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THE IMPORTANCE OF NUTRIENTS IN ENSURING CHILDREN'S HEALTH

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Abstract. This article highlights the importance of proteins, carbohydrates, vitamins, and energy supply in ensuring the healthy growth and development of children. The role of proteins in the formation of tissues and cells, strengthening the immune system, and regulating metabolic processes is analyzed. The significance of carbohydrates as the primary source of energy for the body, as well as the adverse effects of their excessive consumption, is discussed. In addition, the physiological functions of essential vitamins, including vitamins A, D, B-complex, C, E, and K, their major dietary sources, and the consequences of their deficiency in children are described. The article emphasizes that meeting children's daily energy requirements and providing a balanced and rational diet are fundamental prerequisites for raising a healthy generation.

Keywords: child nutrition, proteins, carbohydrates, vitamins, energy expenditure, calories, balanced diet, immunity, metabolism, children's health, healthy development, micronutrients, vitamin deficiency, healthy lifestyle.

Proteins

Proteins are one of the principal components of food. Their primary function is to build and maintain the cells and tissues required for the growth, development, and vital functions of the body. Proteins are also essential constituents of antibodies, hormones, and enzymes.

Antibodies are necessary for protecting the body against various diseases. Hormones participate in the regulation of metabolic processes, while enzymes are biological catalysts that accelerate biochemical reactions in the body by tens, hundreds, or even thousands of times.

In the gastrointestinal tract, proteins are gradually broken down into simple amino acids under the action of digestive enzymes. These amino acids are subsequently used to synthesize new proteins specific to the human body.

A deficiency of dietary protein can lead to profound changes in a child’s organism. Growth may be delayed, the formation of the skeleton and muscles may be impaired, and dental caries may develop. Protein deficiency is often accompanied by disorders such as anemia and metabolic disturbances.

Insufficient production of antibodies and a weakened immune defense increase children's susceptibility to various diseases. Persistent protein deficiency in the diet can also adversely affect cognitive development, resulting in delayed speech acquisition and poor academic performance. Moreover, the consequences of protein deficiency experienced during childhood may persist even after the deficiency has been corrected.

Excessive consumption of protein-rich foods is also not beneficial for children: it increases putrefactive processes in the intestines, leads to the accumulation of incompletely oxidized dietary proteins in the body, and results in the excretion of large amounts of nitrogen-containing compounds through urine. This, in turn, places additional strain on the liver and kidney functions.

High intake of proteins, especially animal proteins, may increase the excitability of the nervous system and contribute to the development of metabolic disorders.

Many food products derived from both animal and plant sources serve as primary protein sources. Accordingly, proteins are classified into animal and plant proteins.

In children's daily diet, protein should account for 12–15% of total caloric intake. The proportion of animal proteins in the daily diet should be: 70% for children aged 1–3 years, 65% for ages 4–6 years, and 60% for ages 7–17 years.

Children have a higher protein requirement compared to adults, as growth and developmental processes are more intensive during childhood, and a portion of dietary protein is used for the formation of cells and tissues. High-quality proteins are predominantly found in animal products, particularly fish (100 g of fish contains 15–18 g of protein). Seafood enriches children's diets with a range of microelements and vitamins. They are rich in iodine, manganese, and copper, which are essential for normal metabolic processes in children.

Daily energy expenditure in children and caloric intake

Carbohydrates. Young children require fewer carbohydrates compared to adults. Excess intake of carbohydrates, especially refined sugar, hinders children's growth and development, reduces immunity, and increases the incidence of dental caries. It is known that unrefined (brown) sugar does not adhere to tooth surfaces and contains chemical compounds that help protect tooth enamel from decay. Therefore, it is advisable to use unrefined sugar in the production of confectionery, soft drinks, and other food products intended for children [1].

Scientific and practical studies show that children who consume large amounts of carbohydrates experience a decrease in muscle tone, paleness of the skin and mucous membranes, excess body weight, and even obesity. Such children become ill more frequently, and the diseases tend to be more severe and often accompanied by complications.

Good sources of carbohydrates for children include vegetables, fruits, berries, and fresh juices, as well as milk sugar (lactose) found in milk. In children's diets, sweets, cookies, pastila, jam, and other confectionery products should be regulated according to physiological needs: not exceeding 19–25 g per day depending on age. It is recommended that children and adolescents obtain 20% of their daily carbohydrates from simple sugars (glucose, fructose, lactose, sucrose), 75% from starch, and 3% from pectin substances.

Childhood is considered the most active stage of growth and development in human life. Therefore, a child's daily diet must fully correspond to their energy expenditure.

The role of vitamins in the child's body

Vitamins. Even food products containing sufficient amounts of proteins, fats, carbohydrates, and minerals cannot be considered nutritionally complete for a child if they lack vitamins. During the growth period, the need for vitamins is especially high. The deficiency of certain vitamins may lead to diseases whose clinical symptoms are not always clearly expressed. In some cases, changes associated with vitamin deficiency may remain unnoticed.

In such cases, children may experience lethargy, paleness, fatigue, and decreased appetite. Mild forms of vitamin deficiency can later lead to the development of serious diseases. Vitamins A and D are particularly important for children [2].

Vitamin A (retinol) deficiency leads to severe eye damage, such as loss of night vision (night blindness), conjunctivitis, and dryness of the cornea, which may become inflamed and lead to

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necrosis. Even a small deficiency of vitamin A increases children's susceptibility to gastrointestinal and pulmonary infections and therefore raises mortality rates.

The richest sources of vitamin A are fish oil, butter, cream, milk, sour cream, egg yolk, and liver. Plants contain carotene (provitamin A), which is converted into vitamin A in the liver after consumption. Carotene is abundant in vegetables such as carrots, green onions, lettuce, spinach, tomatoes, and green peas. Provitamin A is fat-soluble and does not break down under heat; its absorption improves when cooked vegetables are served with fats (butter, sour cream, or milk).

Vitamin D (calciferol) stimulates growth in young organisms and participates in mineral and carbohydrate metabolism. It helps maintain calcium and phosphorus in the body and supports their deposition in bone tissue. Vitamin D is mainly found in fish oil, liver, meat, and the roe (eggs) of some fish, as well as egg yolk.

Vitamin B1 (thiamine) is closely related to carbohydrate, protein, fat, and water metabolism. It acts as a growth factor and is essential for the normal functioning of the nervous system. A deficiency of vitamin B1 in food leads to anorexia, which causes significant weight loss in children. Children become irritable, quickly fatigued, and show impaired conditioned reflex activity, as well as coldness in the hands and feet. In B1 avitaminosis, muscle pain in the legs appears, later progressing to polyneuritis and paralysis. Swelling, shortness of breath, and cardiovascular disorders may also develop.

Vitamin B1 is found in brewer's and baker's yeast, whole grain bread, buckwheat and oats, legumes, liver, kidneys, and heart.

Vitamin B2 (riboflavin) participates in enzyme systems regulating oxidation-reduction processes. It is important for growth and vision, participates in carbohydrate and protein metabolism, and improves food digestion. In B2 hypovitaminosis, symptoms include weight loss, weakness, headaches, eye irritation, and pain at the corners of the mouth and lower lip. Deficiency leads to cracks in the lip mucosa and a bright red tongue. Vitamin B2 is found in both plant and animal products, especially in yeast, meat, liver, kidneys, heart, milk, egg yolk, and honey.

Vitamin B6 (pyridoxine) plays an important role in protein and fat metabolism, has a positive effect on higher nervous activity, and protects children from skin lesions. It is found in fish, egg yolk, yeast, peas, and green parts of plants.

Vitamin B12 participates in protein metabolism, stimulates growth and physical development in children, and supports normal blood formation. It is found in animal products such as liver, kidneys, meat, egg yolk, and milk.

Vitamin PP (niacin) plays a role in oxidation-reduction processes. Its deficiency causes muscle weakness, fatigue, dizziness, irritability, insomnia, depression, and memory impairment. PP vitamin deficiency affects the skin, gastrointestinal tract, and central nervous system and may lead to serious diseases. It is found in meat, liver, kidneys, yeast, mushrooms, wheat groats, wheat bread, rye bread, dried peas, and potatoes.

Vitamin C (ascorbic acid) participates in oxidation-reduction processes as well as carbohydrate, protein, and mineral metabolism. It helps increase the body's resistance to external influences and improves children's resistance to infectious diseases. A deficiency of vitamin C reduces immunity. A child with vitamin C deficiency may have a bluish coloration of the ears, fingers, and nails, bleeding gums, dryness, and pallor of the skin. The main sources of vitamin C are vegetables, berries, and fresh fruits. These products are recommended for daily consumption in children's diets.

Folic acid stimulates and regulates blood formation and is also involved in protein metabolism. Sources of folic acid include yeast, liver, spinach, and cauliflower.

Vitamin E (tocopherol) is involved in all functions of the body. However, its role is especially important in metabolic processes in children. It ensures the proper absorption of proteins, fats, and other vitamins such as A and D in the body. Tocopherol activates the synthesis of pituitary hormones, including the growth hormone, and improves blood circulation. Vitamin E is capable of neutralizing the toxic effects of free radicals in the body. In childhood, many free radicals are formed during infectious and inflammatory diseases. An adequate amount of tocopherol in the body helps the child recover more quickly.

Tocopherol is found in many food products. These include primarily natural vegetable oils (sunflower, corn, and olive oil), as well as spinach, legumes, beef, liver, fatty fish, egg yolk, etc.

Vitamin E is also present in other plant products, such as apples; however, specialists have proven that it is better absorbed from animal-derived products.

Phylloquinone (vitamin K) is involved in the blood clotting process. Its deficiency leads to bleeding disorders. Vitamin K is found in plant foods such as cabbage, lettuce leaves, pumpkin, and spinach. Among animal products, liver is considered rich in vitamin K.

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