Pathophysiology of hypoxia

The theory of phase metabolic changes at intermittent hypoxic training may be used for the prevention of severe acute immobilization stress

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During periodic hypoxia and chronic immobilization stress, similar phase changes of energy metabolism have been identified. Four consequent phases was characterized: hypometabolic (1-5 day), metabolic shift (5-7day), hypermetabolic (7-14 day) and adaptive (after 14day). It raises the question: whether it is possible knowing the regularities of these changes in energy metabolism during periodic hypoxia use them to enhance the resistance to severe acute immobilization stress. From this point of view, the hypermetabolic phase was the most interesting among others. We compared the pattern of respiration, gas exchange, mitochondrial respiration in two groups of conscious male rats (300-550 g): those trained to intermittent hypoxia (12 day, 12% O2, 30min, n = 12) and normoxic control (n = 8). Both groups were exposed acute severe immobilization stress (6h). In the control group stress resulted in decrease of breathing pattern values, energy metabolism and NAD-dependent mitochondrial respiration in gums, and finally in hypometabolic state development. The prevention of stress with intermittent hypoxic training led to increased metabolic rate and raised of breathing pattern values, energy metabolism and NAD-dependent mitochondrial respiration, and after stress all values returned to normal. Thus, resistance to severe acute immobilization stress during the third phase of intermittent hypoxia is significantly increased.