

Study of the Biological Activity of a Ganglioside-Containing Drug (Cronassil) in an Experimental Model of Multiple Sclerosis

Authors : Hasmik V. Zanginyan, Gayane S. Ghazaryan, Laura M. Hovsepyan

Abstract : Experimental autoimmune encephalomyelitis (EAE) is an inflammatory demyelinating disease of the central nervous system that is induced in laboratory animals by developing an immune response against myelin epitopes. The typical clinical course is ascending palsy, which correlates with inflammation and tissue damage in the thoracolumbar spinal cord, although the optic nerves and brain (especially the subpial white matter and brainstem) are also often affected. With multiple sclerosis, there is a violation of lipid metabolism in myelin. When membrane lipids (glycosphingolipids, phospholipids) are disturbed, metabolites not only play a structural role in membranes but are also sources of secondary mediators that transmit multiple cellular signals. The purpose of this study was to investigate the effect of ganglioside as a therapeutic agent in experimental multiple sclerosis. The biological activity of a ganglioside-containing medicinal preparation (Cronassil) was evaluated in an experimental model of multiple sclerosis in laboratory animals. An experimental model of multiple sclerosis in rats was obtained by immunization with myelin basic protein (MBP), as well as homogenization of the spinal cord or brain. EAE was induced by administering a mixture of an encephalitogenic mixture (EGM) with Complete Freund's Adjuvant. Mitochondrial fraction was isolated in a medium containing 0,25 M saccharose and 0, 01 M tris buffer, pH - 7,4, by a method of differential centrifugation on a K-24 centrifuge. Glutathione peroxidase activity was assessed by reduction reactions of hydrogen peroxide (H_2O_2) and lipid hydroperoxides (ROOH) in the presence of GSH. LPO activity was assessed by the amount of malondialdehyde (MDA) in the total homogenate and mitochondrial fraction of the spinal cord and brain of control and experimental autoimmune encephalomyelitis rats. MDA was assessed by a reaction with Thiobarbituric acid. For statistical data analysis on PNP, SPSS (Statistical Package for Social Science) package was used. The nature of the distribution of the obtained data was determined by the Kolmogorov-Smirnov criterion. The comparative analysis was performed using a nonparametric Mann-Whitney test. The differences were statistically significant when $p \leq 0,05$ or $p \leq 0,01$. Correlational analysis was conducted using a nonparametric Spearman test. In the work, refrigeratory centrifuge, spectrophotometer LKB Biochrom ULTROSPECII (Sweden), pH-meter PL-600 mrc (Israel), guanosine, and ATP (Sigma). The study of the process of lipid peroxidation in the total homogenate of the brain and spinal cord in experimental animals revealed an increase in the content of malonic dialdehyde. When applied, Cronassil observed normalization of lipid peroxidation processes. Reactive oxygen species, causing lipid peroxidation processes, can be toxic both for neurons and for oligodendrocytes that form myelin, causing a violation of their lipid composition. The high content of lipids in the brain and the uniqueness of their structure determines the nature of the development of LPO processes. The lipid layer of cellular and intracellular membranes performs two main functions -barrier and matrix (structural). Damage to the barrier leads to dysregulation of intracellular processes and severe disorders of cellular functions.

Keywords : experimental autoimmune encephalomyelitis, multiple sclerosis, neuroinflammation, therapy

Conference Title : ICNND 2022 : International Conference on Neurovascular and Neurodegenerative Diseases

Conference Location : Cairo, Egypt

Conference Dates : December 15-16, 2022