



### Effects of different concentrations of hydrogen on oxidative stress in rats with high intensity exercise

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**Objective** Exercise-induced oxidative stress is due to the massive increase in free radicals caused by strenuous exercise, which exceeds the ability of self-clearing. It is one of the main causes of sports injury and sports fatigue. Eliminating excessive production of free radicals is the key to alleviating exercise induced oxidative damage. Therefore, the purpose of this study is to study the effect of hydrogen on exercise-induced oxidative damage, to explore its possible mechanism and to explore the best dose of hydrogen with different concentrations.

**Methods** 40 male SD rats (200±20g) were randomly divided into five groups(n=8):sedentary, exercise control, low concentration hydrogen with exercise(H1), medium concentration hydrogen with exercise(H2), high concentration hydrogen with exercise(H3). The rats performed high-intensity exercise for 4 weeks, except the sedentary. rats that with Low, medium and high concentration hydrogen were placed in a hydrogen atmosphere with a concentration of 0.5%, 1% and 1.5% for 1 h immediately after each exercise (keeping the concentration of oxygen and nitrogen in the environment the same as those in the air). The rats were weighed weekly during the experiment. The next day after 4 weeks of training, the samples were collected, and the contents of total superoxide dismutase (T-SOD), catalase (CAT), total antioxidant capacity (T- AOC) and malondialdehyde (MDA) were determined respectively.

**Results** The weight of exercise control was significantly lower than sedentary in the third and fourth weeks of exercise ( $P<0.05$ ). Compared to sedentary rats, there was no significant difference in the weight of rats between H1, H2 and H3 group. The contents of T-AOC, CAT and T-SOD in exercise control were significantly higher than those in sedentary ( $P<0.05$ ). The content of CAT in H2 group was significantly decreased compared with exercise control ( $P<0.01$ ). Compared with exercise control, the T-AOC and T-SOD in the H2 group showed a downward trend but no statistical difference ( $P>0.05$ ), there was no significant difference between the above indexes, compared with sedentary. In addition, there was no difference in T-SOD and CAT content between H1 group and exercise control; Compared with exercise control, there was no significant difference in T-SOD, T-AOC and CAT in H3 group. At the MDA level, each exercise group increased significantly compared with the sedentary ( $P<0.05$ ), and the MDA levels in the H1, H2, and H3 groups were decreased compared with the exercise control, but there was no statistical difference.

**Conclusions** It can be seen from the above results that different concentrations of hydrogen intervention can improve the weight loss of rats after intensive exercise. More importantly, the dosage and effect of 1% concentration of hydrogen is easier to remove the excessive radicals produced by intense exercise in the body, avoid the aggravation of oxidative stress, and have very good therapeutic effect. It provides a theoretical basis for the further study of the application of hydrogen in exercise oxidative damage.