

EFFECT OF A MIXTURE OF ETHYL AND METHYL ALCOHOLS ON THE ULTRASTRUCTURE OF THE OUTER LAYERS OF THE RAT VISUAL CORTEX

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Background. Alcohol surrogates containing methyl alcohol (methanol) have a significant toxic effect on the human body, primarily on the brain and visual organs. The reason for this is methanol, which resembles ethyl alcohol in smell and color, but is a strong poison. Consumption of up to 10 ml causes blindness, and consumption of up to 30–50 ml causes death. The purpose of our comprehensive research was to study the effect of a small dose of methanol and its combination with ethanol on the ultrastructures of the visual analyzer of experimental animals. The results of the study on the effect of these alcohols at the specified dose on the eyes of white rats have been published in scientific articles.

Purpose. To study the effect of a mixture of ethyl and methyl alcohols on the ultrastructure of the outer layers of the visual cortex (VC) of white rats.

Material and methods. The study was performed on 12 adult white Wistar rats weighing from 250 g to 300 g, divided into 2 groups: Study Group, experimental rats given a single intraperitoneal (IP) injection of a mixture of ethyl and methyl alcohols in a ratio of 3:1 with a dose of methanol of 0.75 g/kg of rat body weight; Control Group, rats given IP injection of 100 % methanol in a similar dose as in the Study Group. For rats, the LD50 effect of methanol is 9.5 g / kg of body weight. Animal manipulations and euthanasia were carried out in accordance with the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes (Strasbourg, 1986). The ultrastructure of the molecular and outer granular layers of VC in the rats was studied using an electron microscope PEM-100-01 (Ukraine) in the period from 1 hour 10 minutes to 14 days after alcohol injection.

Results. At 1 hour 10 minutes and 3 hours after the IP injection of the alcohol mixture, elements of cytoplasmic edema of astrocyte processes that are in contact with capillaries and parts of nerve processes (NPs) located nearby were observed. Some of the nerve and glial cells underwent reactive changes. The structure of the capillaries was unchanged, but their lumen had osmophilic granularity.

After 3 hours, in addition to the above changes, there were nerve cells with chromatolysis and pathology of some mitochondria. The number of NPs with hydropic changes increased.

In the dynamics of the study (up to 14 days), the pathological changes in the studied structures of the central nervous system were progressing and referred mainly to the structures of the neuropil and glial cells. Among the nerve cells, only some had chromatolysis, mitochondrial pathology, and a reduced number of free ribosomes

and polysomes. It should be noted that on the 14th day, the depth of pathological changes was characterized by focality. In some areas of the central nervous system, the destruction of NPs plasmol and myelin sheaths of axons, alteration of organelles or complete devastation of the cytoplasm of nerve and glial cells was noted.

After the IP injection of methanol, the changes in the structures of VC were unidirectional with the changes in them after the IP injection of the mixture of alcohols, but in the dynamics of the study, they were somewhat more significant.

Thus, a single IP injection of a mixture of alcohols causes changes in the structures of the outer layers of the VC with hydropic dystrophy phenomena starting from 1 hour 10 minutes of observation, which leads to a violation of nerve impulse conduction and transport of nutrients. By day 14, changes in the EC progress and involve more nerve and glial cells and capillaries.

Conclusions

1. An intraperitoneal injection of a mixture of ethyl and methyl alcohols at a dose of 0.75 g / kg body weight in a rat causes, within the first 3 hours, hydropic degeneration of the processes of nerve and glial cells of the outer layers of the visual cortex, which are located mainly around capillaries.
2. In the dynamics of the study (up to 14 days), pathological changes in the studied structures of the visual cortex progress and involve nerve and glial cell bodies and capillaries.
3. Intraperitoneal injection of 100 % methanol at a dose of 0.75 g / kg body weight in the rat induces dystrophic changes in the structures of the outer layers of the visual cortex in the period from 1 hour 10 minutes to 14 days, but the depth of their manifestation in the dynamics of observation is more significant than after the use of a mixture of alcohols.

The ultrastructure of the outer layers of the visual cortex (VC) was studied in the period from 1 hour 10 minutes to 14 days after intraperitoneal (IP) injection of a mixture of ethyl and methyl alcohol in a ratio of 3:1 at a dose of 0.75 g / kg of rat body weight. Controls were rats that were given an IP injection of 100% methanol in the same dose as in the experimental group. It is shown that the mixture of alcohols causes, in the first 3 hours after the IP injection, hydropic dystrophy of the processes of nerve and glial cells of the outer layers of the VC, which are mainly located around the capillaries. By the 14th day of observation, the pathological changes in the studied structures of the VC progress and involve nerve and glial cell bodies and capillaries. After the use of 100% methanol in the dynamics of observation, deeper dystrophic and destructive changes in the structures of the outer layers of the VC develop than after the use of a mixture of alcohols.