

The role and significance of selenium in clinical practice

L.V. Chernetsova

(Izhevsk State Medical Academy, Izhevsk, Russia)

In the last 15–20 years, the study of the biological role of selenium in human life and pathology has attracted more and more attention of researchers from different countries.

Selenium, which occupies the 34th cell of the periodic table, is a key trace element in the spectrum of minerals that a person needs. Of the 92 naturally occurring trace elements in the human body, 81 were found, while 15 of them (iron, iodine, copper, zinc, cobalt, chromium, molybdenum, nickel, vanadium, selenium, manganese, arsenic, fluorine, silicon, lithium) are recognized as essential, i.e. vital. Selenium is part of the most important enzymes and hormones, works in synergy with iron ions, iodine, copper, chromium, zinc, calcium, sulfur; vitamins E, C, bioflavonoids.

According to the Institute of Nutrition of the Russian Academy of Medical Sciences, more than 50% of Russians are clearly deficient in selenium. In areas of environmental disasters, it reaches 95-100%. The greatest deficiency of selenium in soils, local cereals and meat products is noted in the North-West of Russia, including the Moscow and Leningrad regions, in the Upper Volga region, in the Urals, in Siberia and in the Far East. In a number of regions of the country, selenium deficiency, in addition to natural factors, is associated with increased toxicity of the environment (Chelyabinsk, Sverdlovsk, Kemerovo regions, Altai Territory). The more carefully the soil is cultivated, the more we lose this element. Selenium is washed out by water, carried by the wind, and it is getting less and less. As a result, there are more and more areas on the planet with soil poor in selenium. Selenium deficiency diseases are more common in these areas.

For the normal functioning of enzymes, the level of selenium in the blood must be at least 160–170 mcg per liter of blood. For Russians, it fluctuates between 40-60 mcg. In Moscow, in particular, a moderate selenium deficiency was found in 80% of women of childbearing age, in 33% of children and 38% of men over 30 years old.

The reasons for selenium deficiency in the human body are manifold:

- widespread use of nitrate fertilizers and acid rain of industrial origin, which sharply reduce the ability of plants to assimilate selenium from the soil;
- burning of fallen leaves of trees and shrubs, last year's grasses, forest fires, which contributes to the conversion of organic compounds of selenium into indigestible selenides;
- cleaning of cereal grains from shells, along with other minerals and vitamins, in which up to 70% of selenium is lost;
- thermal processing of food contributes to the loss of up to 50% of selenium;
- Excessive consumption of refined sugar, which leads to an increased consumption of selenium in the body, since a modern person consumes 12 times more sugar than 100 years ago;
- lack of protein in the diet of a part of the population, which plays an important role in the transfer and accumulation of selenium, the formation of enzymes;
- hypovitaminosis C, detected in 90% of the population of Russia. This vitamin

- promotes the release of selenium from its compounds in the intestine and absorption into the blood, works with it as an antioxidant;
- disorders of absorption processes in the intestine in diseases biliary ways, liver, chronic gastroenteritis, intestinal dysbiosis, old age; which is especially pronounced in the elderly and
 - stress, unfavorable environment, alcohol abuse, smoking, widespread use of synthetic drugs, pregnancy, various chronic diseases.

On the selenium deficiency more often is developing failure connective tissue, which creates a fertile ground for the development of diseases as a result of malnutrition, cleaning and regulation of the work of cells. They lead to disorders of microcirculation of blood, lymph and intercellular fluid; a decrease in immunity, anti-inflammatory and regenerative abilities of the body, an increase in the tendency to the formation of chronic, sluggish processes that are poorly amenable to drug treatment, in contrast to acute diseases.

Insufficiency of connective tissue is especially manifested in the so-called critical periods of a person's life. They are associated with hormonal changes, hormonal stress in the work of enzymatic systems, disorders of adaptive processes during periods of active growth or aging of a person. During these periods, there is an increased wear of the body and its systems, a significant loss of vital energy.

There are five such periods:

- intrauterine and early postpartum up to 2 years;
- the formation of sexual functions (11-14 years old);
- "Christ's age" (29-33 years old), when the processes of active aging begin;
- pregnancy and breastfeeding. This period is especially dangerous when it coincides with the "Christ's age". At the same time, a woman often develops a whole "bouquet" of diseases, and a landslide aging of the body can occur;
- menopause in women and men (45-54 years old.).

Specialists in microelements have the concept of age-related "selenium pit", when the selenium content in the body drops sharply. This is the climacteric period and old age. It is during these critical periods of life that the regular intake of selenium against the background of vitamin and mineral preparations is most important.

The biological role of selenium is associated with its antioxidant properties due to its participation in the construction of one of the key antioxidant enzymes - glutathione peroxidase. Selenium deficiency leads to increased lipid peroxidation - a non-enzymatic chain process, the inadequate development of which threatens gross and irreversible damage to cell membranes, i.e. development of typical processes of cell damage that underlie the occurrence of many pathological conditions. In regions where there is little selenium, multiple sclerosis, glaucoma, and cataracts are more common.

Selenium is actively involved in the processes metabolism in the body, especially in the exchange of proteins and nucleic acids. Selenium-containing proteins are found in all cells and tissues, especially in the liver, kidneys, muscles, including

number in the heart muscle, thyroid gland, testicles in men. Selenium affects energy metabolism, in particular, its key link - Krebs cycle. It activates the enzyme cytochrome oxidase, forms coenzyme Q10 in the respiratory chain of ATP synthesis of cells as the main source energy. Selenium-containing enzymes are involved in the regulation of production substances with the highest bioactivity from polyunsaturated fatty acids (prostaglandins, prostacyclins, thromboxanes, leukotrienes), through the complex competitive relationship of which the state of cell membranes, vascular tone, blood viscosity, immunity, metabolism, inflammation, allergies are regulated in the body.

For constant cleansing of the body, in it, in the process of evolution, a special enzyme system has developed. The vast majority of xenobiotics and under-oxidized metabolic products dissolve only in fats. But the entire system for removing unnecessary substances from the body is built on working with water-soluble compounds and excreting them in urine, then, through the intestines and lungs. To cleanse the body, a system is needed for transferring substances from a fat-soluble to a water-soluble state with a simultaneous deprivation of toxic properties. It is at this stage that selenium plays an important role through the interaction of cytochrome enzymes and reactive oxygen species, fat peroxides, being included in the antioxidant system, which is a specific type of the body's detoxification function.

In the thyroid gland, kidneys, liver there is a special selenium-dependent enzyme deiodinase. It ensures the cleavage of one of the four iodine atoms from the thyroid hormone thyroxine. In this case, thyroxine is converted into the more active hormone triiodothyronine, which mainly provides the effects of iodine in the body. With a deficiency of selenium, the activity of glutathione peroxidase in the thyroid gland can decrease, which leads to damage to its tissue by free radicals. For these reasons, a lack of selenium in the body often leads to a decrease in the function of the thyroid gland, the formation of goiter, a slowdown in metabolism, and persistent obesity often develops. In such patients, the effect of thyroid hormone replacement therapy may be insufficient and increase only with the addition of selenium.

Against the background of selenium deficiency, iodine prophylaxis is ineffective, the clinical manifestations of iodine deficiency are significantly aggravated. Elimination of the combined deficiency of selenium and iodine is especially important in children and adolescents because of the possible pronounced negative impact on their mental and physical development.

In older people with thyroid dysfunction, enlargement, selenium supplementation is important for the prevention of cancerous degeneration. It has been established that the level of reproductive functions in men and women, the possibility of procreation largely depend on the supply of selenium and zinc. In men, selenium is involved in the production of the male sex hormone testosterone, maintains vitality and sperm motility, protects the prostate and testes from It has a damage. preventive and therapeutic effect with such common diseases like chronic inflammation and adenoma prostate, negatively affecting sexual and reproductive

ability of men. With the use of selenium in the treatment of prostate adenoma, very positive results have been obtained. When taking selenium for six months, not only the growth of the adenoma stops, but it is also possible to reduce its size, which avoids surgical treatment. In addition, there is an increase and restoration of potency.

It has been established that selenium-containing amino acids (methionine and cysteine) are able to inhibit the malignant degeneration of cells under the influence of radioactive and chemical substances that cause 80% of tumors in humans, therefore selenium preparations are effective in the treatment of oncopathology, especially against the background and after chemotherapy and radiation, reducing the only the intensity of the harmful effects of the latter on the body, but also prolonging the life of cancer patients by 10-12 years.

It was found that a decrease in the selenium content in the body contributes to the development of various forms of leukemia in people of different age groups. Appointment of selenium to such patients in sufficiently large quantities leads to a significant improvement in the general condition within 1.5-2 months, and the blood counts improve within 2-3 months.

In women during pregnancy and lactation, selenium consumption increases, and its deficiency is aggravated. At the same time, miscarriages, hypertension, edema, anemia, depressive conditions, late toxicosis, and birth weakness are much more common in pregnant women. Newborns of such mothers more often suffer from muscle weakness, underdevelopment of the spine and brain, heart defects, which now occurs in 40-60% of cases, lung diseases; disorders of physical and mental development, including increased excitability, excessive activity, decreased ability to learn.

In women with selenium deficiency, inflammatory processes, benign and malignant tumors of the female genital organs, infertility, and early menopause are much more often observed.

Selenium proved to be effective in the treatment of patients with various chronic inflammatory diseases (hepatitis, pancreatitis, nephritis, arthritis, ulcerative colitis, psoriasis, etc.).

With a sufficient level of selenium, the concentration of cholesterol, fats and glucose in the blood decreases, which is directly related to the prevention of atherosclerosis; the fat content in the liver decreases, which increases the activity of its work; the sugar level decreases.

Selenium enhances immune defenses against viruses, bacteria and fungi. Laboratory studies have shown that selenium activates the work of the main protective factors: leukocytes, macrophages, natural killer cells, antibodies, and the production of interferon. On the army contingents in Russia it was shown that taking selenium reduces the incidence of hepatitis A by 6 times, significantly reduces the frequency and recurrence of pustular skin diseases. A high incidence of selenium deficiency in HIV-infected patients and its relationship with the severity of the disease and the rapidity of the development of AIDS have been established.

In the last decade, many developed countries have taken measures to provide people with selenium (selenization) through the mass information system, the use of fertilizers with selenium, its addition to food products, the importation of products obtained in selenium-rich regions,

popularization of selenium-containing dietary supplements.

Excellent results of population selenization were obtained in Finland, where only in 1992-94. the number of newly registered cardiovascular diseases decreased by 2.5 times, the incidence of cancer, endocrine pathology - by 77%, overall morbidity - by 47%, and life expectancy over the past 10 years has increased by 10-15 years.

The aim of our study was to study the presence and degree of deficiency of essential trace elements in patients with various types of "diseases of civilization" using the developed algorithm "Elements of the Periodic System" by the ART method "IMEDIS-TEST". The object of observation was 56 patients in the conditions of specialized departments of the sanatorium "Metallurg". Selenium deficiency was found in 100% of cases, fluorine - 14.3%, sulfur and potassium - 46.4%, magnesium - 66.1%, silicon - 67.9%, calcium - 87.5%, iodine - 91.1%, zinc - 87.5% against the background of the simultaneous detection of an excess of heavy metals: strontium, cadmium, mercury, tellurium. We have explained the detected change the principle of selective accumulation, based on the fact that if the cells do not receive the necessary minerals in sufficient quantities, then the body begins to intensively absorb the currently available radioactive substances, similar in structure to the missing ones. For example, instead of calcium - strontium, instead of potassium - cesium, instead of selenium - tellurium or polonium, instead of zinc - mercury. The degree of selenium deficiency ranged from 15-30% - in 80.4% and from 30-50% to 51.8% of cases, confirming the role of selenium in the detoxification systems of the body in modern conditions, when with air, water, food, medicines harmful foreign substances (xenobiotics) enter the body, up to salts of heavy metals (lead, mercury, cadmium, etc.) and radioactive substances. Selenium deficiency leads to aggravation and chronicity of the course of various diseases and is, in all likelihood, one of the important reasons for the emergence and rapid growth of "diseases of civilization": atherosclerosis, coronary heart disease, diabetes mellitus, tumors.

It should be noted that when trying to correct selenium deficiency using drugs available in the arsenal of the medical selector of the hardware-software complex "IMEDIS-EXPERT", we failed to achieve the desired effect. Nevertheless, we found one regularity, when loading only with selenium led to a decrease in the deficiency of other microelements that we identified, which forced us to make a comparative analysis of selenium-containing preparations and assess the degree of their effectiveness.

To compensate for the selenium deficiency, a sufficient number of inorganic preparations have been synthesized (Neoselen, Vitaselen, etc.). However, nature has created a unique plant biocomplex, in which selenium is the main active ingredient of organic origin, and its effects are enhanced and supplemented by the entire set of biological substances. It is a selenium-accumulating astragalus plant. In this herb, up to 1.5 mg% of selenium was found (the accumulation of selenium in astragalus occurs 5000 times more than in other plants growing in the same area). In addition, astragalus herb contains a large amount of iron, calcium, magnesium, as well as silicon, manganese, aluminum, zinc, copper, molybdenum, chromium, cobalt, phosphorus, sodium, potassium, barium, nickel, vanadium. Thanks to many years

scientific research, Russian scientists have created a drug of the same name of organic origin from this plant (AV Voshchenko "Planet of Selenium"). One "Astragalus" dragee is equivalent to two days of good nutrition with everyday products that supply selenium to the body. These are bakery and meat products. Only 25-30 mcg of selenium enters the body every day, thus accumulating its chronic lack. The daily norm is 200 mcg of selenium, that is, three Astragalus tablets replenish the daily requirement of selenium in the body. There are no contraindications for taking the Astragalus pills, the toxicity inherent in inorganic and monocomponent selenium preparations is removed in Astragalus pills with a natural balanced biocomplex of microelements found in the extract of the plant of the same name.

Thus, the constant use of selenium-containing drugs is a real prevention and treatment of the most common diseases and premature aging.

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