



ANALYSIS OF CROSS-ADAPTATION TO COLD EXPOSURE AND PHYSICAL EXERTION

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Abstract

The adaptive changes that occur in the body under the influence of hardening (dousing with a cold shower 2 times a day for 6 weeks) and running training on a treadmill (30 minutes at 70-80% of the individual maximum oxygen consumption, 3 times a week, for 6 weeks) were compared in 6 of the same subjects. The interval between the two sets of training was more than 3 months. The indicators recorded during the ramp test and the standard cold test before and after each training cycle were compared. It is shown that the patterns of adaptive shifts in adaptation to factors of different modalities are very different. Shifts in adaptation to physical activity turned out to be generally more pronounced than in adaptation to regular cold exposures. The individual diversity of adaptive reactions testifies to the expediency of developing new approaches in the theory of adaptation related to the study of physiological individuality.

Keywords: Adaptation, hardening, physical training, ramp test, cold test, lactate, brown adipose tissue, facultative functions, physiological individuality.

Introduction

Human adaptation has been one of the most popular topics of physiological research since the middle of the twentieth century. To date, the idea of a multiplicity of ways (strategies) of adaptation is generally accepted, especially under the alternative or combined influence of environmental factors of different modalities, to which the functions of the organism are adapted.



More recently, the data obtained have again raised the question of the relationship between cold adaptation and physical training. This issue was studied in detail in the 80-90s of the twentieth century, and there was no unanimity in the assessments, as can be seen from the data given in Table 1. 1. According to Y.I. Bazhenov, who studied this problem in detail, the relationship between these two types of adaptation, if any, is rather negative. Similar results were obtained by I.A. Kornienko, who focused on the development of tissue mechanisms of contractile and non-contractile thermogenesis in the process of ontogenesis, including models of temperature adaptation of growing animals. An unequivocally negative result was demonstrated by Japanese authors, according to which training rats on treadmill leads to a decrease in the activity of interscapular brown adipose tissue (BHT).

At the same time, data have recently been obtained indicating a sharp activation of some metabolic capabilities of BRT cells under the influence of physical training. It became known that in the process of physical activity or thermal shivering, the peptide irisin is produced in the muscles, which is released into the blood and contributes to the activation of certain genomic complexes of fat cells, due to which white fat cells are transformed into beige - an analogue of BZHT cells, specializing in the function of non-contractile thermogenesis. Based on these results, it is appropriate to assume that there must be some functional relationship between motor activity and cold adaptation: either synergistic or antagonistic. Meanwhile, all these studies were carried out on small laboratory animals, but like a rat. The thermoregulatory activity of BZT in detrained and untrained animals was known, human adaptation has its own specifics and may differ in mechanisms from what is shown in animal experimental models. For example, recent attempts to stimulate the development or activity of human BAT through physical training do not necessarily lead to success: such exposure does not always increase the production of irisin, and there is not always a correlation between the content of irisin and the functional activity of BZT.

Given these circumstances and controversies, we have made a new attempt to investigate cross-adaptation to cold exposure and physical exertion. The previous article presented the results of the first series of studies in which the subjects adapted to running in a mixed aerobic-anaerobic range of loads. This training significantly increased the level of performance of all subjects, led to a slowdown in lactate accumulation during the control ramp test, but did not lead to the activation of non-contractile thermogenesis under standardized cold exposures.



This paper presents the results of the next series of experiments aimed at testing whether adaptation to cold affects performance indicators and, at the same time, the activity of noncontractile thermogenesis. An important feature of this study is the fact that the same individuals who adapted to running loads in the previous series of studies participated in it.

Method

The study involved 6 healthy volunteer subjects (5 men and 1 woman, aged 22-26 years) of varying degrees of physical fitness. All of them were participants in the experiment with running training described in the previous report. In order to neutralize the influence of the previous adaptive process, the interval between the two series of experimental exposures was at least 4 months, during which the subjects did not purposefully engage in any Exercise. All participants of the experiment underwent a medical examination and received admission to participate in the study with physical and cold exertion, and also gave written informed consent to the experimental procedures.

The experiment consisted in the implementation of a program of hardening training and the assessment of the functional characteristics of the subjects before and after the cycle of these trainings. We hypothesized that regular cold exposure should stimulate the activity or proliferation of BRT. We expected that stimulation of BAT would ultimately lead to a decrease in the concentration of lactic acid in the blood during physical activity and to an increase in the severity of the metabolic response to acute cold exposure. These considerations determined the overall design of the experiment. The hardening training was organized as follows. Hardening was carried out with the help of regular dousing with cold water. The duration of the cycle of hardening training was 6 weeks, the initial water temperature in the shower was 20 °C with a gradual (weekly) decrease by 1 °C, staying in the shower for 2 minutes.

Procedure:

Everyday in the morning and evening at home, the subjects took a cold shower for 2 minutes, pouring themselves completely.

References

1. Niyazmetov B., Akhmedov R., Mirzaolimov M. UNCOU'LED RESPIRATION IN BIRD MITICHONDRIA: CONNECTION WITH THERMOGENESIS //Bulletin of Namangan State University. – 2019. – T. 2019. – C. 18.
2. Mirzaolimov M. M., Abdullaev G. R., Abdullayev S. S. ROLE OF A CALORIE-RESTRICTED DIET IN PROLONGING THE LIFESPAN OF AN ORGANISM AND ITS MITOCHONDRIAL MECHANISMS //Scientific Bulletin of Namangan State University. – 2019. – T. 1. – №. 10. – C. 106-112.
3. Axmerov R. N. et al. ON THE POSSIBILITY OF UNCOUPLED MITOCHONDRIA IN BROWN FAT OF NEWBORN GUINEA PIGS //Scientific Bulletin of Namangan State University. – 2019. – T. 1. – №. 9. – C. 49-55.
4. Mirzaolimov M. M. et al. THE METHOD OF SEPARATION OF MITOCHONDRIAS AND DETERMINATION OF PHYSIOLOGICAL AND BIOCHEMICAL CHANGES IN ORGANISMS IN ONTOGENESIS //Scientific Bulletin of Namangan State University. – 2020. – T. 2. – №. 3. – C. 175-178.
5. Soliev N., Mirzaolimov M. ACTION OF CALCIUM ON THE CONTENT OF PHOSPHOTYDYLCHOLIN, PHOSPHATYL ETHANOLAMINE AND THEIR LYSOFORMS IN THE RAT LIVER MITOCHONDRIA //Scientific Bulletin of Namangan State University. – 2019. – T. 1. – №. 3. – C. 69-71.
6. Mirzaolimov M. M. Rakhimjonovich MAG EFFECT OF LIPID PEROXIDATION ON RAT LIVER MITOCHONDRIA IN POSTNATAL ONTOGENESIS // INTERNATIONAL JOURNAL OF DISCOURSE ON INNOVATION, INTEGRATION AND EDUCATION. – 2020. – T. 1. – №. 5. – P. 78-86.
7. Mirzaolimov M. M., Abdullaev Gofurjon Rakhimjonovich., Effect of lipid peroxidation on rat liver mitochondria in postnatal ontogenesis // International journal of discourse on innovation. Integration and education, Uzb, December. – T. 11. – P. 78-86.
8. Karimov M. A. et al. RESULTS OF COMPLEX TREATMENT OF ORAL HEMANGIOMAS. – 2023.