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У збірнику представлені матеріали 106-ї науково-практичної конференції з міжнародною участю професорсько-викладацького колективу Буковинського державного медичного університету (м. Чернівці, 03, 05, 10 лютого 2025 р.) зі стилістикою та орфографією у авторській редакції. Публікації присвячені актуальним проблемам фундаментальної, теоретичної та клінічної медицини.

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THE INFLUENCE OF CHRONIC EXOGENOUS HYPOXIA ON THE IONOREGULATORY FUNCTION OF THE KIDNEYS OF RATS

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Introduction. The effect of hypoxia on numerous physiological and biochemical processes in tissues and cells is twofold and oppositely directed. Renal parenchymal hypoxia has been documented under a large number of clinical conditions, and in most cases, it contributes to the progression of chronic kidney diseases. However, one of the factors, on which the manifestations of multiorgan, morphofunctional disorders that are formed at the systemic level under the influence of hypoxia depend, is the duration of hypoxic exposure. Therefore, knowledge of the mechanisms of oxygen deficiency compensation and the mechanisms of adaptation to hypoxia in the dynamics of its development has not only theoretical but also applied significance. At the same time, the state of the ionoregulatory function of the kidneys under the conditions of chronic exogenous hypoxia has not been sufficiently studied.

The aim of the study. Study of the influence of chronic exogenous hypoxia in the dynamics of its development on the state of the ionoregulatory function of the kidneys of rats.

Material and methods. Experiments were conducted on white laboratory nonlinear male rats of reproductive age weighing 120-180 g. Hypobaric hypoxia was simulated in a modified flow-through pressure chamber imitating the ascent of rats to an altitude of 4000 m above sea level at a speed of 24 km/h. The animals were kept in the chamber for 2 hours daily from 1 to 4 weeks. The ionoregulatory function of rat kidneys was characterized by the concentration of sodium and potassium ions in urine, excretion of these electrolytes, and indicators of proximal and distal transport of sodium ions.

Results. The concentration of sodium ions in the urine increased intensively with the prolongation of the duration of hypoxia: in the first week of the experiment – by 1.6-fold, in the second week – by 2.2-fold, in the third week of exposure to hypoxia – by 2.5-fold, and in the fourth – by 3.3-fold compared to intact animals. A constant increase in sodium excretion was observed starting from the first week of exposure to hypoxia (by 1.25-fold) and already by the second week of the experiment – by 1.9-fold; in the third and fourth weeks, this indicator remained high (by 1.96-fold and 1.94-fold more than the control respectively). However, a significant decrease in the filtration charge of this electrolyte is recorded only in the fourth week of the experiment (by 1.5-fold), which indicates a limitation of the filtration loading of nephrons with sodium during this period of exposure to hypoxia. The indicator of the excretory fraction of sodium ions increased rapidly from the first to the fourth week of the experiment and was twice as much as the control in the fourth week. The absolute reabsorption of sodium ions significantly decreased in the fourth week of the experiment by 1.5-fold, while changes in the concentration index of sodium ions remained unidirectional – from the first week of the experiment, its constant increase was observed (1.5-fold), in the second and third weeks – by 2-fold, and in the fourth week of the experiment – by 2.5-fold. Such significant changes in the concentration index of sodium ions in the fourth week were detected due to inhibition of proximal cation reabsorption in this period by 1.6-fold. Violation of the distal transport of sodium ions was characterized by a significant decrease of 1.3-fold during this period of exposure to hypoxia. The dynamics of the ion imbalance of potassium was even more complex: the content of potassium ions in the urine significantly increased compared to the control and gradually increased with the prolongation of the duration of hypoxia – in the third and fourth weeks of the experiment (by 5.6-fold and 5-fold respectively). Excretion of potassium ions also increased maximally during the third and fourth weeks of exposure to exogenous hypoxia.

Conclusions. Thus, the obtained data indicate significant violations of the ionoregulatory function of the rats' kidneys (constant increase in sodium excretion with impaired proximal and distal reabsorption of this electrolyte and pronounced kaliuresis), and the changes increase with the duration of exposure to hypoxia and are maximally expressed in the fourth week of the experiment.