International Conference 'Advances in Pneumology'
Bonn, 17-18 June 2011

THREE-PHASE RESPIRATORY RESPONSE AND HYPERGLYCEMIA DURING RECOVERY FROM ACUTE HYPOXIA

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Tissue response on hypoxia may be connected with carbohydrate metabolic changes. Tight co-localization of oxygen and glucose receptors in carotid body was found, that may indicate an association of these regulatory ways. On the other hand, hypoxia-inducible factor(HIF) subunits demonstrate stabilization and transactivation abilities under oxygen and/or glucose deprivation. The aim of the investigation was to examine interrelation between changes of glucose metabolism and breathing pattern regulation after acute hypoxia. Theexperimentswereperformedin 6-monthsmaleWistarrats, which were exposed to hypobaric hypoxia séance (5600 m in barochamber during 1 or 3 h). The values of gas exchange, breathing pattern, body temperature, and glycemia were registered during 2 week period after hypoxic episode in conscious animals. In the same time points tissue samples were excised under urethane narcosis, and used for determination of expression of glucose transporter GLUT-1 mRNA by real-time PCR. It was shown that 3 h, but not 1 h hypoxic influencecaused hyperglycemia after the séance. In the both group of hypoxic animals, the recovery period after hypoxia was divided into three phases. The first phase (1-3 days), hypometabolic, was characterized by two waves of gas exchange reduction: immediately, and in third dayafter the séance. Body temperature was more reduced at beginning of hypometabolic phase. The second phase (5-7 days), rehabilitative, was characterized by increase of oxygen consumption and lung ventilatory function, by body temperature recovery, and hypoglycemic reaction. In the third, adaptive phase (7-14 days), stabilization of gas exchange and ventilation was found, but body temperature and glycemia values were diminished. In the group after short-time hypoxic influence, glycemia changes were accompanied with similar changes of breathing and gas exchange. But in the other group a weak correlation between these values was appeared. In general, the first group had a less extent of hypometabolic reaction, and less significant but more durated rehabilitative phenomena. In the lung tissue, GLUT-1 expression increased at the end of hypometabolic phase that may indicate insulin independent glucose transport intensification. In adaptive phase, GLUT-1 expression in lungs has been reduced. In the right heart ventricle, hypoxia led to reduction of GLUT-1 expression, maximally in 5 day. The values have been partially recovered in adaptive phase. The data evidence that in the heart insulin dependent glucose transport appears to be more essential during hypometabolic and rehabilitative periods, and glucose resources may be used for heart and lung function by specific ways. Thus, short-time hypoxia was accompanied with delayed hypoglycemia, which activates regulatory mechanisms similarly to hypoxia. Prolonged hypoxia caused more pronounced energy substrate deprivation, which may be compensated through contra-insulin factors and rapid hyperglycemic reaction. At this time, insulin independent glucose transport can be useful. The

changes of breathing pattern and gas exchange, which developed after hyperglycemia during recovery period, have weak correlation with glucose metabolism that may evidence distinction of their regulatory ways.