Antioxidant complex administration and the serum and tissue oxidant/antioxidant balance in hypobaric hypoxia exposed exercise-trained rats

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Abstract

Background. Studies on exercise at altitude and the favorable effects of increasing exercise capacity when returning to lowlands, especially in endurance exercise, have become a very topical subject after the Olympic Games in Mexico City (1968) held at 2241 m. Intermittent exposure to hypobaric hypoxia associated with exercise can be done by several models: Hi-Hi (living high-training high), Hi-Lo (living high-training low), Lo-Hi (living low-training high), Hi-Hi-Lo (living high-exercise high-training low). In the present research we chose the Hi-Lo model (living at high altitude, training at low altitude), well known and used for competitive sports training.

Aims. We pursued the influence of an antioxidant complex administration on the serum and tissue oxidant/antioxidant balance under exercise conditions after exposure to hypoxia in rats.

Methods. The research was performed using the Hi-Lo model, in 5 groups of white male Wistar rats, under laboratory conditions corresponding to the altitude of 364 m, O2=20.93%: group M – sedentary controls, kept under normoxia conditions, group I – exercise trained under normoxia conditions, group II – supplemented with an antioxidant complex and exercise trained under normoxia conditions, group III – exposed to hypobaric hypoxia for 28 days, followed by exercise under normoxia conditions, group IV – supplemented with an antioxidant complex, exposed to hypobaric hypoxia for 28 days, followed by exercise under normoxia conditions.

Results. Our results show significantly increased MDA and PC levels and significantly decreased DH and GSH levels in the serum, in all groups, compared with controls. In brain tissue, PC levels were significantly increased and GSH levels were significantly decreased in all groups, compared with controls. In the myocardium, MDA and GSH levels were significantly increased and DH levels were significantly decreased in all groups, compared with controls.

Conclusions. Chronic hypobaric hypoxia exposure followed by moderate-intensity exercise, performed under normobaric conditions, determines: significant decreases in MDA in the serum and brain, significant increases in PC in the myocardium, significant decreases in DH and significant increases in GSH in the brain, compared to the exercise trained group. AO complex supplementation, hypobaric hypoxia exposure followed by moderate-intensity exercise, performed under normobaric conditions, determine: increases in brain MDA and decreases in myocardial DH, compared to the hypobaric hypoxia-exposed exercise-trained group.

Keywords: antioxidants, hypobaric hypoxia, exercise, rats.