average size water polyanides increasing. This effect is observed both in air and in a weakly polar organic solvent medium (deuterochloroform).

Key words: ischemic stroke, the strongly and weakly associated water, $^1$H NMR spectroscopy.


13. Gun’ko V. M., Turov V. V., Bogatyrev V. M., Zarko V. I., Leboda R., Goncharuk E. V.,


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