

Histopathological changes in myocardial and nerve tissue under the influence of hypobaric hypoxia, physical exercise and antioxidants

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Abstract

Background. Antioxidant supplementation can influence histological changes in myocardial and nerve tissues, after altitude exposure and physical exercise, conditions under which oxidative stress occurs.

Aims. To study the histopathological changes induced in the myocardium and the encephalon by physical exercise and antioxidant supplementation after exposure to hypobaric hypoxia.

Methods. The research was performed using the Hi-Lo model, in 4 groups of white male Wistar rats, under laboratory conditions corresponding to the altitude of 364 m, O₂ = 20.93%: group I – sedentary controls, kept under normoxia conditions; group II – sedentary animals, kept under normoxia conditions and supplemented with an antioxidant complex daily, for 28 days; group III – animals exposed to hypobaric hypoxia corresponding to a 5500 m altitude for 28 days, followed by exercise under normoxia conditions; group IV – animals exposed to hypobaric hypoxia for 28 days, followed by the administration of an antioxidant complex and daily exercise. Groups II and III received a complex of antioxidants – Antioxidant Optimizer, produced by the Jarow company (2010 Jarow Formulas, Los Angeles), distributed by Secom, in a dose of 45 mg/kg body weight, by oral gavage, daily, before exercise. The histopathological study was performed on the myocardium and 3 encephalic areas: hippocampus (Ammon's horn), thalamus and cerebral cortex.

Results. Hypobaric hypoxia exposure followed by exercise has beneficial effects on the heart, with a reduction in the number of the foci of chronic progressive cardiomyopathy, and on the nervous system, with the reduction in the number of apoptotic necrotic neurons. The administration of an antioxidant complex does not influence the cardioprotective and neuroprotective effects of hypoxic preconditioning, followed by physical exercise.

Conclusions. The Hi-Lo model involving the association of severe chronic intermittent hypobaric hypoxia and aerobic physical exercise under normoxia conditions has favorable cardioprotective and neuroprotective effects.

Keywords: hypobarism, physical exercise, antioxidants.