



## Properties of Microbiogenic Elements in the Body of Athletes

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**Resume:** The article is devoted to the study of the characteristics of the metabolism of the most important microelements for athletes: chromium, iron, copper, zinc and selenium. A review of domestic and foreign literature on issues of diagnosis and correction of dyselementoses in athletes. Educational and training process of qualified athletes includes long-term high-intensity physical activity. Such a regime requires the intensity of metabolic processes, which means an increase in the need for minerals. Loss of bioactive elements leads to disruption of homeostasis. It has been established that the basis of these disorders is the deficiency of essential microelements. The use of vitamin-mineral complexes, specialized dietary supplements in elite sports is an auxiliary method of maintaining sports form.

**Key words:** athletes, mineral status, deficiency of elements, physical activity.

According to modern concepts, it is nutrition that determines the duration and quality of human life, creates conditions for optimal physical and mental development, maintains high performance, and increases the ability of the body to resist the effects of adverse factors. According to most experts, errors in the structure of nutrition, year-round deficiencies in the diets of essential micro elements have become one of the leading risk factors for maintaining health and disrupting the activity of adaptive-regulatory systems organism [1].

An analysis of the diets of athletes shows that the imbalance of diets remains one of the major problems. Training process for qualified athletes includes long-term high-intensity physical activity [2]. Such a regime requires the intensity of metabolic processes, increased costs and energy demand, vitamins and minerals [3]. Loss of bioactive elements lead to disruption of homeostasis, this, in turn, limits the vital athlete's body functions [4-6].

It is known that the vast majority of all naturally occurring chemical elements (81) found in the human body. 12 elements are called structural, since they make up 99% of the elemental composition human body (C, O, H, N, Ca, Mg, Na, K, S, P, F, Cl).

The main building materials are four elements: nitrogen, hydrogen, oxygen and carbon.

The remaining elements, being in the body in insignificant quantities, play an important role in affecting the health and condition of our body.

The mineral composition of the intracellular fluid, according to scientists, is similar to the composition prehistoric sea and is strictly maintained at the same level, even if at the same time you have to absorb chemical elements from other tissues (for example, bone).

Minerals, together with water, provide a constant osmotic pressure, acid-base balance, absorption, secretion, hematopoiesis, bone formation, blood clotting; without them, the functions of muscle contraction would be impossible, nerve conduction, intracellular respiration.

Trace elements act in the body by entering in one form or another and in small amounts in the structure of biologically active substances, mainly way of enzymes (enzymes).

A disturbed ecology, an increased pace of life with an inevitable increase in stressful situations, food processing methods that "kill" biologically active substances, not always high-quality food - this is not a complete list reasons for the growth of deficiency of vital microelements and excess of toxic, causing irreparable harm to health.

Residents of megacities usually suffer from an excess of heavy metals in the body: lead, arsenic, cadmium, mercury, chromium, nickel. It's no secret that heavy metals are hazardous to health.

For example, the accumulation of mercury in the body occurs imperceptibly, gradually, so mercury so insidious that when poisoned by it, no specific, bright pronounced symptoms. The result of such poisoning may be speech impairment, nervousness, the appearance of a state of fear, drowsiness, leukopenia (decrease the number of leukocytes in the blood).

Often you can observe such changes in the appearance of a person: hair become dull, with split ends, nails exfoliate and break, skin acquires an earthy hue, loses its elasticity.

Hair, like no other biological substrate, reflects processes over the years flowing in our body. The concentration of all chemical elements in the hair many times higher than in the usual liquids for analysis - blood and urine. Serum blood, for example, you can determine the content of 6-8 elements, and in the hair - 20-30.

Statistics show that the content of trace elements in hair reflects microelement status of the body as a whole, and hair samples are integral indicator of mineral metabolism. It is the hair that helps to diagnose chronic diseases when they do not yet manifest themselves.

An important advantage of this non-invasive (i.e. without penetration into tissues and organs person) of the method lies in the fact that sampling can be carried out without injury to the patient and the person is not at risk of getting any infection.

Iron is an important trace element for the normal functioning of an athlete's body [5]. Biological value is determined versatility of its functions and indispensability other metals in complex biochemical processes. Iron is part of hemoglobin, participating in the transport of oxygen, as part of myoglobin - in the transfer and provision of oxygen reserves in the muscles, as part of the cytochromes of the respiratory chain - in the processes of aerobic energy production in all cells of the body.

As a catalyst for oxygenation and hydroxylation reactions, iron is involved in production and removal of free radicals, in the processes of tissue proliferation and immune protection. Due to this physiological role iron, violations of its metabolism in an athlete have direct negative consequences regarding professional opportunities.

The mechanisms of regulation of iron absorption have not been fully elucidated, but it has been established that absorption is accelerated with its deficiency and slowed down with an increase in its reserves in the body.

Recent scientific research indicate that athletes who specialize in sports that require predominantly manifestations of endurance with long-term aerobic and aerobic-anaerobic loads, there are violations of iron metabolism, which dictates the need for pharmacological correction. For athletes, like As a rule, allocate polydeficiency (sports) anemia. Leading position among deficient elements in athletes with anemia occupies iron deficiency, accompanied by, as a rule, deficiency of zinc and copper [1, 2].

Copper is a vital element part of many vitamins, hormones, enzymes and respiratory pigments. It is involved in metabolic processes, in tissue respiration, is of great importance for maintaining the normal structure of bones, cartilage, tendons, elasticity of the walls of blood vessels vessels, pulmonary alveoli, skin. Her action on carbohydrate metabolism is manifested through acceleration of glucose oxidation processes, inhibition of glycogen breakdown in the liver [10].

Copper exchange can be judged using determining the level of ceruloplasmin in the blood serum, as well as the activity of copper-containing enzymes. The main manifestations of copper deficiency are associated with inhibition of absorption

iron, impaired hemoglobin formation, oppression of hematopoiesis, development of microcytic hypochromic anemia, deterioration of the activity of the cardiovascular system. Athletes may develop wall aneurysms blood vessels, cardiopathy, worsening conditions of bone and connective tissue, impaired bone mineralization, osteoporosis, bone fractures. [2].

Zinc is a unique trace element cofactor of a large group of enzymes involved in various types of metabolism. This element is required for the synthesis of proteins, incl. collagen and bone formation. The main manifestations of zinc deficiency are characterized by irritability, fatigue, memory loss, decreased visual acuity, loss taste sensations. Possible weight loss, emaciation, scaly rash on skin. Often there is a decrease in insulin levels, a decrease in T-cell immunity, a decrease in resistance to infections, anemia, accelerated aging [1].

The data obtained by Giolo De Carvalho indicate that in professional athletes during the competitive period, there is a significant decrease in the content of zinc.[2].

Zinc is an essential element and of greatest interest is his participation in

regulation of protein biosynthesis [3, 4]. The intensity of protein metabolism in the body of professional athletes is activated by constant high physical activity, which stimulate both the processes of muscle hypertrophy tissue, and the rate of resynthesis of functional proteins. In this regard, the initially low the level of zinc in the blood and urine of professional athletes, as well as even more decrease in its content for competitive period.

Chromium is a constant component of the cells of all organs and tissues, is involved in the regulation of fat synthesis and carbohydrate metabolism. Included in low molecular weight organic complex - glucose tolerance factor, which ensures the maintenance of normal glucose levels in blood. Promotes structural integrity

nucleic acid molecules, is involved in the regulation of the work of the heart muscle and the functioning of blood vessels [1]. Decreased chromium content is usually observed with stressful effects and intense physical activity [5].

In foreign literature, the question of the advisability of using additional food additives containing chromium in athletes [6]. Early research reported an increase in muscle mass and reduction of body fat with the use of chromium preparations. Some clinical tests have found that chromium supplements can promote weight loss [5].

Selenium is an element that performs numerous protective functions in the human body, stimulates metabolic processes. The biochemical function of selenium is participation in the construction and

functioning of glutathione peroxidase, glycine reductase and cytochrome C, the main antioxidant compounds. This microelement is necessary for the synthesis of iodine-containing thyroid hormones [6].

A lack of selenium in the body of an athlete leads to a violation of the integrity of cellular membranes, a significant decrease in the activity enzymes grouped on them, accumulation calcium inside cells, impaired metabolism of amino acids and ketone acids, decreased energy-producing processes [1]. Long-term positive changes in metabolic processes have been noted after the inclusion of selenium supplements in the diet of athletes [4].

Currently, research on macro- and trace elements is carried out in all biological environments of the human body: in the blood and plasma, saliva, urine, hair. Main analytical methods: inductively coupled plasma atomic emission spectrometry, inductively coupled plasma mass spectrometry, high performance liquid chromatography.

They provide the highest quality results. The most sensitive method that allows you to fix low concentrations of drugs in biological fluids, is a recognized and used worldwide method of gas chromatography-mass spectrometry. This method is currently used for doping control, as is the most accurate and indisputable [1-2].

Thus, the conducted studies indicate the presence of macro- and microelementoses in athletes, which characterizes the peculiarities of metabolism in conditions of increased physical activity.

Mineral deficiency is never isolated, but is always characterized by trace elements imbalance and is manifested by a significant violation of various types of metabolism. Timely correction of the mineral composition is the most important means of prevention in conditions of intense training and competitive loads. Providing the athlete's body with macro- and microelements should be carried out at the expense of the products of the main diet. The use of vitamin and mineral

Complexes, specialized dietary supplements in elite sports is an effective, but auxiliary method of maintaining the peak of sports form.

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