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Influence of different intensity exercise on immune factor in the hot and humid environment

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Objective to study the influence of exercise on immune factor IL-2、IL-3、IL-6 in the hot and humid environment by comparing the changes of leukocytes after different intensity exercise with the normal environment, exploring the training program which is beneficial for the immune system in the hot and humid environment, and supply the theoretical basis for the sports training and National Physical Fitness in the hot and humid area.

Methods The experimental subjects were 32 healthy male college students of Guangzhou Sports with an average age of 20.9 years. All the subjects tested the maximum oxygen uptake before the experiment, and then were divided into the control group, the 55%VO₂max sports group, the 70%VO₂max sports group and the 85%VO₂max sports group. The experimental subjects took a treadmill running in the normal environment(20-25°C;RH: 55-60%) and finished the same exercise training program in the hot and humid environment(30-32°C; RH: 90-95%) after a week, collected the elbow venous blood before and after exercise in the normal environment, The main test indicator contained IL-2、IL-3 and IL-6, Training program: control group sit quietly for 30 min; The 55%VO₂max group: Movement×2, 15min one time, Interval 5 min; The 70% VO₂max group: Movement×3, 10min one time, Interval 5 min; The 85%VO₂max group: Movement ×4, 7.5 min one time, Interval 5 min; All data were calculated using SPSS 25.0, Mean + / - standard deviation (Mean + / - SD), paired T test, single factor variance and multifactor variance analysis. P<0.05 was the significant level, and P<0.01 was the very significant level.

Results 1、IL-2 is mainly produced in activated T lymphocytes, which can promote T cell proliferation, improve the secretion and function level of NK cells, play an important role in immune regulation and is an important regulatory factor. Under normal circumstances, IL-2 of the body of each exercise group increased slightly after acute exercise, but there was no statistical significance ($p>0.05$). In the humid and hot environment, IL-2 decreased in all groups after exercise, and the decrease in the quiet group was large, but there was no statistical significance($p>0.05$). 2、IL-3 is a multipotent hematopoietic regulatory factor that ACTS on the proliferation and differentiation of hematopoietic cells, mainly produced by activated T lymphocytes. Under normal circumstances, the IL-3 increase of 55% VO₂max and 85% VO₂max group was not obvious after exercise, while that of 70% VO₂max group was not obvious before and after exercise. After acute exercise in hot and humid environment, IL-3 increased in all groups, but there was no statistical significance($p>0.05$).

Compared with the normal environment, IL-3 increased after exercise in each group. 3、IL-6 plays an important role in the regulation of motor mediated function, known as kinematic factor, mainly from stimulated mononuclear macrophages, fibroblasts and vascular endothelial cells. Skeletal muscle can also express IL-6 under exercise stress, which is involved in the repair of muscle cell injury and plays an important regulatory role in skeletal muscle metabolism. Under normal circumstances, after exercise, there was a significant increase in all the exercise groups, among which 55% of the VO₂max group and 70% of the VO₂max group had a significant difference in IL-6 before and after exercise ($p<0.05$), and 85% of the VO₂max group had a very significant difference ($p<0.01$). In the humid and hot environment, IL-6 increased after thermal stress in the quiet group, and IL-6 increased

significantly after acute exercise in all the exercise groups ($p<0.01$). Compared with the normal environment, IL-6 increased more significantly and significantly in each group after exercise.

Conclusions The combined effect of heat stress and exercise stress on human immune function in the thermal environment is more significant than that of heat stress or exercise stress alone. The greater the intensity of exercise, the decrease of IL-2 and the significant change of IL-6, the more attention should be paid to the temporary immunosuppression caused by excessive intensity of exercise in the humid and hot environment.