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The morphofunctional state of cerebral hemisphere's neuropil in rats with nitrite-induced experimental Alzheimer's disease after mesenchymal stem cells intravenous injections

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Background. An increasing incidence of Alzheimer's disease (AD) has been found in excessive accumulation of nitrosamines, which are formed in the body by the interaction of sodium nitrite with proteins after ingestion with water, food and after smoking tobacco. It is known that nitrosamines increase oxidative stress, cause endothelial dysfunction of brain vessels and atrophy of the brain white matter. The effect of mesenchymal stem cells (MSC) on brain neuropil in rats with experimental AD is being actively studied.

Aim. The aim of the current study was to investigate the effect of mesenchymal stem cells on the cerebral hemisphere's neuropil in rats with nitrite-induced experimental Alzheimer's disease.

Methods. The experiment was performed on 48 male WAG rats with 14- and 28-days nitrite-induced models of Alzheimer's type dementia. Half of the animals received a single intravenous injection of MSC in a dose of 500,000 cells for each rat after sodium nitrite injections (Nitr, 50 mg/kg). Control animals (gr. C) received 0.1 ml isotonic saline. The brain slices were stained with Congo-red, bromophenol blue (BPB), according to Einarson's method and studied using Zeiss Axiostar plus binocular microscope and software GIMP.

Results. In all experimental groups, there were signs of amyloid accumulation in the cerebral hemisphere's neuropil in the form of red homogeneous masses. The homogenization of the neuropil was accompanied by a decrease in its optical density, especially in rats with 28-days AD. Using BPB staining in rats with AD the state of the cerebral hemisphere's neuropil was close to the control state, close to dystrophy, atrophy, and amyloid formation. The introduction of MSC lead to an increase the RNA content in neuropil branches. Moreover, in the brain slices stained with BPB, there were areas with reduced optical density of neuropil proteins and a predominance of carboxylic groups over amino groups, as in gr. C. It could be interpreted as the presence of new proteins in the neuropil.

Conclusion. The intravenous injection of mesenchymal stem cells led to the emergence of new cerebral hemisphere's neuropil branches in rats with nitrite-induced experimental Alzheimer's disease.

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