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THE ROLE OF MICRONUTRIENTS IN CHILDREN'S NUTRITION FOR THE FORMATION OF HEALTH AT AN EARLY AGE

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Abstract: *Proper nutrition of a child at an early age is important for the optimal formation of organs and systems, can determine the state of health in subsequent years, predisposition to the development of a number of diseases. Micronutrients are food substances (vitamins, minerals and trace elements) that are contained in food in very small quantities of milligrams or micrograms. They are not sources of energy, but participate in the absorption of food, regulation of functions, implementation of growth processes, adaptation and development of the body. At present, it is obvious that adequate nutrition is determined not only by the energy value of food, the balance of the diet in proteins, fats and carbohydrates, but also by the provision of micronutrients.*

Аннотация: *Правильное питание ребенка в раннем возрасте является важным для оптимального формирования органов и систем, может определять состояние здоровья в последующие годы, предрасположенность к развитию ряда заболеваний. Micronutrients are food substances (vitamins, minerals and trace elements) that are contained in food in very small quantities of milligrams or micrograms. Микронутриенты пищевые вещества (витамины, минеральные вещества и микроэлементы), которые содержатся в пище в очень малых количествах миллиграммах или микрограммах. Они не являются источниками энергии, но участвуют в усвоении пищи, регуляции функций, осуществлении процессов роста, адаптации и развития организма. В настоящее время очевидно, что полноценное питание определяется не только энергетической ценностью пищи, сбалансированностью рациона по белкам, жирам и углеводам, но и обеспеченностью микронутриентами.*

Key words: *children, growth and development, microelements, macroelements, nutrition of children, correction of nutrition of children.*

Ключевые слова: *дети, рост и развитие, микроэлементы, макроэлементы, питание детей, коррекция питания детей.*

INTRODUCTION

Micronutrients are present in the human body in extremely small quantities, but nevertheless play an important role in all biochemical processes. A deficiency of these substances can lead to catastrophic consequences for a child's body. There are several types of micronutrients, each of which performs its own specific function. However, the main purpose of all components included in the groups is to protect the body from adverse environmental impacts. Immunonutrients include substances that affect the state of the immune system: trace elements (iron, zinc, selenium, iodine), vitamins (A, E, C), amino acids, nucleotides, probiotics, polyunsaturated fatty acids and others. It is noted that such a trace element as zinc takes part in almost all immune reactions, and the latest scientific data indicate its important role in "apoptosis" reactions (programmed cell death). It is part of over 20 enzymes, including those that participate in the metabolism of nucleic acids.

Regular consumption of iron in the required doses promotes cell growth and differentiation. This microelement also helps to produce enzymes necessary for the functioning of immune cells.

METHODS

The objective of this review was to examine the essential roles of selected micronutrients (iron, zinc, vitamin A, vitamin D, iodine, and folate) in the health of children and adolescents, with particular emphasis on growth and development. These micronutrients were chosen based on their high prevalence of deficiency worldwide and their fundamental importance in pediatric development. In particular, vitamin A, iodine, iron, zinc and folate play pivotal roles in maintaining healthy and productive populations and are therefore, of public health importance.

The amount of micronutrients in the subjects' daily food was calculated on the basis of special tables with the chemical composition of food products. This narrative review comprehensively summarizes recent research trends and guidelines regarding essential micronutrients (iron, zinc, vitamin A, vitamin D, iodine, and folate) crucial for the growth and development of children and adolescents.

RESULTS AND DISCUSSION

When considering the role of microelements in the processes of growth and development of a child, one cannot fail to mention the importance of such an element as iodine. According to WHO (World Health Organization), 30% of the world's population is at risk of developing iodine deficiency diseases. Iodine is actively involved in the development of a child's cognitive processes.

Micronutrients that provide antioxidant protection are especially important. They are called antioxidant micronutrients. Even in a healthy body, unstable molecules called free radicals are formed during metabolism. They have high

biological activity and are capable of causing acid (oxidative) damage to cells and tissues. This is countered by the antioxidant protection system, which consists of antioxidant substances that come with food and are formed inside us. They are capable of preventing the formation of free radicals or neutralizing their excessive oxidative activity in one way or another, not only preventing cellular and tissue damage, but also ensuring the restoration of damaged structures. When exposed to unfavorable environmental factors, as well as under the influence of chronic diseases, the formation of free radicals in our body increases many times over. The increased need for antioxidants is replenished by the intake of micronutrients with appropriate properties from the outside. If this does not happen, the body's resistance to infections decreases and the risk of diseases increases. Regular inclusion of natural antioxidant micronutrients in your diet is a fairly simple and very effective method of maintaining and improving health.

Many products of plant and animal origin contain natural antioxidant micronutrients, but their quantity, and therefore the degree of impact on health, varies widely. The most well-known antioxidant micronutrients are vitamins A, C, E, and selenium. Zinc and alpha-lipoic acid, although they do not have a direct antioxidant effect, when they enter the body, are either actively involved in biochemical reactions that provide antioxidant protection or are converted into compounds with a powerful antioxidant effect.

According to statistics, risk groups for micronutrient deficiency include children under 3 years of age, preschoolers 5-7 years old, and teenagers 11-15 years old. Frequently ill children are a special risk group.

All food products contain some micronutrients. First of all, the liver, as well as the kidneys and heart of poultry are not only the main source of vitamin A, but also selenium, zinc, and alpha-lipoic acid. About 120-150 grams of offal from domestic animals is enough to provide an adult with the daily requirement for these micronutrients. Cattle tenderloin, poultry breast, mushrooms, seafood, and eggs can also be a source of vitamin A, alpha-lipoic acid, selenium, and zinc. Yellow, orange, red, and dark green vegetables and fruits (carrots, peaches, apricots, spinach, broccoli, pumpkin, tomatoes) are rich in beta-carotene, a precursor of vitamin A. The main sources of vitamin E in the diet are sunflower seeds, almonds, hazelnuts, and vegetable oils made from seeds (sunflower, cottonseed, olive, etc.). About 50 grams. seeds (nuts) or 2-3 tablespoons of vegetable oil will provide the body of an adult with the daily requirement of vitamin E.

Red and green sweet peppers, kiwi, orange, grapefruit, strawberries, wild strawberries, red and black currants, and some other vegetables and fruits can serve as the main sources of vitamin C in our region. For example, one medium-sized kiwi

or orange contains almost the full daily requirement of this vitamin for an adult, and 100 grams of fresh red sweet pepper contains twice as much!

It is easy to see that the greatest intake of natural antioxidant micronutrients into the body can be achieved by eating a combination of animal and plant foods. In this case, plant foods are preferable in their natural form, and vegetables should be served with vegetable oil. The child's diet must include: meat (source of B vitamins, iron, zinc), milk and dairy products (sources of vitamin D, calcium, phosphorus), fish and seafood 1-2 times a week (sources of fat-soluble vitamins A, E, D, iodine, zinc, selenium), vegetables and fruits (sources of vitamin C, group B, beta-carotene, magnesium, calcium), butter (vitamins A, E, D). There are recommendations from the Institute of Nutrition of the Russian Academy of Medical Sciences on the timing and rules for introducing complementary foods into the child's diet. It is impossible to consume qualitatively new products that are different from breast milk in the early stages, since the digestive organs of the baby are still immature, in the first half of his life the enzymatic systems are not yet mature enough. The principle of gradual introduction of cereals, vegetables, meat, fruit juices and purees, fish, etc. is a very important rule in children's nutrition. A pediatrician should prescribe complementary foods for a baby, taking into account the individual characteristics of his health and the innate needs of the body. In general, heredity plays an important role in this matter. For example, if the child's mother and grandmother ate raw meat all their lives, then the child will very quickly get used to such a diet. If the parents still prefer cooked meat, then an attempt to accustom the baby to uncooked foods will have a detrimental effect on his health. When composing a menu for a baby, you should also remember that habits and preferences in food will remain with him for life. Nutritional prevention and correction of micronutrient deficiency is considered optimal. However, this does not exclude the use of vitamin and mineral complexes in childhood. Babies should be breastfed for as long as possible, receiving the necessary micronutrients with breast milk. The formation of pre-provision of micronutrients occurs during the woman's pregnancy, a reserve of essential substances is created. Prevention continues after the birth of the child, during lactation. The baby receives the required amount of microelements and vitamins, provided that the mother eats properly and takes vitamin and mineral complexes. Even a small amount of micronutrients from breast milk is absorbed better than from formula.

In subsequent periods of childhood, nutrition as the main source of vitamins and microelements should be balanced and rational, taking into account age-related needs. And the needs for nutrients in children are much higher than in adults. That

is why, in addition to the main diet, a mandatory subsidy of vitamins and micronutrients is required.

Today, pediatricians and parents have a wide choice of vitamin and mineral complexes (Multi-tabs baby, Multi-tabs baby, Jungle, Kinder-biovital gel, Sanasol, Alphabet, Pikovit, Complivit, etc.), which makes it possible to individually select a drug for each baby. Manufacturers offer different forms of vitamin and mineral complexes: oil and water solutions, syrups, gels, chewable tablets, capsules - based on the age capabilities of the child. For example, children in the first year of life will not be able to chew a tablet or swallow a capsule, so pediatricians will recommend prescribing vitamins and minerals in the form of drops, syrup or gel. In children of early and preschool age, the chewing apparatus is formed, and they can easily cope with vitamin preparations in the form of tablets. Modern vitamin and mineral complexes must necessarily contain prophylactic doses of vitamins and macro-, microelements, only in this case the complex will be considered complete. An additional vitamin supplement is usually prescribed to babies after one year of life. In the 1st year, the child should additionally receive only a prophylactic dose of vitamin D3. And in subsequent age periods, vitamin and mineral prophylaxis, according to pediatricians, should be carried out year-round, in combination with a complete diet.

Dosages of vitamins and minerals should correspond to the daily needs of the body, and not be excessive. Incompetent use of vitamin and mineral preparations can lead to the development of hypervitaminosis, hypermicroelementosis and disruption of vitamin and mineral metabolism. Excessive intake of vitamins (except fat-soluble) leads to an increase in their excretion from the body and does not bring additional benefit. A significant excess can disorganize the metabolic systems of the body and cause hypervitaminosis. With the simultaneous use of two or more drug complexes containing the same micronutrients, their overdose is possible. The greatest danger is an excess of iron, copper, vitamins O, K, A (retinol), biotin. Some diseases, including chronic renal and hepatic failure, hereditary metabolic disorders, increase the risk of overdose when taking vitamin and mineral preparations.

Modern vitamin and mineral complexes must necessarily contain preventive doses of vitamins and macro- and microelements, only in this case the complex will be considered complete. Additional vitamin supplementation is usually prescribed to babies after one year of age. In the first year, a child should additionally receive only a preventive dose of vitamin D3. And in subsequent age periods, vitamin and mineral prophylaxis, according to pediatricians, should be carried out year-round, in combination with a complete diet. Having an idea of what micronutrients are contained in certain foods and what functions the nutrients, vitamins and minerals

known to you perform, you will be able to competently compose a menu for your child. And a correctly selected vitamin and mineral complex will complement the proposed dishes and turn them into the most useful for the growth, health and mental development of the baby.

CONCLUSION

Thus, nutritional imbalance, especially at a young age, often leads to the formation of deficiency states (anemia, rickets, protein-energy malnutrition, iodine deficiency states), chronic diseases, delayed physical and neuropsychic development, and failure of the immune system.

Despite numerous studies in the field of nutrition, there remains a need to study the structure of nutrition and nutritional status of children studying in special schools for the scientific substantiation and development of measures for the prevention and correction of alimentary-dependent diseases. The main areas should be monitoring the nutritional status of children in the dynamics of their development, optimizing nutrition taking into account the child's pathology, using fortified foods and prescribing vitamin and mineral complexes for additional intake of necessary substances.

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