



Experiments were performed on 50 mature white male rats with body weight 160-180 g. Alloxan diabetes was induced by intraperitoneal injection 5% solution of alloxan monohydrate at a dose of 150 mg/kg. Animals were divided into groups: 1) control animals; 2) animals with manifest diabetes (basal glycemia 12,8-17,2 mmol/l); 3) animals with manifest diabetes which underwent intragastric administration of melatonin daily at a dose of 10 mg/kg at 8.00 a.m. The animals were decapitated under light ether anesthesia on the 7th and 14th day of the drug administration. In postnuclear supernatants of heart homogenates the activity of glutathione-S-transferase was measured. The results were processed statistically using nonparametric methods of variation statistics using STATISTICA 7.

Experimental model of alloxan diabetes accompanied by an increased activity of glutathione-S-transferase in the rats' hearts by 34% above the control one on the 7th of the experiment. The increase of glutathione-S-transferase activity in the hearts of diabetic rats is probably related to an increased disposal of waste products of lipid peroxidation and other oxidized compounds by conjugation with glutathione. On the 14th day of the experiment there was no significant difference in this parameter between control and diabetic animals.

Administration of melatonin to animal with alloxan diabetes caused a decrease of glutathione-S-transferase activity in the heart compared to untreated animals on the 7th day of experiment which resulted in normalization of its value.

Antioxidant properties of melatonin are likely to be related to both direct disposal of reactive oxygen species and the influence of melatonin on the expression of genes responsible for synthesis of antioxidant enzymes.

Dikal M.V., Ferenchuk Ye.A.

ACTIVITY OF MITOCHONDRIAL SUCCINATE DEHYDROGENASE IN THE KIDNEYS UNDER CONDITIONS OF EXPERIMENTAL DIABETES MELLITUS

*Department of Bioorganic and Biological Chemistry and Clinical Biochemistry
Higher state educational establishment of Ukraine
«Bukovinian State Medical University»*

Mitochondria are the keepers of the eukaryote's cell viability by regulating programmed cell death, and they control the production of reactive oxygen species. Some findings suggest that mitochondria play a key role in diabetes complications, because diabetes mellitus is a disease characterized by different molecular and cellular destructions.

The aim of our study was enzymohistochemical observation and biochemical determination of activity of mitochondrial succinate dehydrogenase (SDH) in the kidneys under conditions of experimental diabetes mellitus.

The experiment was carried out on male albino rats with the body weight 0.16 – 0.18 kg. The animals in the experimental group were administered a single intraperitoneal dose of alloxan (150 mg/kg). Mitochondria were isolated by differential centrifugation in the isolation buffer. Statistical analysis was done using Microsoft Excel, Office 2007. $P < 0,01$ was considered to be statistically significant. All manipulations with animals were carried out according to European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes and the law of Ukraine "On protection of animals from cruelty".

Succinate dehydrogenase is an enzyme complex bound to the inner mitochondrial membrane that converts succinate into fumarate, in a reaction coupled to the reduction of flavin adenine dinucleotide to $FADH_2$. According to the literature, succinate and its mitochondrial metabolites may participate in triggering of insulin release by pancreatic islets. Activity of mitochondrial SDH in diabetic rats was markedly lowered (by 16 %), probably due to impairment in the Krebs cycle activity.

Moreover, the enzymohistochemical observation shows a decrease of the activity of succinate dehydrogenase at the level of the proximal tubules of the nephron. These changes might have a critical role in determining the direction of electron flow. The decrease of activity of mitochondrial SDH perturbs cellular bioenergetics, supporting the metabolic disorders by diabetes mellitus.

In addition, the role of mitochondria in diabetes has not been fully elucidated and the energy metabolism under conditions of diabetes mellitus needs further studying.

Kondratieva I. V.*, Kobasa I. M.*, Kropelnyska Yu. V.
DYE SENSITIZED TiO_2 -BASED SOLAR CELLS

*Department of Chemical Analysis, Food Safety and Testing
Yuriy Fedkovych National University of Chernivtsi*
Department of Medical and Pharmaceutical Chemistry
Higher State Educational Institution of Ukraine
«Bukovinian State Medical University»*

The solar energy generation has significant potential and wide prospects to supply mankind with environmentally safe energy. However, the solar energy generation still covers less than 1 % of the total energy output. These photoelectrochemical redox systems built with the wide-zone oxide semiconducting materials sensitized with different dyes have better competitive potential and can easily be introduced into commercial energy production.

Gratzel cell is known as an especially promising type of the photoelectrochemical solar cells made of inexpensive components and without any sophisticated equipment.

Construction and development of the TiO_2 -based solar cells sensitized with different dyes and determination of their efficiency under various working conditions were the main aims of this work.



The simplest cell is a sandwich-like structure composed of two electrodes and the iodide-containing electrolyte. Both electrodes are made of the electroconducting glass plates. The anode is placed on the top of the cell and it should have a layer of the $\text{TiO}_2/\text{dye}/\text{polyethylenepolycarbonate}$ ($\text{TiO}_2/\text{D}/\text{PEPC}$) heterostructure located underneath in order to supply the light-generated excited electrons.

It has been proven that the photocatalytic reduction of methylene blue inside the synthesized heterostructures is induced by the light absorbed with the dye-sensitizer. However, photocatalytic activity of the material significantly depends on the dye content. Photoexcitation of the dye-sensitizer occurs under irradiation of the heterostructure with light with a wavelength $\lambda > 400$ nm. The photocatalytic activity shows initial increase followed by gradual lowering in all cases. Methylene blue reduces by $\text{TiO}_2/\text{D}/\text{PEPC}$ under irradiation with light with $\lambda > 400$ trough light absorption by the dye. Increase in the photocatalytic activity with content of the dye in the heterostructure seems quite expected and natural as a number of the excited molecules participating in the photocatalytic transformation rises with the dye concentration. Further decrease in photocatalytic efficiency of the materials occurred at massive application on the semiconductor surface can be caused by lower efficiency of the dye/semiconductor interaction that results in lesser probability of the excited electrons capturing in the conductivity band. This process causes worse functioning of the photocatalytic heterostructures.

Kushnir O.Yu., Yaremii I.M.

EFFECT OF MELATONIN ACTION IN DOSE 5 MG/KG OF BODY WEIGHT ON CONTENT OF REDUCED GLUTATHIONE IN MUSCLES OF RATS WITH ALLOXAN DIABETES

*Department of Bioorganic and Biological Chemistry and Clinical Biochemistry
Higher state educational establishment of Ukraine
«Bukovinian State Medical University»*

Oxidative stress plays a key role in the development of diabetes complications, both microvascular and cardiovascular ones. Melatonin, a potent antioxidant agent, is essential for glucose homeostasis and regulation. The influence of melatonin supplementation on the oxidative stress parameters in elderly NIDDM patients has been identified.

The aim of this investigations was to determine the effect of two weeks daily melatonin injection on changes in the content of reduced glutathione in skeletal muscles of rats.

The experiments were carried out on 18 sexually mature male albino rats with the body mass – (0,18 – 0,20) kg. Alloxan diabetes was evoked via injecting the rats with a 5% solution of alloxan monohydrate intraperitoneally in a dose of 170 mg/kg of body weight (b.w.). The animals were divided into three subgroups: 1) control group; 2) diabetic rats; 3) diabetic animals which were introduced the melatonin drug intraperitoneally in a dose of 5 mg/kg of b.w. at 8 a. m. daily during 14 days starting with the 5-th 24 hour period after the injection of alloxan. Tissues of skeletal muscles were taken immediately after the decapitation of animals and used to prepare 10% homogenates on 6% sulfosalicylic acid. Determination of reduced glutathione (RG) conducted by a titration method by I.V. Meschyshen. Statistical analysis of results was conducted by Student's test. The level was considered sufficient with the probability differences $p \leq 0,05$.

According to the results, in the skeletal muscles of alloxan diabetic rats the content of RG was by 38% lower than in the muscles of the control group animals. The introduction of melatonin intraperitoneally in a dose of 5 mg/kg at 8 a. m. daily during 14 days to alloxan diabetic rats was conducted to increase the content of RG, that did not differ from the control rats. A decrease in RG content in skeletal muscles of alloxan diabetic rats is indicative of the reduction of glutathione system of antioxidant protection under the conditions of manifest insulin deficiency. There are some possible reasons of RG reduction during diabetes mellitus – using too much RG by glutathione-dependent enzymes. There can be disturbances in RG synthesis or reduction from its oxidized form due to deficiency of NADPH (glucose-6-phosphate dehydrogenase enzyme – main source of NADPH – activated by insulin).

Pinelectomy is well known to lead to a decreased synthesis and secretion of melatonin, which causes insulin resistance and reduces the gene expression of glucose transporter GLUT 4 in muscles.

According to the results of the study, introduction of melatonin intraperitoneally in a dose of 5 mg/kg at 8 a. m. daily during 14 days to alloxan diabetic rats is a protection against exhaustion of RG reserves in rat muscles. Positive influence of melatonin is likely to be mediated by its direct antioxidant action and activation of antioxidant enzymes.

Thus, the content of reduced glutathione in skeletal muscles of alloxan diabetic rats is decreased. The introduction of melatonin intraperitoneally in a dose of 5 mg/kg at 8 a. m. daily during 14 days to alloxan diabetic rats is conducted to normalize the content of reduced glutathione in skeletal muscles.

Okrepka G.M., Vorontsov D.S.*

ANISOTROPIC PHOTOLUMINESCENCE PROPERTIES OF $\text{KH}_2\text{PO}_4:\text{CdTe}/\text{CdS}$ COMPOSITE CRYSTALS

*Department of Medical and Pharmaceutical Chemistry
Higher state educational establishment of Ukraine
"Bukovinian state medical university"
Institute of Biology, Chemistry and Bioresources
Yuriy Fedkovych Chernivtsi National University**

Recently, nanoparticles of semiconductors (quantum dots, QDs) are becoming more and more popular due to their unique electronic and optical properties. But they are synthesized in solutions, while devices where they could be