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Changes In The Digestibility Coefficient At Different Stages Of Ontogenesis

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Abstract: The article discusses the importance of correctly determining the nutritional value of food products when assessing the digestibility coefficient in humans. It also presents information on the reasons for age- and sex-related variations in this indicator and on factors that can enhance digestibility.

Keywords: Macro- and microelements, digestibility coefficient, intestinal microflora, biological substrate, biological efficiency.

INTRODUCTION:

Relevance of the topic: In recent years, cases of excessive body weight have become increasingly common among people. This trend is also rising year by year among young children and adolescents. In turn, this negatively affects students' psychological state and emotional stability during the academic year, contributing to stress. Under the changing climatic conditions of our country, the digestion process in humans and their sensitivity to weather significantly influence children's health, psycho-emotional development, and lifestyle. The digestibility coefficient is a measure that reflects the extent to which the body assimilates consumed food and its ability to obtain energy from it.

This coefficient varies depending on age and sex, because a number of physiological changes occur in the body with age. In particular, due to a significant impairment in the absorption of fat and amino-acid hydrolysis products, the average total concentration of amino acids in blood plasma decreases by about 10% in older adults aged 60–75, and by 25% in elderly individuals aged 75–90. At the same time, the concentrations of threonine, serine, and histidine decrease markedly, while the concentrations of glutamine and cysteine increase [2, pp. 162–163].

Bundan tashqari oqsillarning biologik qiymati muhim aminokislotalarning mavjudligi, ularning almashtiriladiganlari bilan nisbati, ovqat hazm qilish tizimidagi fermentlar tomonidan hazm bo'lishi bilan bog'liq. Ularda oziq-ovqat oqsillari mavjudligi uchun antiproteazlar fraksiyaari, antivitaminlar va allergen omillari oziq-ovqat oqsillari sifatini baholash uchun muhimdir [3; C.27.].

Breshchenko, K. I., and Melkonyan, in their scholarly

works, explained the causes of hypovitaminosis in humans as follows. In particular, they pointed out that hypovitaminosis may result from:

- an increased need for vitamins (pregnancy, lactation, stress, illness, and other conditions);
- disturbances in the processes of vitamin absorption, transport, and storage;
- impaired vitamin utilization at the cellular level (formation of active forms, interaction with apoenzymes, and related mechanisms);
- increased intake of antivitamins [4, p. 13].

Biological foundations of digestion. Digestion is mainly carried out by organs such as the stomach, intestines, and liver. When food enters the body, it undergoes mechanical and chemical breakdown. As a result, the body absorbs the substances it needs. The digestibility coefficient reflects the efficiency of food breakdown and its assimilation by the body. The effectiveness of this process changes with age, because as a person grows older, intestinal motility, gastric juice secretion, and the capacity to absorb nutrients tend to decline.

The following age-related stages of change in the digestibility coefficient are distinguished in humans:

1. Childhood and youth. In children and young people, the digestive system develops rapidly. Their digestibility coefficient is high because the body requires more energy and nutrients for fast growth. The ability to digest food quickly and extract beneficial substances plays a major role in a child's growth and development. In addition, a high level of gastric juice and other digestive enzyme activity in children increases the overall efficiency of digestion.

2. Transition from adolescence to older age. During adolescence (approximately 12–18 years), the digestive system undergoes further changes. At this stage, growth is gradually completed and the digestibility coefficient may decrease slightly. Hormonal fluctuations and changes in the intestinal microflora can slow down digestion. As age increases, the efficiency of the digestive system continues to decline, but this reduction is relatively gradual and often not immediately noticeable.

3. Old age. In this stage, the digestibility coefficient becomes considerably lower. This is explained by age-related physiological changes. In older adults, digestion is affected by decreased motility of the stomach and intestines and by reduced secretion of gastric juice and pancreatic enzymes. As a person enters old age, the digestive process slows down, making it more difficult to assimilate food fully and efficiently. As a result, food remains in the intestines for a longer period, which can prevent the body from using essential nutrients to their full extent.

Age-related causes of changes in the digestion process.

1. Enzyme activity: As age increases, the secretion of gastric juice and other digestive enzymes decreases. These enzymes are necessary for the effective breakdown of food. In old age, the production of these enzymes declines, which slows down digestion.

2. Intestinal motility: With advancing age, intestinal motility—that is, the speed at which food moves through the intestines—decreases. In older adults, this leads to food remaining in the intestines for a longer time; as a result, there may be insufficient conditions for the body to assimilate it fully.

3. Microflora: As a person grows older, the composition of the intestinal microflora also changes. Depending on age, the balance between harmful and beneficial microorganisms in the gut may shift, which affects the digestion process.

4. Hormonal changes: As age advances, the level of hormone production in the body changes. In old age, the production of the hormones estrogen and testosterone decreases. This, in turn, influences the efficiency of the digestive system.

Children need to consume organic and inorganic substances for growth and development. As a result of breakdown and biosynthesis processes, biological substrates are formed that ensure the necessary balance of energy and plastic (building) material. Harmonious growth and development of a growing organism, renewal of cells, organs, and tissues, as well as accumulation of energy required to maintain vital body functions, are supported by the provision of necessary conditions. Nutrients are absorbed by the body through various pathways. A number of factors affect the digestibility of food components, including the method of cooking, the presence of compounds in food that facilitate digestion, the type of vitamins,

the functional condition of the human body, and the presence of diseases. Therefore, when calculating the digestibility coefficient, it is necessary to distinguish between the concepts of the "nutritional value" and the "actual nutritional value" of food products.

Table 1.

Indicators of nutrient digestibility by the human body

No	Nutrients	Digestibility %
1.	Protein	70-96
2.	Makroelements	20-90
3.	Mikroelements	1-30

The causes of differences in digestion vary. Significant differences are also observed in the digestion indicators for fats, carbohydrates, and vitamins. More precise indicators describing the nutritional value of products include biological value, energy value, and biological effectiveness.

Biological value is an indicator of the quality of food protein; it reflects how well the amino acid composition of the protein corresponds to the body's need for amino acids for protein synthesis.

Energy value refers to the amount of energy (kcal, kJ) released from nutrients in the body to support physiological functions. Nutritional value is primarily characterized by the product's chemical composition, consumption in generally accepted amounts, and its energy value.

Biological effectiveness is an indicator of the quality of the fat components of food products and reflects the content of polyunsaturated fatty acids. The biological effectiveness of the fat component of food is assessed by the biological effectiveness coefficient. Its calculation is based on determining the total amount of all fatty acids that make up the fat. The obtained data are then compared with a hypothetical "ideal" fat.

Food safety includes ensuring that food products consumed in generally accepted amounts do not produce toxic, carcinogenic, mutagenic, or other negative effects on the human body. Individual chemical compounds that constitute food are called nutrients (macro- and microelements). Microelements also include vitamins and a number of mineral compounds.

Of the 92 chemical elements found in nature, 81 occur in the human body. Twenty-two basic elements constitute about 4–5% of an average person's body weight. Twelve chemical elements (C, O, H, N, P, Ca, Mg, K, S, F, Cl) make up 99% of the elemental composition of the human body and are components of cells and tissues. These are also called macroelements. The daily requirement for them ranges from 10 mg to several grams.

Microelements (17 essential, i.e., vital elements—Fe, I, Cu, Zn, Co, Cr, Mo, Ni, V, Se, Mn, As, F, Si, Li, B, Br) are elements present in the human body in very small amounts. The need for them ranges from several micrograms to milligrams. Essential elements are part of various enzymes, hormones, and vitamins and form a functionally necessary component of different cellular structures. Microelements influence human growth and development, respiration processes, blood formation, immunogenesis, behavioral reactions, morphofunctional activity, and many other functions of all organs and tissues.

Stability and adequacy of nutrition ensure the constancy of eubiosis (normal microflora in the intestinal lumen). Excessive consumption of nutrients leads to an increase in the numbers of clostridia and bacteroides. A higher proportion of animal fats in the daily diet increases the number of bacteroides and reduces the number of bifidobacteria and enterococci. A dairy-based diet increases the amount of bifidobacteria. Intestinal secretion plays a major role in the formation of intestinal flora. The

composition and quantity of microflora depend on the composition of digestive secretions entering the intestine. When nutrient intake decreases, the diversity of microflora also decreases. Lactoferrin and peptides inhibit the development of pathogenic microflora. Normal microflora (eubiosis) performs important functions in the body: it prevents the overgrowth of pathogenic microflora and participates in the synthesis of vitamins K and B-group vitamins. Bacterial enzymes break down cellulose in the large intestine, fatty acids, and other substances.

For people to feel well, they should consume a daily amount of food that provides the body with the energy it needs through metabolism. This intake must compensate for energy expenditure related to daily work activities, cover basal metabolism, and account for the specific dynamic effect of food.

CONCLUSION

In order to increase the digestibility coefficient in the human body depending on age, it is necessary to take into account the following:

1. the biological value, energy value, and biological effectiveness of food products;

2. the fact that excessive consumption of nutrients leads to an increase in the number of clostridia and bacteroides;

3. that an increase in animal fats in the diet results in a higher number of bacteroides and a decrease in bifidobacteria and enterococci;

4. that a dairy-based diet increases the quantity of bifidobacteria;

5. the stability and safety of food.

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