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THE STATE OF PROOXIDANT SYSTEM IN RATS' KIDNEYS UNDER ALCOHOLIC INTOXICATION AND ITS COMBINATION WITH LIGHT EXPOSURE

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Introduction. Although the negative effects of excessive alcohol consumption are generally known in the human population, drinking alcoholic beverages is prevalent in society. According to WHO, alcohol abuse contributes to three million deaths per year globally and millions of people's disabilities and organ damage.

In modern life, the use of ethanol is often combined with the influence of other harmful factors, such as the violation of the light regime. A modern person is exposed to light almost all the time. Night shifts, flights, jet lag and active nightlife contribute to the disturbance of circadian rhythms. Normally, the biological rhythms are regulated by melatonin, which is known to be secreted in the dark. Even a slight lighting inhibits its synthesis. It has been shown that melatonin has a wide range of biological effects but its main feature is a powerful antioxidant action.

The aim of the study. To investigate the effects of melatonin on oxidative stress biomarkers (malonic dialdehyde and oxidatively modified proteins) in the kidneys of rats exposed to alcohol intoxication and its combination with constant light exposure.

Material and methods. A subacute alcohol intoxication was induced by intragastric administration of 40% ethanol in a dose of 7 ml/kg of body weight for 7 days. Light exposure was caused by keeping animals under a fluorescent light of 1500 lux intensity for 24 hours a day.

Results. Alcohol intoxication was accompanied by an increase of malonic dialdehyde in rats' kidneys by 28% above the control level along with a decrease of oxidatively modified proteins by 33%. A combination of modified photoperiod with ethanol administration resulted in the elevation of malonic dialdehyde by 34% and a decrease of oxidatively modified proteins in kidneys by 25% lower than the control level. The rise in malonic dialdehyde in case of alcohol intoxication along with the permanent light exposure was significantly higher than that of rats that had alcohol intake under the normal light regime, that might have resulted from a decrease in melatonin synthesis and lack of its antioxidant effect under constant light exposure.

The administration of the melatonin at the dose of 5 mg / kg daily at 20^{00} for 7 days to animals exposed to ethanol intoxication has shown no significant effect on malonic aldehyde and oxidatively modified proteins levels in kidneys. Melatonin intake revealed more effective in normalization of oxidatively modified proteins in case of ethanol combination with constant lighting but the level of malonic dialdehyde remained by 53% above control.

Conclusions. The administration of melatonin against the background of alcohol intoxication or its combination with constant light exposure contributed to the normalization of oxidatively modified proteins in rats' kidneys but had no positive effect in normalization of malonic dialdehyde.

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DETERMINATION OF THE ACTIVITY OF NADH DEHYDROGENASE, SUCCINATE DEHYDROGENASE AND H^+-ATP-ASE IN EXPERIMENTAL DIABETES

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Introduction. Diabetes mellitus, without exaggeration, is considered a non-infectious epidemic of the 21st century. According to research, about 40% of people with diabetes develop chronic kidney disease (CKD). The increased glucose level in the blood and tissues causes the constant generation of free radicals, which damage the lipid and protein components of cells, contribute to the formation and accumulation of reactive oxygen species, which intensify the processes of cell membrane destabilization. Such changes cause a malfunction of one of the main energy processes in the kidneys, namely, the cycle of tricarboxylic acids and partial disconnection

of oxidation and phosphorylation processes in kidney mitochondria. In this regard, one of the priority tasks is to study the state of the energy supply system of the kidneys in diabetes.

The aim of the study. To investigate the activity of the energy supply system of mitochondria of rat kidneys under the conditions of experimental diabetes.

Material and methods. The experiment was conducted on 50 white male rats weighing 0.16-0.18 kg. Diabetes mellitus was induced by intraperitoneal injection of 5% solution of alloxan monohydrate at a dose of 150 mg/kg. Animals were divided into two groups: control and experimental. The mitochondrial fraction was obtained by differential centrifugation. Determination of NADH dehydrogenase activity was carried out by the spectrophotometric method. SDH activity was determined by the intensity of potassium ferricyanide reduction, H^+-ATPase activity – by the accumulation of inorganic phosphate. Protein level was determined by the Lowry method. Animals were killed by decapitation under light ether anesthesia in accordance with the ethical principles for conducting experiments in accordance with the requirements of the European Convention for the Protection of Vertebrate Animals. Statistical analysis was performed using Statistica 10 (StatSoft Inc).

Results. It has been established that with alloxan diabetes in the mitochondria of the kidneys of experimental animals, there is a violation of the mitochondrial respiratory chain: a decrease in NADH-dehydrogenase, H^+-ATPase activity and a compensatory increase in the level of succinate dehydrogenase activity.

Conclusions. Established changes in the work of the respiratory chain of nephrocyte mitochondria can be considered as additional criteria for assessing the severity of energy metabolism disorders in diabetic nephropathy.

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EFFECT OF GLUTATHIONE ON OXIDANT-ANTIOXIDANT SYSTEM IN HEPATOCYTES UNDER THE CONDITIONS OF EXPERIMENTAL NEPHROPATHY

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Introduction. In diseases of the kidneys and liver, a violation of oxidant-antioxidant protection leads to the accumulation of reactive oxygen species, activation of the free radical cascade, and peroxidation of lipids and proteins. The alteration of oxidant/antioxidant balance affects metabolism-related organelles, leading to phospholipid membrane damage and depletion of the body's antioxidant reserve. An important role in maintaining intracellular homeostasis is played by thiol-mediated redox control that can be provided by the most famous natural antioxidant, glutathione.

The aim of the study. To determine the state of the oxidant-antioxidant system in the liver of rats under conditions of experimental nephropathy and the use of glutathione.

Material and methods. The experiment was carried out on 131 male albino rats with the bodyweight of 0,16–0,18 kg. Experimental nephropathy was modeled by injection of a single intraperitoneal dose of folic acid (250 mg/kg, Sigma-Aldrich). Glutathione (Sigma-Aldrich) was introduced daily (100 mg/kg) by the intragastric way for 3 and 7 days following the injection of folic acid.

Results. It was established that under the conditions of nephropathy, the processes of free radical damage to molecules in the liver of the studied animals increased, as evidenced by an increase in the content of TBA-active products by 17% on the 3rd day and by 27% on the 7th day of the experiment. The introduction of glutathione during 7 days equated the level of TBA-active products of experimental animals to the values of the control group. The glutathione content in the liver of animals with nephropathy decreased by 33% on the 3rd experimental day and by 23% on the 7th, and the use of glutathione on both the 3rd and the 7th day of the experiment led to the studied indicators to normal values. It was found that glutathione peroxidase activity decreased by 11.6% on the 3rd experimental day, and by 36.5% on the 7th day. This result indicates the depletion of glutathione resources under the conditions of nephropathy. On the 3rd day after glutathione