

CARBOHYDRATE AND LIPID METABOLISM REBUILDING UNDER HYPOXIA: MECHANISMS AND THERAPEUTIC POTENTIAL

V. Portnichenko, A. Portnychenko, V. Nosar, M. Vasylenko, and T. Lapikova-Bryhinska

International Centre for Astronomical, Medical and Ecological Research, NAS of Ukraine; Bogomoletz Institute of Physiology, NAS of Ukraine; 4 Bogomoletz str., 01024 Kyiv, Ukraine, vport@biph.kiev.ua

Earlier we have found favourable effects of moderate hypoxia of different regimen on lipid and carbohydrate metabolism in human and animals: attenuation of hyperglycemia, impaired glucose tolerance, and reduction of total cholesterol and its fractions in blood plasma [Portnichenko V. et al., 2008-2016]. The metabolic changes occurred in a phasic manner, and mediated by induction and repression of hypoxia-sensitive genes. We showed the alternate transactivation of HIF-1 α and -3 α subunits, and the modification of glucose transport by consecutive induction of GLUT-4 and -1 in rat myocardium and lungs. Mitochondrial respiration in tissues was shifted from down - to up-regulation, and from carbohydrate to lipid substrate using. In health volunteers we found attenuation of plasma levels of transcriptional regulator of cholesterol synthesis SREBP-1, leptin and IGF-1, which correlated with HDL-cholesterol and triglyceride levels. In patients with metabolic disorders (metabolic syndrome, diabetes mellitus, dyslipidemia), favourable influence of moderate chronic, acute or periodic hypoxia was found, but metabolic pathology was associated with altered pattern of regulatory protein expression. The data evidence the both metabolic and genetic basis of the relationship between carbohydrate and lipid metabolism modification under hypoxia, and demonstrate the possibilities for hypoxic correction of metabolic disorders.