

**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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Конференція внесена до Реєстру заходів безперервного професійного розвитку,  
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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) ≥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

exposure, which activate the formation of reactive oxygen species and, along with the direct destruction of cells and organelles, are triggers of metabolic processes dysfunction.

**The aim of the study.** To determine the influence of melatonin on the level and chronorhythms of changes in the total antioxidant activity (TAOS) of the rat's blood serum with toxic hepatitis under the conditions of different functional activity of the pineal gland (PG).

**Material and methods.** Experimental studies were carried out on white non-linear male rats weighing  $170 \pm 10$  g. For 14 days before the beginning and throughout the experiment, the animals were kept under different conditions of the light regime (simulation of different functional activity of the pineal gland): group A - PG normofunction - (12 hours of light: 12 hours of darkness); group B – PG hypofunction - (24 hours of light: 0 hours of darkness); group C – PG hyperfunction - (0 hours of light: 24 hours of darkness). Daylight lamps with an intensity of 1500 lux were used in the experiment. On the 15th day of light exposure, subgroups were formed in each group of animals: I - control - continued to be kept under the appropriate conditions of the light regime; II – animals were injected intragastrically with melatonin solution (3 mg/100 g of body weight) every day at 8:00 a.m.; III – 50% oil tetrachloromethane solution in a dose of 0.25 ml/100 g of mass was administered intragastrically to the animals twice (every other day); IV – after tetrachloromethane intoxication (see group III), animals received melatonin for 7 days (see group II). Animals were euthanized by decapitation under light ether anesthesia at 8:00 a.m. and 8:00 p.m. TAOS of blood was shown as a percentage of inhibition of spontaneous peroxide oxidation of endogenous lipids of the brain (according to the content of malondialdehyde). Statistical processing of the obtained results was carried out using the Student's parametric t-test.

**Results.** Analyzing the obtained results, was established that the TAOS has a rhythmic activity during the day with a predominance in the evening hours. Under the conditions of different functional activity of the PG, this rhythm is preserved, however the absolute values differed under the conditions of hypofunction of the PG (group B1 by 9% and 6% lower at 8:00 and 20:00, respectively, compared to animals of the A1 group) and hyperfunction of the PG (group C1 at 18-20% exceeded the indicators of group A1). When melatonin was administered, the TAOS tended to increase in all groups of animals compared to the control with the highest probability under conditions of normofunction of the PG (13-15%, respectively, at 8:00 a.m. and 8:00 p.m.). Intoxication of animals with tetrachloromethane caused changes in both the chronorhythm and the absolute values of TAOS. There was a tendency to reversion of the rhythm with predominance of activity in the morning hours regardless of lighting conditions. As for the absolute values, the decrease in activity was from 17% (group III at 8:00 a.m.) to 40% (group VIII at 8:00 p.m.). In tetrachloromethane intoxication condition, the introduction of melatonin contributed to the restoration of the TAOS rhythm in the blood with a predominance in the morning hours and contributed to an increase in indicators in all groups of animals approaching the level of control values: in the AIV group by 30% (8:00) and 46% (20:00); in the VIV group by 16% (8:00 a.m.) and twice at 8:00 p.m.; in the CIV group by 21% and 37% at the corresponding hours.

**Conclusions.** Under the conditions of toxic hepatitis, melatonin shows a positive effect on the total antioxidant activity of the blood and increases its level under conditions of different functional activity of the pineal gland (the most likely changes are observed under conditions of hypofunction of the gland). In addition, melatonin exhibits the properties of a regulator of the daily rhythms of the TAOS of the blood, which arise during the development of oxidative stress due to toxic liver damage.

**Lukan Yu.R.**

## **SYNTHESIS AND PHYSICOCHEMICAL PROPERTIES OF $\text{AgInS}_2$ NANOPARTICLES**

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**Introduction.** The semiconductor material of group I-II-VI,  $\text{AgInS}_2$ , due to its unique photoelectric and catalytic properties, is widely used in the field of photovoltaic solar cells and low-toxic photostable molecular analyzers. The advantages of these quantum dots (QDs) are that their