RESEARCH OF THE ENERGY METABOLISM PARAMETERS IN RATS WHEN INHALED BY REACTIVE OXYGEN SPECIES

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Currently much attention is paid to the integrated evaluation of the therapeutic potential of the various sources of reactive oxygen species (ROS) [2, 4, 6]. Among them refers singlet oxygen (SO), traditionally viewed as the messenger in the implementation of photobiological processes and photodynamic therapy [4, 6]. In the last decade were created devices for saturation of the air flow to this ROS and were being conducted active research of the prospects of the use of this technology in the correction of various diseases [2-4, 6]. On the other hand, molecular cellular effects of gaseous SO were studied enough [3], therefore, the aim of the study was served as a comparative analysis of the impact of SO on the parameters of the energy metabolism.

Material and methods. The experiment was performed in 45 healthy Wistar rats were divided into 3 groups (15 rats in each): control group (without manipulation); the group with SO inhalation within 10 days of 10 minutes; a group with inhalation of ozone-oxygen mixture (ozone concentration of 60 mcg/l).

We used the device «Airnergy» (Germany) as generator SO. Ozone-oxygen mixture was received with an ozonator BM-3. Animals were deduced from the experiment for 10 day under anesthesia. We investigated the activity of lactate dehydrogenase in direct and reverse reactions by G. A. Kochetov [1] in the blood and homogenates of rats organs (liver, kidneys, lungs, heart). The protein concentration was determined by the method of Lowry. We calculated the coefficient of the balance of the energy reactions (CBER) for receiving integral representations about the state of the energy metabolism [5]. The obtained data were processed in the software package Statistica 6.0. We used the U-test Mann-Whitney to evaluate of the statistical significance of differences in view the character of distribution of the characteristic.

Results and discussion. Studies have shown that inhalation sources ROS healthy animals cause a change of lactate dehydrogenase activity in the direct and return reactions. This leads to violation of the ratio of lactic acid and pyruvic acid. This indicates a substantial transformation of intermediate metabolism of the tissues cells. Detected changes were observed both in blood and in homogenates of the studied organs, but their severity varies.

We early demonstrated that integral characteristics of lactate dehydrogenase activity changes may be executed by estimation of the CBER. It was stated that in animals blood this parameter was increased in 3.07 times ($p<0.05$) under singlet oxygen inhalations. We fixed minimal reduction of

CBER in rats blood under use of dry ozone-oxygen mixtures.

In rats liver both factors induced the stimulation of energy metabolism, but ozone inhalations stipulated CBER more clearly (in 1.82 times; $p<0.05$). In kidney tissue marked activation of direct reaction of lactate dehydrogenase was registered under use of ozone-oxygen mixtures (in 1.71 times; $p<0.05$).

Important clinical value has a results of CBER dynamics in heart and lung homogenates. In cardiac tissue inhalations of singlet oxygen and gaseous ozone led to stimulation of energy metabolism with aerobic glycolysis activation. In lungs ozone use caused more pronounced effect with CBER increasing in 1.83 times ($p<0.05$), and singlet oxygen inhalations elevated the parameter level in 1.3 times ($p<0.05$).

Conclusion. Thus, gaseous sources of ROS (ozone and singlet oxygen) contribute to the activation energy metabolism in various organs and tissues. It is provided the shifting of functioning of lactate dehydrogenase predominance of activity of direct reaction under return reaction of enzyme. This has a significant adaptive importance and may cause sanogenetic effects of the ROS when using as a therapeutic agent.

References

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