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БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»

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Конференція внесена до Реєстру заходів безперервного професійного розвитку, які проводитимуться у 2023 році №5500074

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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

introduction was observed an increase in glutathione peroxidase activity by 7%, and after seven days - the level of enzyme activity increased by 23% compared to the group of animals with nephropathy. Also, in the experimental group of animals, it was observed on the 3rd day of the study the decrease in the activity of glutathione-S-transferase by 22.5%. Seven-day introduction of the antioxidant, a normalization of the activity indicators of the enzyme was observed.

Conclusions. Folic acid-induced nephropathy increases oxidative stress in the liver, as evidenced by increased formation of TBA-reactive products, decreased glutathione content, and glutathione peroxidase and glutathione-S-transferase activities. The positive effect of the seven-day use of glutathione can be due to its antioxidant, anti-inflammatory, anti-apoptotic and immunomodulatory properties. The received results regarding the effect of glutathione on the state of the oxidative-antioxidant system by kidney disease can be the theoretical basis for further study of the possibility to use glutathione for nephro- and hepatoprotective effects by kidney disease.

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SOME SPECIFIC FEATURES OF SPECTRAL, ELECTROCHEMICAL AND ENERGY CHARACTERISTICS OF THE POLYMETHINE CATIONIC DYES-SENSITIZERS

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Introduction. The sensitization of semiconductors to a broader light spectral range is an important direction in the design of photosensitive semiconductors. However, the method of sensitization, which involves the direct addition of dyes to the reacting mixture, has some disadvantages. First, the adsorption of dye is comparatively weak, while its solubility in the reacting mixture is much higher. Because of that, the dye concentration in the mixture should be kept high, which makes unwanted inner light filtering more intense. This problem can be fixed by developing special heterostructures consisting of a layer of the dye-sensitizer applied to the surface of a semiconductor and protected by a special polymer film. This film doesn't put any obstacles to the interphase electron-exchange processes and prevents the dye from being washed off. Polymethine dyes are very efficient sensitizers to be used in such heterostructures and are widely used in photocatalysis and technologies for solar light conversion and accumulation.

The aim of the study. Our work was aimed at the investigation of electrochemical, spectral and energy characteristics of the cationic polymethine dyes in the context of evaluating their potential effectiveness as TiO_2 sensitizers, and developing broad photosensitivity range photocatalytic systems.

Material and methods. P25 titanium dioxide (Degussa), symmetric cationic polymethine dyes D_1-D_3, and a polymer polyepoxypropylcarbazole were used to obtain the photosensitive heterostructures. All absorption spectra of the dyes were recorded using a spectrophotometer „Oceanoptics" USB 2000+XR. Redox potentials of the polymethine dyes were measured by cyclic voltammetry using BAS 100B/W Electrochemical Workstation by Bioanalytical Systems equipped with a standard three-electrode cell. All solutions were prepared using a 0.1 M tetra-n-butylammonium tetra-fluoroborate solution.

Results. The abovementioned spectral and electrochemical data were used to calculate the excitation energy required to switch a dye electron between the main and excited conditions. Since the difference between the light absorption energy and the potentials of oxidation and reduction is rather small, the proposed experimental methods can be used for the determination of the energy parameters.

The HOMO and LUMO energies were calculated from the experimentally determined oxidation and reduction potentials of the dyes. Their energy level diagrams were then built and compared with the diagram of titanium dioxide. It was found out that if the length of the polymethine chain increases by one vinylene group, a reduction in the energy gap as well as the energy required for the transition of a molecule from the main into an excited condition would decrease. As seen from the energy level diagrams, the dye oxidation potential (LUMO level) is located higher than the upper edge of the TiO_2 conductance area. Therefore, injection of electrons into the conductance area of the semiconductor is thermodynamically allowed, and these dyes can be used for the sensitization of titanium dioxide.