THE CHANGE OF ENERGY METABOLISM IN THE BLOOD AND TISSUES OF ANIMALS UNDER THE INFLUENCE OF REACTIVE OXYGEN SPECIES

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Background: At the present time considerable attention is paid to a comprehensive assessment of the therapeutic possibilities of different sources of reactive oxygen species (ROS). Among the relatively new of them can be attributed to singlet oxygen (SO), traditionally regarded as the messenger in the implementation of photobiological processes and photodynamic therapy [1]. However molecular and cellular effects of gaseous singlet oxygen are studied insufficiently.

Aim of the study: To conduct a comparative analysis of the impact of singlet oxygen on parameters of energy metabolism of animal blood and organs.

Materials and methods: The experiment was performed on 45 healthy Wistar rats: 15 rats – control group without any manipulation; 15 rats – group, received a daily 10-minute inhalation of SO from the device "Airnergy" (Germany); 15 rats – group with the inhalation of the ozone-oxygen mixture with O_3 concentration 3000 mcg/l from an ozonator BM-3 (Russia). The animals were removed from the experiment under anesthesia on 10 day. The activity of lactate dehydrogenase (LDH, EC 1.1.1.27) in direct (LDHdir) and reverse reactions (LDHrev) was investigated in the erythrocytes and homogenates of liver, kidneys, lungs, heart. The protein concentration was calculated by Lowry's method [3]. The coefficient of energy reaction balance (CERB=(LDHdir/LDGrev) / (LDGrev/LDGdir) × 100) was calculated [2].

Results: It was established that the inhalation of ROS have a significant impact on the activity of LDH in the direct and reverse reactions in the blood and in the homogenates of organs. When inhalation of the SO the CERB in the blood increased (in 3.07 times; $p<0.05$), when the impact of ozone-oxygen mixture the CERB was reduced. In rat liver SO and ozone-oxygen mixture lead to stimulation of energy metabolism, and more CERB increased with inhalations of ozone (in 1.82 times; $p<0.05$). The marked activation of LDHdir was observed in kidney only in inhalation of the ozone-oxygen mixture (in 1.71 times, $p<0.05$). The results of the evaluation of the dynamics of CERB in the heart and lungs have clinical importance. In the heart SO and ozone-oxygen mixture leads to stimulation of energy metabolism with the activation of aerobic way, in the lungs ozone has a more pronounced effect, increasing CERB in 1.83 times ($p<0.05$), and SO - in 1,3 times ($p<0.05$).

Conclusion: Thus, the gaseous sources of ROS (ozone and SO) contribute to the activation of energy metabolism in various organs and tissues, the activity of LDHdir higher than the activity of

LDHrev. This has significant adaptive value and may cause sanogenetic effects of ROS data when used as a therapeutic agent.

References

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