

**МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ  
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»**



## **МАТЕРІАЛИ**

**104-ї підсумкової науково-практичної конференції  
з міжнародною участю  
професорсько-викладацького персоналу  
БУКОВИНСЬКОГО ДЕРЖАВНОГО МЕДИЧНОГО УНІВЕРСИТЕТУ  
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**Conclusions.** Symmetric cationic dyes D<sub>1</sub>-D<sub>3</sub> were used for the first time as sensitizers of titanium dioxide. Spectral, electrochemical and energy characteristics of the dyes have been investigated and determined. Volt-ampere characteristics of the polymethine dyes have also been obtained, and their photosensitivity limits have been outlined.

**Krupko O.V.**

## INFLUENCE OF METHYLSILICATE ACID ON OPTICAL PROPERTIES OF STABLE COLLOIDAL SOLUTIONS OF CdS/L-CYSTEINE NANOPARTICLES

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**Introduction.** Obtaining nanoparticles of a given size and degree of dispersion is a complicated task, the solution of which is devoted to numerous studies. In order to create the structures of the nucleus / membrane, a pharmaceutical preparation methylsilicate acid hydrogel or polymethylsiloxane (PMS) was used  $(\text{CH}_3\text{SiO}_{1.5}\cdot n\text{H}_2\text{O})_\infty$ . According to its medical action, it is an enterosorbent – a drug that binds exo- and endogenous substances in the gastrointestinal tract by adsorption, absorption, ion exchange and complex formation.

**The aim of the study.** The aim of our work is creation of heteronanostructures of the "nucleus-membrane" type based on silicon dioxide nanoparticles and a shell from nanocrystals (NC) of CdS/L-cysteine (CdS/L-Cys) semiconductors.

**Materials and methods.** To observe the effect of a colloidal aqueous solution of PMS on the properties of semiconductor nanoparticles, CdS solutions synthesized at pH = 7 at different temperatures were used. The absorption spectra of nanocrystals were recorded on the USB-650 spectrophotometer and the MDR-32 monochromator in the wavelength range of 350-700 nm. As a standard of comparison, a solution of L-cysteine was used.

**Results.** The effects of the interaction of the components of the system start to manifest themselves only 6 days after the synthesis by the appearance of an additional absorption edge in the longwave area. The displacement of the absorption edge into the longwave area and the appearance of an additional area on the absorption curve indicates the formation of larger semiconductor particles and their possible adsorption on the surface of the injected adsorbent. An increase in the PMS content naturally shifts the absorption edge to the longwave area. With an increase in PMS content by 10 times, the absorption edge has noticeably shifted to the longwave area compared to the initial solution. The assessment of the average size of nanoparticles or their aggregates adsorbed by the surface of PMS particles gave a value of 6.4 nm (at a radius of 3.2 nm) after maturation for 3 hours (Fig.).

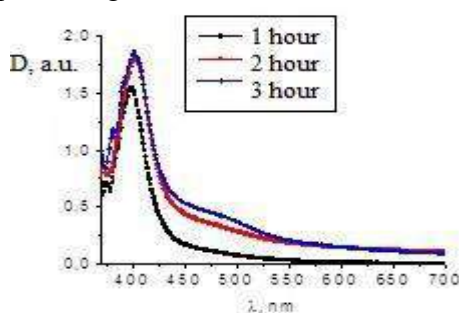


Fig. Evolution of absorption spectra of colloidal solutions of CdS/L-Cys/SiO<sub>2</sub> nanocrystals synthesized at pH=7 and temperature 10°C.

The study of the optical characteristics of solutions made it possible to observe the evolution of spectra associated with the adsorbing of "large" nanoparticles of a semiconductor on the surface of the adsorbent used. With time, the effect of adsorption is also observed visually by the appearance of a yellowish jelly-like precipitate at the bottom of the vessel. In this case, the solution above the precipitate is enriched with particles of small size (1-4 nm). Thus, it has been found out that PMS solution can be used for size-selective precipitation of L-cysteine-stabilized CdS nanoparticles using environmentally friendly reagents.

**Conclusions.** The injection of an aqueous solution of methyl silicate acid into colloidal solutions of NC CDS can stimulate both the growth of NC and the size-selective precipitation due

to the adsorption of NC semiconductor on the surface of the adsorbent, regulating the pH and synthesis temperature of the initial solution.

**Kushnir O.Yu.**

## **IMPAIRED GLUCOSE TOLERANCE IN THE BLOOD OF ALLOXAN DIABETIC RATS UNDER LONG TERM MELATONIN INJECTIONS**

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**Introduction.** An increasing number of studies have shown that melatonin, as the main product secreted by the pineal gland, plays a vital role in the occurrence and development of diabetes. Melatonin ameliorates hypertrophic growth of the myocardium induced by hyperthyroidism and provides an insight into the mechanism of reactive oxygen species-mediated downregulation of metabolically important genes such as GLUT4 in the heart. There is evidence that impaired glucose tolerance (IGT) is a risk factor for cardiovascular disease. Melatonin and its metabolites have potent antioxidant/anti-inflammatory properties, and they have proven to be highly effective in a variety of disorders linked to inflammation and oxidative stress. Hyperglycemia-mediated oxidative stress plays a crucial role in diabetic complications.

**The aim of the study.** To investigate changes of the carbohydrate metabolism in the blood of alloxan diabetic rats with impaired glucose tolerance on the background of melatonin injections under long term experimental conditions.

**Material and methods.** Experiments were conducted on 50 sexually mature male rats with a body weight of 0.18 - 0.20 kg. Diabetes was induced by intra-abdominal injection of a 5% solution of alloxan monohydrate at the rate of 170 mg/kg of body weight. The GTT (glucose tolerance test) measures changes in blood glucose concentration over a 2-h period following the administration of a bolus of glucose. Animals were divided into 3 groups: 1) control group; 2) group with IGT (prandial glycemia (PG) <6.9 mmol/l; postprandial glycemia (pPG)  $\geq$ 8 mmol/l); 3) diabetic animals with IGT, which were injected with melatonin. Melatonin (Sigma, USA) was injected intraperitoneally at the rate of 5 mg/kg of body weight daily for 42 days, starting on the 5th day after the injection of alloxan. Blood was taken from the tail vein to assess glycemia level using OneTouchUltra (LifeScan, USA). Rats were sacrificed on the 47th day of experiments in accordance with the ethical treatment of animals. Blood was taken to determine the activity of the enzymes glucose-6-phosphate dehydrogenase (G6PD), pyruvate kinase (PK) by standard methods. Statistical analysis was performed using Statistica 10 (StatSoft Inc).

**Results.** Pyruvate kinase activity in erythrocytes of animals with IGT decreased by 18% and same time activity of G6PD increased by 35%, respectively, compared with the control. The changes may be the result of less insulin production due to disturbances in free radical mechanisms caused by alloxan monohydrate injection and inhibition of pyruvate dehydrogenase activity. We have reached the recovery of the PK and normalization of G6PD activities in the blood of diabetic rats through melatonin injections. Impaired glucose tolerance in the blood of alloxan diabetic rats under long-term melatonin injections was stabilized, while in such conditions PG and pPG did not differ from control. Possible melatonin has the ability to increase the body uptake of glucose from the circulation system into organs and tissues, such as muscle and adipose tissue.

**Conclusions.** We have determined that long-term melatonin injections improved glucose tolerance in alloxan diabetic rats with preserved glycemia.

**Lenha E.L.**

## **ANTIOXIDANT AND RHYTHMOREGULATING EFFECT OF MELATONIN ON THE TOTAL ANTIOXIDANT ACTIVITY OF BLOOD SERUM**

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**Introduction.** The issue of correcting violations of the antioxidant status is important in the therapy of organ and tissue damage caused by various factors, such as viruses, toxins, radiation