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IMPORTANCE OF CHEMICAL ELEMENTS IN THE HUMAN BODY

АДАМДЫН ДЕНЕСИНДЕГИ ЭЛЕМЕНТТЕРДИН МААНИЛҮҮЛҮГҮ

ЗНАЧЕНИЕ ХИМИЧЕСКИХ ЭЛЕМЕНТОВ В ОРГАНИЗМЕ ЧЕЛОВЕКА

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IMPORTANCE OF CHEMICAL ELEMENTS IN THE HUMAN BODY

Abstact

Human body substancially needs chemical elements for various biochemical processes and metabolic reactions. Microelements are also nesesaary for in the human body. Microelements are a group of chemical elements that are found in the human body in very small quantities, in the range of 10-3-10-12%. Microelements perform essential functions in the human body. Even in microscopic quantities they are extremely effective. Microelements are part of the structure of biologically active substances: enzymes, hormones and vitamins. Their lack leads to serious diseases of the body. Microelements are involved in the metabolism of proteins, fats, carbohydrates, protein synthesis in the body, heat exchange, hematopoiesis, bone formation, reproduction, and immune reactions. In our body, the composition of chemical elements can change, which certainly affects our health and well-being, and various factors can cause an imbalance of useful elements.

***Keywords*:** elements, deficiency, human body, zinc, iron, minerals.

Адамдын денесиндеги элементтердин маанилүүлүгү

Аннотация

Адамдын организми ар кандай биохимиялык процесстер жана зат алмашуу реакциялары үчүн химиялык элементтерге олуттуу муктаж. Микроэлементтер адамдын организми үчүн да зарыл. Микроэлементтер – адамдын организминде өтө аз санда, 10-3-10-12% чегинде кездешкен химиялык элементтердин тобу. Микроэлементтер адамдын организминде маанилүү функцияларды аткарат. Ал гургай, микроскопиялык өлчөмдө, алар абдан натыйжалуу болуп саналат. Микроэлементтер биологиялык активдүү заттардын: ферменттердин, гормондордун жана витаминдердин курамына кирет. Алардын жетишсиздиги денонин олуттуу ооруларына алып келет. Микроэлементтер белоктордун, майлардын, углеводдордун алмашуусуна, организмдеги белоктун синтезине, жылуулук алмашууга, кандын пайда болушуна, сөөктүн пайда болушуна, көбөйүүсүнө, иммундук реакцияларга катышат. Биздин денебизде химиялык элементтердин курамы өзгөрүшү мүмкүн, бул, албетте, биздин ден соолугубузга жана жыргалчылыгыбызга таасирин тийгизет жана ар кандай факторлор пайдалуу элементтердин дисбалансына алып келиши мүмкүн.

Ачкыч сөздөр: : элементтер, жетишпестик, адамдын организми, цинк, темир, минералдар.

Значение химических элементов в организме человека

Аннотация

Человеческий организм существенно нуждается в химических элементах для различных биохимических процессов и метаболических реакций. Микроэлементы также необходимы человеческому организму. Микроэлементы – группа химических элементов, которые содержатся в организме человека в очень небольших количествах, в пределах 10-3-10-12%. Микроэлементы выполняют важнейшие функции в организме человека. Даже в микроскопических количествах они чрезвычайно эффективны. Микроэлементы входят в структуру биологически активных веществ: ферментов, гормонов и витаминов. Их недостаток приводит к серьезным заболеваниям организма. Микроэлементы участвуют в обмене белков, жиров, углеводов, синтезе белков в организме, теплообмене, кроветворении, костеобразовании, репродукции, иммунных реакциях. В нашем организме может меняться состав химических элементов, что, безусловно, влияет на наше здоровье и самочувствие, а различные факторы могут вызвать дисбаланс полезных элементов.

Ключевые слова: *элементы, нехватка, организм человека, цинк, железо, минералы*.

Introduction. All living organisms on Earth, including humans, are in close contact with the environment. Food and drinking water promote the entry into the body of almost all chemicals elements. They are introduced into and removed from the body every day. Analyzes have shown that the number of individual chemical elements and their ratio in the healthy body of different people is approximately the same.

Iron is part of blood hemoglobin, or rather red blood pigments that reversibly bind molecular oxygen. An adult's blood contains about 2.6 g of iron. In progress life activity in the body there is a constant breakdown and synthesis hemoglobin.

Microelements are found in the body in concentrations of 10^{-3}-10^{-5} %. If the element concentration is below 10–5%, then it is considered ultramicroelement. Inorganic substances in a living organism are found in various forms. Most metal ions form connections with biological objects. It has already been established today that many enzymes (biological catalysts) contain metal ions. For example, manganese is part of 12 different enzymes, iron is in 70, copper - 30, and zinc - more than 100. The main microelements necessary for the body include iodine, magnesium, iron, zinc, calcium, potassium, phosphorus, selenium, and fluorine.

Biogenic elements are chemical elements that are constantly included in the composition organisms and necessary for their life. The most important biogenic elements are: oxygen, carbon, hydrogen, nitrogen, as well as calcium, potassium, silicon, magnesium, phosphorus, sulfur, sodium, chlorine, iron. Their average content is more than 0.01% biomass. These nutrients make up the group of macroelements [1, 7].

Classification of chemical elements

Based on the modern quantum mechanical interpretation of PS, the classification chemical elements are produced according to their electronic configuration. It is based on the nature of filling atomic orbitals with electrons. In accordance with by this principle all elements are divided into s-, p-, d- and f-blocks, or families [2].

The number of macroelements will include only 4 elements: hydrogen (6 kg), nitrogen (1.8 kg), calcium (1 kg) and phosphorus (0.78 kg), and the number of microelements includes 3 elements: rubidium (0.68 g), strontium (0.32 g) and bromine (0.17 g). Then to which class should the 10 elements from potassium be classified (140 d) to zirconium (1.7 g), which include elements such as: sodium (100 g), magnesium (19 g), iron (4.2 g), etc.? In accordance with these criteria, ultramicroelements will include so common in the human body elements such as lead (120 mg), copper (72 mg), aluminum (61 mg) [3].

In another classification, all elements are divided into: main elements - 6 elements: sodium, potassium, calcium, magnesium, chlorine and phosphorus; trace elements - 11 elements: iron, iodine, fluorine, zinc, selenium, copper, manganese, chromium, molybdenum, cobalt and nickel; ultra-trace elements – 21 element: aluminum, arsenic, barium, bismuth, boron, bromine, cadmium, cesium, germanium, mercury, lithium, lead, rubidium, antimony, silicon, samarium, scandium, strontium, thallium, titanium and tungsten.

It should be emphasized that the content of the same elements in the body of different people is a variable value and can vary significantly. For example, magnesium content may fluctuate from 21 to 28 g, zinc - from 1.4 to 2.4 g (differences are 1.7), vanadium - from 10 to 25 mg (differences are 2.5) [4].

Iodine. Necessary for the production of thyroid hormones. Lack of iodine in the body leads to disruption of the nervous, cardiovascular systems, and gastrointestinal tract. Children experience a decrease in mental, physical and sexual development, intellectual abilities, and memory. Pregnant women have an increased risk of miscarriages and stillborn babies. The iodine norm is 150-300 mcg per day.

Magnesium. Helps the body overcome overwork, overexcitement caused by excessive consumption of coffee, alcohol, nicotine, and quickly restore strength after intense mental stress, nervous breakdowns and severe mental experiences. It is recommended for pregnant women and those who are on a “severe” diet, taking sleeping pills and contraceptives. The consumption level for an adult is 400-800 mg per day.

Iron. An integral element of many enzymes and proteins. “Iron fasting” hits the body hard. First of all, the synthesis of hemoglobin, the iron-containing protein of red blood cells, is disrupted, as a result of which less oxygen reaches organs and tissues. Developing oxygen starvation negatively affects a person’s quality of life. First of all, the heart, brain, and kidneys are affected. The iron norm is 10 mg for men and 18 mg for women. The upper tolerable intake level is 45 mg per day. Sources: offal, meat, mushrooms, buckwheat, cocoa, blueberries, nuts. This microelement plays an important role in the development of immunological reactions, especially cellular immunity. Zinc takes part in the functioning of the hormones of the pituitary gland, adrenal glands, and pancreas. It is indispensable for the normal development and functioning of the sense organs: taste, vision, smell. The daily requirement is 10-20 mg.

Calcium. Takes care of the formation and strengthening of bone tissue. Necessary for tooth growth. Promotes the restoration of all cells, as it is an integral part of not only their nucleus, but also cellular and tissue fluids. “Feeding” the nervous system, it does not allow the nerves to become “loose.” Ensures normal functioning of the endocrine glands. For an adult, the calcium intake level is 1000-2500 mg per day. The norm increases when playing sports, with long-term use of hormonal drugs, and with diseases of the blood, intestines, and kidneys.

Potassium. Helps the heart beat calmly, rhythmically and evenly, regulates water-salt metabolism in the body, participates in the conduction of nerve impulses to the muscles, normalizes carbohydrate and fat metabolism. Daily dose - 2.5 g for adults, for children - 10-15 g. Sources: dried apricots and other dried fruits, potatoes, seaweed, bananas, oranges.

Phosphorus. Together with other minerals, it builds the skeletal system and has a beneficial effect on the functions of the nervous system and brain tissue. Ensures normal functioning of the liver and kidneys. Consumption level is 700-1600 mg per day.

Selenium. It is involved in protecting the immune system from the destructive effects of bacteria, viruses and other negative factors. It is even considered to be anti-cancer due to its ability to act against free radicals. Thanks to it, cells live longer, which is why selenium is considered the “element of longevity.” The consumption rate is 60-150 mcg per day. Its content in the soil, water, and air of the Republic of Belarus is 10-12% of the norm. Sources: garlic, oatmeal and buckwheat, brewer's yeast, seaweed. In refined and cooked foods, the selenium content is reduced by 50%.

A person receives most of the microelements from the outside along with food, water, and air. A diet consisting of refined foods does not provide the necessary amounts of vitamins and microelements, the need for which increases significantly under unfavorable environmental

conditions, physical and psychological overload. Refined products include, for example, white rice, semolina, premium flour, sugar and products made from them. If your diet consists of such products, the deficiency of microelements and vitamins can be eliminated by taking multivitamin-mineral complexes [5].

Copper is contained in the body in the amount of 70–120 mg. Approximately 30% each contains the liver and brain, and the rest is distributed in the muscles, bones, blood and kidneys. Copper is a vital element that is part of many enzymes and respiratory pigments. She plays a significant role in the implementation of the most important physiological processes. Copper deficiency can be a cause of frequent fractures, as it is an important component of the protein framework of bones. Copper deficiency threatens lovers of processed foods and overly refined foods, and also supporters of the dairy diet. Copper deficiency threatens lovers of processed foods and overly refined foods, and also supporters of the dairy diet. Copper deficiency is characterized by rapid fatigue, constant and causeless headaches, pain, bad mood, irritability. A lack of copper can lead to gout, and excess - to Wilson-Konovalov disease

Cobalt is contained in the body of an adult in an amount of 1–2 mg. Greatest Cobalt concentration is in the liver (0.076–0.201 mg/kg), followed by the kidneys, pancreas and spleen. Cobalt influences on hematopoietic processes, participates in metabolism, stimulates the formation of hemoglobin and red blood cells, participates in the biosynthesis of vitamin B_{12}. Vitamin B_{12} deficiency leads to pernicious anemia.

Manganese is found in bones, liver, kidneys and heart; its content fluctuates from 12 to 20 mg. It takes part in the production and exchange of neurotransmitters in the central nervous system, enhances the action of insulin, supports stability of the cell membrane structure, takes part in the synthesis of the thyroid hormone - thyroxine, promotes normalization of energy balance, improves the functioning of the immune system and is necessary for the synthesis of interferon [6].

Molybdenum is a biogenic microelement, the content of which in the human body is about 9 mg. Its main part is concentrated in bone tissue, liver, kidneys, brain, pancreas and thyroid glands and adrenal glands. Molybdenum performs the following functions in the body: promotes the metabolism of proteins, fats and carbohydrates, activates a number of enzymes necessary for development and growth of the body, strengthens dental the tissue, protecting teeth from destruction and helping to prevent caries, accelerates the breakdown of purines and the removal of uric acid from the body.

Sulfur makes up 0.25% of the human body weight and is a component of cells nervous, bone and cartilage tissue, as well as hair, skin and nails. It participates in metabolic processes and contributes to their normalization, is part of a number of amino acids, vitamins, enzymes and hormones (including including insulin), plays an important role in maintaining oxygen balance, improves functioning of the nervous system, stabilizes blood sugar levels, improves immunity, has an antiallergic effect, have a radioprotective effect.

Conclusion

The large number of elements in the body with the exception of electrolytes, do not act on their own, but in combination with organic macromolecules, for example, enzymes. In the internal environment of the body, most macro- and microelements are not found in free, and in bound form

in complex with substrate-binding proteins and other macromolecules. This results in concentration and accumulation of certain elements in individual organs and tissues.

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