

ANTIOXIDANT ENZYMES AND OXIDATIVE STRESS ADAPTATION TO EXERCISE TRAINING IN HYPOXIA

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Background: Exposure of the human body to hypoxia is a well-known environmental stressor that can modify the function of the cardiovascular system by decreasing arterial pressure of oxygen (PaO₂) leading to impairment of tissue oxygenation. Hypoxia and exercise training may modulate the activity of antioxidant enzymes and cytokines expression, which are involved in the regulation of anti-inflammatory responses and tissue protection. The present study was undertaken to investigate the effects of hypoxia, equivalent to an altitude of 2500 m, on antioxidant enzymes, oxidative stress, and inflammatory markers.

Methods: Twelve endurance-trained athletes performed training under normoxia (NT) and normobaric hypoxia (HT) (FiO₂ = 15.2%). Serum cardiac biomarkers, HIF- α , vascular endothelial growth factor (VEGF), cytokines, and total antioxidant status were analyzed before and after both training protocols.

Results: Activities of superoxide dismutase (SOD) and glutathione peroxidase (GPx) in erythrocytes significantly increased in response to exercise in hypoxia. We observed a significant effect of exercise and hypoxia on transforming growth factor β ($p = 0.01$) and creatine kinase activity ($p = 0.05$). There were no significant differences in the interaction of exercise training and hypoxia between variables of antioxidant defense. It can be concluded that hypoxia and normoxia training induced the same changes in the redox state at rest and after the graded exercise test.