



of sodium ions ( $RFNa^+$ ) was calculated by the formula:  $RFNa^+ = C_{cr} \cdot PNa^+ - V \times UNa^-$ . Proximal and distal reabsorption of sodium ions was also investigated ( $T^pNa^+$ ;  $T^dNa^+$ ). The calculations were carried out according to the formulae:  $T^pNa^+ = (C_{cr} - V) \times PNa^+$ ;  $T^dNa^+ = (PNa^+ - UNa^-) \times V$ . The condition of glomerular-tubular and tubular-tubular balance was assessed by conducting the correlation analysis between the processes of glomerular filtration, absolute, proximal, distal reabsorption of sodium ions and relative water reabsorption.

According to the conditions of the development of nephrolithiasis with concrement of 0.6-1.0 cm in size under low sodium diet the mechanisms of glomerular-tubular and tubular-tubular balance with the presence of positive correlation of glomerular filtration with absolute, proximal reabsorption of sodium ions and relative reabsorption of water in each examined group are being kept.

The dysfunction of glomerular-tubular and tubular-tubular balance increases in the following sequence: the upper third part of ureter with the tendency of correlational relationship strengthening of relative water reabsorption from the glomerular filtration, absolute, proximal reabsorption of sodium; the middle calyx with the formation of two new negative correlation dependencies of diuresis, distal reabsorption of sodium with the relative reabsorption of water; the upper calyx with the creation of eight new negative correlation dependencies in the structure of glomerular-tubular and tubular-tubular balance.

**Semenenko S.B.**

### **THE PECULIARITIES OF CHRONORHYTHMICAL ALTERATIONS OF ION REGULATING RENAL FUNCTION AGAINST BLOCKADE OF NITROGEN MONOXIDE SYNTHESIS UNDER CONDITIONS OF PINEAL GLAND HYPERFUNCTION**

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Kidney sare responsible for the production of hormones and substances which are of a similar structure. They play an important role in redistribution of fluids in the body, vascular tone and intensity of the electrolyte excretion. The hormone of the pineal gland (PG) melatonin takes an important part in providing chronoorganisation of physiological functions.

That's why the objective of our work was to find out the particularities of chronorhythmical reconstruction of ion regulating function of the kidneys under above mentioned conditions.

The experiments were carried out on 72 mature nonlinear male rats with the body weight of 0,15-0,18 kg. The animals were kept in the vivarium under the constant temperature and humidity of air and were fed on as usual. The control group was composed of animals (n=36) which were kept under normal light conditions (12.00L:12.00D) for a week. The group of examination consisted of animals (n=36) which were kept in a permanent darkness (00L:24.00D) for a week. On the eighth day the animals were given 5% water test with warm running water at a room temperature. Then the parameters of ion regulating function of the kidneys under conditions of forced diuresis were examined. The experiments were carried out with a 4-hour interval per day. The results were processed "Kosynor-analysis" statistical method and by the methods of variation statistics.

As far as control animals are concerned their ion regulating function of the kidneys is subordinated to accurate circadian organization.

Under conditions of PG hyperfunction and additional blockade of nitrogen monoxide (NO) synthesis a considerable increase of natriuresis occurs. The daily rhythm of sodium ions excretion was of a sinusoidal character. Absolute reabsorption of the cation decreased in all periods of day, and an average level of this index was reliably lower as compared to those in the control group. An average level of a distal transport of sodium ions under conditions of circadian oscillations as compared to the control group decreased reliably. The phase structure of rhythm was similar to the chronograms of control rats.

Therefore, hyperfunction of PG against blockade of NO synthesis resulted in circadian alterations of renal transport of sodium ions.

**Tymofiychuk I.R.**

### **THE CHANGES OF HISTOLOGICAL PROTEO- AND FIBRINOLYTIC ACTIVITY AND THE LEVEL OF NITROGEN MONOXIDE METABOLITES IN RATS OF DIFFERENT AGE UNDER CONDITIONS OF EXPERIMENTAL DIABETES**

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Aging is a significant factor modifying neurochemical status of the brain. Oxidative stress, which is the reason for brain tissue degeneration with age, can initiate the modification of tissue proteo- and fibrinolytic activity. It can result in alterations in homeostasis on the cellular and tissue levels as well as in the whole human organism stipulating the reasonability of studying the reactions of proteo- and fibrinolytic cerebral systems in rats of different ages.

The objective of our investigation was to carry out the analysis of dependence of proteo- and fibrinolytic activity of tissues on nitrogen monoxide synthesis in rats of different ages against the conditions of experimental diabetes mellitus.



The experiment was carried out on nonlinear laboratory male rats at the age of the age of 1 month (young animals), 5 month (adult animals), 18 month (old animals). Non-enzymatic, enzymatic and total fibrinolytic activity was measured in rats with experimental diabetes. Proteolytic activity in homogenates of the brain structures was measured according to the intensity of stainin gafter the reaction with a zoalbumin, a zocasein and a zocol. The content of nitrates and nitrites (NO<sub>x</sub>) was measured by means of Griss's reagent in the blood plasma.

The constitutional proteolytic activity in accordance with lysis of high molecular weight proteins turned to be reduced in the area of hippocampus CA<sub>2</sub> and had the lowest values in the oldest rats. The similar age peculiarities of proteolytic activity status were found in the hippocampus areas according to the lysis of low molecular weight proteins in the area of hippocampus CA<sub>1</sub> and collagen in the area CA<sub>3</sub>. Age differences of the total and enzymatic fibrinolytic activity reduction were pronounced in the hippocampus CA<sub>1</sub> and CA<sub>2</sub> of old rats. There were no reliable changes found in the area CA<sub>3</sub>. The constitutional changes of proteolytic and fibrinolytic activity correlated with changes in metabolites content of NO in the blood plasma of rats from different age groups, and in rats from the oldest age group respectively these values were 2,7 times higher in comparison with the younger ones and 1,3 times lower than in adult ones. Diabetes mellitus striggered a reliable increase of NO level as much as twice in adult rats and caused reduction of this value by 1,5 times.

The study found individual differences between the parameters of histological proteolysis and fibrinolysis in different areas of hippocampus of young adult and old rats. This condition is indicative of age dependence of decrease in activity and enzymes amount, which against additional pathological process can become a reason of accelerated of brain aging and development of neural degeneration in the brains structures.

**Yasinska O.V.**

### **SEX-RELATED EFFECT OF HYPOBARIC HYPOXIA ON PROTEOLYSIS IN ADRENAL GLANDS OF IMMATURE RATS ACCORDING TO ALTERED PHOTOPERIOD DURATION**

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Hypoxia is one of the conditions of usual mode in mammal's life. A peculiar feature of the systemic adaptation to hypoxia is a lot of polyorganic, morpho-functional disturbances, formed with participation of the neuro-endocrine system, the manifestations of which depend on the age, sex and the presence of influence of other environmental factors. Structural-functional change of the adrenal glands is a typical manifestation of organs reaction to the hypobaric hypoxia, varying correspondingly to age, sex, and functional activity of other endocrine glands. Melatonin is the main hormone of the pineal gland of the brain, which not only synchronizes the rhythms of peripheral tissues but also has anti-stress and antioxidant defenses, and promotes the body to adapt to dangerous effects of the environment, including hypoxia. Changing the intensity of proteolytic activity in peripheral tissues in the process of reaction to a variety of environmental factors may occur both as manifestation of regenerative processes, and as their involvement in the mechanisms of apoptosis.

The objective of the research was to study specific characteristics of sex-related changes of proteolytic activity in tissues of the adrenal glands of immature rats under ordinary conditions of keeping and hypoxic conditioning by systemic intermittent hypobaric hypoxia of changes, caused by constant lighting.

The experiments were carried out on 58 immature laboratory albino male and female rats. Proteolytic activity was determined according to azoalbumin (LMWP-lysis), azocasein (HMWP-lysis) and azocol (collagen-lysis). The designed model of intermittent hypobaric hypoxia (equivalent to 4000 m above sea level, 2 hours daily for 14 days) combined with a varying duration of the photoperiod (natural duration of photoperiod and constant lighting) causes different changes of the proteolytic activity in the tissues of the adrenal glands of male and female immature rats with varying intensity, depending on the sex of animals and on the duration of photoperiod.

Simultaneous action of hypobaric hypoxia and constant lighting led to increase of proteolysis indices concerning all kinds of protein molecules: LMWP lysis increased by 25% in female and by 37,8 % in male, lysis of HMWP increased by 28% in female and by 60,5 % in male, as comparing to the control one. Accordingly, simultaneous action of hypobaric hypoxia permanent lighting causes in the most of all experimental groups increase of proteolysis intensity, concerning macromolecular proteins in particular. At the same time, lysis of collagen remained insignificantly higher in comparison with the control one and substantive hypoxia. Detected peculiarities of the reaction of the tissue proteolytic indices in the adrenal glands in immature rats to the applied factors and their combinations are indicative of sex related dependence of the sensitivity of the immature rats to a separated action of medium non-damaging intensity of environmental factors and different intensity of the process of adaptation under various conditions, and equalization of reaction of both male and female immature animals to simultaneous action of influences.

Modeling of the decreased melatonin-producing function of the pineal gland by application of constant lighting resulted in significant increase of the activity of proteolytic processes in the tissues of the adrenal glands in both male and female immature rats, that may testify to intensification of elimination of oxidation-modified protein molecules, formed by reducing of tissue antioxidant capacity according to melatonin deficiency. Sex-related differences in response of indicators of proteolysis condition in the adrenal gland as the main organ of adaptation process in immature animals are indicative of genetic-dependent peculiarities of reactivity of the body response mechanisms due to the action of environmental factors to their isolated and combined impact.