Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
OR-038

CHANGE of SERUM TESTOSTERONE and ENDOCRINE INDEXS after CRYOTHERAPY in DIFFERENT AGE GROUPS

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Objective Ultra-low Temperature Whole-Body Cryotherapy can relieve pain, inhibit inflammation, improve sleep quality, promote immune regulation, reduce excessive muscle tone, and improve damaged joints and muscle function. Currently, it is widely used in competitive sports. There have been few studies on the effects of Ultra-low Temperature Whole-Body Cryotherapy on some endocrine indexes such as testosterone. In the previous study, it was found that the 25-year-old soldier had a good effect on the changes of hormones and other indicators after the cold treatment the next morning and after a week of cold treatment. However, the impact of Ultra-low Temperature Whole-Body Cryotherapy on large age groups with a marked decline in testosterone secretion has not yet begun. Therefore, this study intends to pass a rigorous controlled experiment, taking ordinary healthy men aged 20 and 40 as research subjects, to observe the changes of testosterone and other endocrine indicators before and two hours after cryotherapy for 2 different age groups. Investigate deeply of the changes in testosterone and other endocrine indicators after ultra-low cryotherapy in the general population of different ages, to provide more reference for the application of ultra-low temperature cold therapy in a wider population.

Methods Eight male students with age of 22.0±0.8 yrs in the physical fitness class of Beijing sport university as group A. Eight healthy men with age of 42.2±4.5yrs as group B. The cold therapy parameters used in the experiment were -130 ° C ,for 150 s. The blood samples collected in group A were from 8:00 to 9:00 in the morning， immediately after cold therapy， 30 minutes after cold therapy,， and 2 hours after cold therapy. In group B were collected before cold treatment and 2 hours after cold treatment. In order to avoid the influence of the time rhythm of testosterone secretion, the time points of blood sample collection during cold therapy and non-cold therapy were strictly consistent. Group A and group B were compared before and after cold treatment at the same time at room temperature. No statistical comparison was made between groups A and B. The test indicators were testosterone (T), follicular stimulating hormone (FSH), luteinizing hormone (LH) and estradiol (E2). The data obtained from the experiment were expressed by mean and standard deviation, and the relevant indicators collected were statistically analyzed.

Results (1) Compared with the test value of before cryotherapy, Testosterone(T) in group A had a decrease of -7.8%, -13.4%, and -3.6% at the point of the cryotherapy finished immediately, 30 minutes after cryotherapy, and 2 hours after cryotherapy, respectively. There has been a continuous decline in the Control group with a decrease of -5.7%, -11.3%, and -12.0%, respectively. Compared with the test value of before cryotherapy, there was a significant difference at each time between the cryotherapy group and the control group; there was also a significant difference between the two groups at 2 hours after the cryotherapy. (2) Compared with the test value of before cryotherapy, FSH in group A increased 8.6% after cryotherapy immediately, increased 2.3% at the time of 2 hours after cryotherapy, However, the control group showed different degrees of decline, with a decrease of -4.09%, -6.9%, and -6.4%, respectively. And there were significant differences in FSH between the time point of after cryotherapy immediately and 30 minutes after cryotherapy compared with before cryotherapy. (3) Compared with the test value of before cryotherapy, group A had an increase of 7.9% in LH immediately after Cryotherapy and 1.0% in 2 hours after cryotherapy, while the control group showed different degrees of decline, with a decrease of -13.4%， -13.5% and -8.0%.（4）Compared

with the test value of before Cryotherapy, group A showed different degrees of decline in E2 as immediately after cryotherapy, 30 minutes after cryotherapy and 2 hours after cryotherapy with the decrease ranges of -8.6%, -21.9% and -35.2% respectively. The changes of the control group were 8.7%, -18.7% and -22.6%, respectively. There were significant differences between the cryotherapy group and the control group at 30 minutes and 2 hours after the cryotherapy compared with before the intervention.(5) Before cryotherapy and 2 hours after cryotherapy, FSH and LH in group B decreased in cryotherapy and control, but the decrease in cryotherapy group was higher than control group; The change of T was different from FSH and LH. After the cryotherapy, the cryotherapy group showed a significant increase, which was 27% higher than before the cryotherapy, while the control group decreased by -7.5%,and there was a significant difference in T between the cryotherapy group and the control group before and after cryotherapy.

Conclusions (1)Ultra-low Temperature Whole-Body Cryotherapy has a certain degree of influence on the hypothalamic-pituitary-gonadal (H-P-G) axis. Testosterone will increase 2 hours after cryotherapy, and Ultra-low Temperature Whole-Body Cryotherapy can promote testosterone secretion.(2) Ultra-low Temperature Whole-Body Cryotherapy can reduce the decomposition of testosterone and improve serum testosterone to some extent. (3) Ultra-low Temperature Whole-Body Cryotherapy is more effective in promoting testosterone secretion in people with relatively high age and testosterone secretion relative to the downhill stage (35-40 years old and older).