STUDYING HORMONAL CHANGES DURING TRAINING IN ATHLETES

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ABSTRACT

The effectiveness and comfort of the training process is influenced by many factors that are not always visible to the naked eye. In particular, the state of hormonal levels seriously affects physical activity. We will talk about this. Hormonal background - the ratio of hormones in the human body. Any fluctuations in it can cause various symptoms. For example, an imbalance leads to weight loss or weight gain, hair growth or loss in various places, dry skin, and other disruptions to natural processes. With the normal state of hormones in the body, a person experiences vigor, excellent tone, good mood and confidence in himself and his capabilities. There are many ways to maintain hormone levels in your body. One of them is physical activity. Sport affects not only the muscles and other organs of our body, but also the quantitative state of hormones.

Keywords: Hormones, sport, endocrine system, physical activity, cortisol, testosterone

INTRODUCTION

Intense physical activity affects secretion hormones that are involved in a number of metabolic processes. In particular, the literature is widely discussed increased cortisol and growth hormone. Moreover, the ratio of testosterone to cortisol has recently was proposed as an index of physical activity in male athletes. However, little is known about how hormonal changes in women under the influence physical activity, and only a few studies hormonal changes during a long observation period are discussed. High physical activity inherent modern sports have special requirements for the energy supplying system of the body of athletes. Athletic performance depends on how effective the athlete's body is will be able to mobilize and use energy substrates and how perfectly the system of regulation of these processes will be formed (1, 2). An important role in the adaptation of athletes to a high level of physical activity is traditionally assigned to the "pituitary - adrenal cortex" system, while one should not forget about the influence of the thyroid gland, the extremely significant role of which in the regulation of energy metabolism in the body is not raises doubts (3). Normal

thyroid hormone levels are required to function of all body systems, and in case of dysfunction changes are of a polysystemic nature (4). Thyroid hormones by increasing tissue sensitivity to adrenaline and norepinephrine increase the heart rate contractions, as well as themselves have a direct effect on the contractility of the heart: with a decrease in thyroxine concentration, it decreases, and with an increase, it increases (3). Positive inotropic effect of thyroid hormones is explained not only by their direct effect on the myocardium (participation in the synthesis and modulation activity of contractile proteins and transport calcium), but also the regulation of systemic vascular resistance.

LITERATURE REVIYEW

Regular exercises in the gym and other types of physical activity have a beneficial effect on the respiratory, cardiovascular, musculoskeletal systems of a person, his metabolism, mood and sleep. It should be noted that the nature and amount of stress is individual and depends on factors such as age, gender and initial health. For this reason, a comprehensive examination may be recommended before starting classes to assess the initial state of human health. This comprehensive survey includes the following analyzes:

Vitamin D plays a huge role in maintaining the health of the musculoskeletal system. Its deficiency in adulthood leads to disruption of normal bone mineralization and ultimately to osteomalacia. Calciferol (other names: 25-hydroxycalciferol, 25-hydroxycholecalciferol, calcidiol) is an intermediate metabolite formed at the first stage of provitamin D hydroxylation in the liver. For several reasons, 25 (OH) D is considered the most accurate indicator of vitamin D levels: it has a long half-life (about 3 weeks), reflects the rate of accumulation of both endogenous and exogenous vitamin D, and is less susceptible than other vitamin D metabolites the effects of parathyroid hormone and other humoral factors. A decrease in 25 (OH) D levels indicates a vitamin D deficiency(5).

Cortisol is one of the glucocorticoids produced by the adrenal glands in response to "stressful" stimuli, both physiological (fear, running) and pathological (illness). For this reason, it is often referred to as a stress hormone. Although the biological effects of cortisol are manifold (increased blood pressure, increased gluconeogenesis, suppression of the immune system), in general it can be said that this hormone has a pronounced catabolic effect. It has been shown that long-term intense exertion leads to a persistent increase in the level of cortisol, which can have an adverse effect on the body and, apparently, is one of the mechanisms of the development of the "overtraining" syndrome (sleep disturbance and coordination of movements, tachycardia, etc.)(6).

The thyroid gland plays an important role in the regulation of a person's basal metabolic rate and weight. To assess the function of the thyroid gland, the thyroid hormones triiodothyronine (T3) and thyroxine (T4) and the hormone of the adenohypophysis, thyroid stimulating hormone (TSH), are examined. T3 and T4 increase the metabolic activity of almost all organs, including adipose tissue. A deficiency in thyroid hormones (hypothyroidism) is associated with weight gain, while an excess (hyperthyroidism) is associated with weight loss. Balanced physical activity does not disturb the normal concentration of T3 and T4 (euthyroid state). On the other hand, any prolonged stress (including vigorous exercise) can lead to hypothyroidism (7-8).

Testosterone is a steroid hormone with pronounced anabolic effects. It is the main sex hormone in men. However, it also plays a role in the development and maintenance of the health of the female body. Testosterone ensures the growth and development of muscle mass and muscle strength, bone growth in dyne and its maturation. The physiological effect of testosterone is most pronounced during adolescence during puberty. In adults, increased testosterone levels (seen, for example, with the administration of testosterone or other anabolic drugs to improve physical fitness) also leads to increased muscle mass, but is also associated with a number of side effects, including an increased risk of heart disease and prostate cancer ... When interpreting the test result for testosterone, the following features of its metabolism should be remembered: testosterone synthesis is regulated by the luteinizing hormone (LH) of the adenohypophysis, the concentration of active testosterone depends on the level of sex hormone binding globulin, concentration depends on the level of follicle-stimulating hormone.

Estradiol is the main sex hormone in women. Due to the cyclical change in the level of female sex hormones under the influence of LH and follicle-stimulating hormone, coordinated changes occur in the ovaries (ovulation), endometrium (proliferation, secretion, menstruation or implantation) and cervix, which ensure the woman's fertility. Excessive exercise is known to disrupt this normal, cyclical nature of hormonal changes in the female body. This can result in menstrual irregularities (MCI) and secondary amenorrhea. Another common cause of amenorrhea may be an increase in prolactin concentration (8-9).

In highly qualified athletes, in the process of adaptation to physical activity, the neurohumoral regulation of all functional systems of the body [10, 11].

To study the functional state of the athlete's cardiovascular system, stress tests are used, in particular the treadmill test. They provide invaluable diagnostic information about the features of contractile activity: heart muscle, physical tolerance

load, individual normative and maximum permissible levels of its intensity, endurance thresholds, etc. [12].

The aim of this study was to study features of the functioning of the endocrine system in young men professionally engaged sports.

Changes in the functioning of the endocrine system, arising in the body due to prolonged exposure to increased physical activity, were revealed, indicators reflecting peculiarities of the athlete's body adaptation to high training loads.

Literature traditionally has a lot of attention is given to changes in hormonal status after physical activity at different time intervals, but there is not enough level study data hormones in the blood, as well as calcium and magnesium levels after vacation, in the inter-competition period.

At the same time, the study of these indicators in dynamics can help to understand whether the athlete's body has recovered enough, whether he is ready for training, competitions, etc.

RESEARCH METHODOLOGY

In modern endocrinology, the determination of the content of the hormone in the blood by its immunological activity. However, often in clinical practice, there is a situation when clinical the picture of the disease does not correspond to the level of the hormone in the blood, determined using the immunological method. That is why there is a need in more accurate methods for testing hormone levels in blood. Over the years, methods for determining the level of the hormone by its biological activity - biomethods. How do bio- and immuno-methods differ from each other? Biomethods measure functional impact and characterize hormonal activity. Immunoassays measure antigenic determinants and characterize hormonal concentration of hormones (11-12).

Multisteroid blood test: determination of vital human hormones at a qualitatively new level

The term "multisteroid analysis" refers to the determination of the profile of steroid hormones by gas chromatography-mass spectrometry.

The quantitative determination of the main steroid hormones and their metabolites in blood serum or salivary fluid using the reference method - tandem chromatography-mass spectrometry (in the scientific literature, this method is also referred to as LC-MS / MS) is a time-consuming and expensive procedure. A key feature of the method is the ability to determine all declared analytes in the course of one analysis (Fig. 1), therefore, in terms of one analyte, the cost of determination is almost less than by alternative immunochemical methods.

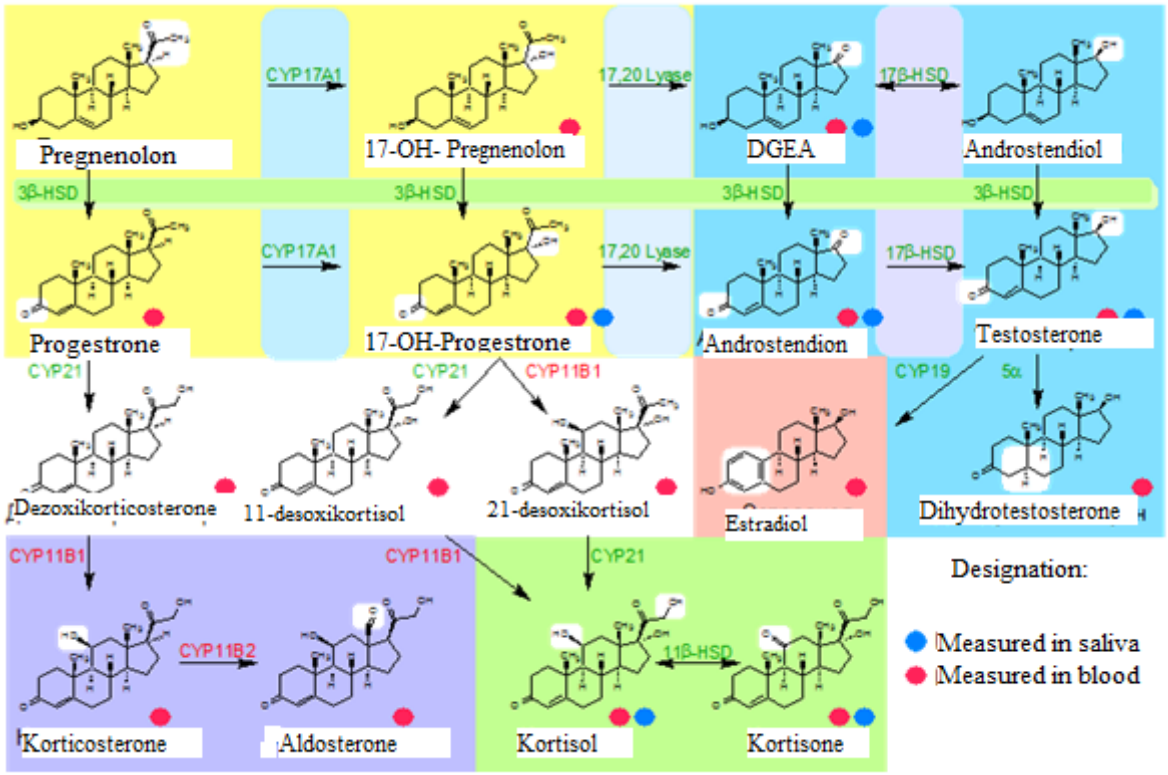


Fig 1. Analytes determined in one analysis, according to the method

Why does the name of the technique contain the designation of the biomaterial "blood"?

In order to immediately distinguish it from the well-known analysis of the "urine steroid profile". It should be noted that the information content of urine analysis is completely different and requires a different interpretation, since the urine contains mainly inactive forms of steroids: sulfates, glucuronides and hydroxylated derivatives that are no longer needed by the body and are derived from it. In the blood, the concentrations of active forms of steroid hormones are determined, which circulate in the general blood supply system, enter the cells and have a signaling effect on the genome.

ANALYSIS AND RESULTS

Participants were prospectively monitored throughout a 18-week period, with weekly physical activity assessments and 15 urine samples for estrogen, luteinizing hormone, testosterone, creatinine, and progesterone concentrations. Each girl and boy underwent body-composition measurements before and after the phsical activity. Analysis of the obtained data on the concentration of cortisol and 17αOHP (Table 1) in the state relative muscle rest in all groups in the comparative aspect of reliable no differences were found (P> 0.07). The testosterone level showed differences (P <0.07) between the indicators in the first group of young handball players and among peers who did not go in for sports, while these differences were not revealed between the

groups of athletes. DHEA-S level data resting state showed an increase in concentration in the 2nd group of young athletes in relation to the 3rd group of peers who do not play sports (P <0.07). Perhaps it is related with the fact that DHEA-S is involved in many general metabolic processes, and also contributes contribution to the development of the reproductive system.

Table 1

The content of the amount of hormones in the saliva of young handball players of the 1st and 2nd groups and non-sports peers in a state of relative muscle rest

Index	Group 1, M±m (*n*=30)	Group 2, M±m (*n*=30)	Group 3, M±m (*n*=30)	P1-2	P1-3	P2-3
Cortisol (ng / ml)	25,1±1,4	27,3±2,5	23,2±1,4	*P*>0,07	*P*>0,07	*P*>0,07
17αONP (ng / dL)	26,9±2,2	25,2±5,2	25,3±2,5	*P*>0,07	*P*>0,07	*P*>v
Testosterone (pg / ml)	177,3±6,7	193,0±8,9	154,0±6,7	*P*>0,07	*P*<0,07	*P*>0,07
DHEA-S (ng / ml)	8,87±0,23	7,37±0,79	6,75±0,7	*P*>0,07	*P*>0,07	*P*<0,07

Note: P1-2 - reliability of differences between indicators of young athletes of the 1st and 2nd groups; P1-3 - reliability of differences between indicators of young athletes of the 1st group and those of the control group (peers who do not go in for sports); P2-3 - the reliability of differences between the indicators of young athletes of the 2nd group and those of the control group (peers who do not go in for sports)

Conclusion: The steroid profile of athletes in blood and saliva can provide important information about their health, fitness, control the progress of training due to the optimal distribution of loads.

CONCLUSION

Multi-steroidal analysis is struggling to find its place in life, given the widespread use of immunoassay methods and resistance from adherents of traditional technologies. But this method is the future, it is already recognized by the best representatives of medical science. According to the analysis of the results, systematic physical activity, which is a “stressor” factor, due to adaptive reactions and activation of stress-realizing systems, cause an increase in the level of cortisol in young athletes at the stage of sports specialization. Similar dynamics was observed when determining

17αOHP in saliva and blood. At the same time, after an increase in the catabolic effect of cortisol (in response to standard physical activity), the concentration of testosterone in young athletes' increases.

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