The influence of chronic hypothermic and anakinetic stress on the redox balance in carnitine supplemented rats

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Abstract

Background. Hypothermia and immobilization are stressful agents used in order to induce experimental laboratory stress.

Aims. The study evaluated the effects of chronic hypothermic and restraint stress on the serum oxidant/antioxidant balance in rats with and without carnitine supplementation.

Material and methods. The study was performed in four groups of male adult Wistar rats (n=10 animals/group), during 15 days: group I - exposed to hypothermic stress (5°C), group II - exposed to anakinetic stress, group III - exposed to combined stress (hypothermic - 5°C - and anakinetic stress), group IV - supplemented with carnitine and exposed to combined stress. Blood samples were used to determine the level and activity of the oxidative stress (OS) indicators - malondialdehyde (MDA), carbonylated proteins (CP) and antioxidant (AO) system - hydrogen donor capacity (HD), thiol groups (SH), reduced glutathione (GSH).

Results. The statistical analysis performed in the 4 groups revealed that chronic combined stress induced significant increases in MDA, CP and decreases in HD and SH in the serum, compared to chronic hypothermic stress. Regarding chronic combined stress, there were significant increases in MDA and CP, and decreases in HD, SH and GSH compared to chronic anakinetic stress. Carnitine supplementation in chronic combined stress conditions (group IV) induced significant changes by diminishing the MDA levels and increasing SH and GSH compared to the combined stress group (III).

Conclusions. Our experimental results show that chronic combined stress (hypothermic and anakinetic stress) increases the oxidative stress (OS) indicators and decreases antioxidant (AO) defense indicators in the serum, compared to chronic hypothermic and anakinetic stress. Carnitine supplementation in chronic combined stress conditions has beneficial effects by diminishing OS indicators and by increasing AO defense, in the serum.

Keywords: chronic combined stress, hypothermic stress, anakinetic stress, carnitine, oxidant/antioxidant balance.