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EFFECT OF A-BACTERINUM ON PROTEIN AND LIPID METABOLISM IN VOLUNTEERS

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Introduction. The human intestinal microbiota is a complex system of microorganisms with enormous species diversity and impressive quantitative characteristics [1]. There are more than 500-1000 types of microorganisms in the intestine. They make up 1–3% of the total body mass and are a huge reservoir of genetic material [2,3].

The symbiosis of the microorganism and microbiota in relation to lipid and carbohydrate metabolism is realized due to the involvement of microorganisms in the synthesis and metabolism of short-chain fatty acids (SCFA), namely, butyric, acetic and propionic (butyrate, acetate and propionate, respectively). SCFA are derivatives of the degradation products of soluble polysaccharides. They stimulate the growth and proliferation of enterocytes and serve as the main energy substrate for intestinal cells [4]. The mechanism of influence of butyrate on the regulation of energy consumption and carbohydrate metabolism is based on the ability to activate specific G-protein-coupled receptors or serpentines, which are widely present in adipocytes, immune and epithelial cells of the intestine [5].

At present, a significant amount of data has been accumulated, indicating the enormous role of intestinal microorganisms in the regulation of energy homeostasis. To a greater extent, the influence of the microbiota on the system of carbohydrate and fat metabolism is realized through the modulation of the synthesis of free fatty acids, bile acids, a number of systemic bioactive molecules, the cellular link of the immune system, and the permeability of the intestinal wall for lipopolysaccharides. Protein metabolism is one of the main ones in the body, according to which indicators one can judge the presence of pathological conditions, or changes that precede them. The total content of proteins in the blood plasma of an adult is 65 - 85 g/L. The main protein fractions of blood plasma are albumins - 40 - 50 g/L, globulins - 20-30 g/L, fibrinogen - 2-4 g/L. In the blood serum, the content of proteins reaches 65-80 g/L.

The main component in the lipid metabolism of the body is cholesterol, an essential component of cells. In the body, cholesterol is present in free form (as part of cell membranes) or in the form of esters with fatty acids (in the composition of lipoproteins in the blood and tissue fluid, as well as fatty inclusions in the cytoplasm). In total, in the body of an adult there is up to 140 g of cholesterol. In the blood plasma, the cholesterol content is 3.9-6.3 mmol/L. Cholesterol is transported in the blood as part of lipoprotein complexes. Cholesterol is transported from the liver to tissues by low-density lipoprotein (LDL). On the plasma membranes of cells there are receptors for LDL. LDL bind to receptors and penetrate into cells, where, under the influence of hydrolytic enzymes, lysosomes break down into constituent components.

In view of the importance of the factor of the relationship between the microbiota and the protein and lipid metabolism of the macroorganism, the task was to reveal the effect of A-bacterinum on the content of protein and lipid metabolites in the course of clinical trials.

Materials and methods. A group of volunteers who used A-bacterinum orally was formed from practically healthy individuals, men and women, aged 17 to 22 years, in the amount of 26 people. Determination of indicators of protein and lipid metabolism was carried out before and after the use of A-barterinum. Volunteers took daily for 10 days, 2 times a day, 5 doses of the drug (1 dose - 200 million cells of

aerococci) 1 hour before meals.

The amount of total protein was determined by the biuret method (Human, Germany). The principle of the method is based on the fact that proteins in an alkaline medium with copper sulfate form a blue-violet color. To determine the level of albumin, a set of reagents "Human" (Germany) was used. The principle of the method is based on the interaction of albumin with bromcresol green to form a blue compound [6]. Total cholesterol and intermediate metabolites of lipid metabolism were determined according to [7, 8]. The cholesterol level was determined by the enzymatic method. Under the action of the enzyme cholesterol esterase, cholesterol esters break down into cholesterol and hydrogen peroxide. Cholesterol under the influence of cholesterol oxide dismutase gives a colored compound. The color intensity is directly proportional to the concentration of cholesterol in the sample, which is determined by the calculation method.

Results and its discussion. Table 1 presents data on the study of the effect of A-bacterinum on the parameters of protein metabolism in practically healthy individuals.

Table 1

Total protein and protein fractions of the blood serum of volunteers treated with "A-bacterinum" / M ± m /

Indicators before and after	Total protein g\L	Protein coefficient	Protein fractions (%; M±m)				
			Albumin	α1-globulin	α2-globulin	β-globulin	γ-globulin
Before application.	101,05±5,4	1,07±0,0	51,1±1,3	5,6±0,6	11,29±0,9	13,3±0,9	18,5±0,9
After application.	94,90±11,6	1,14±0,06	53,2±1,5	4,1±0,6	9,95±0,6	15,7±0,8	17,7±0,9
P	≥0,1	≥0,1	≥0,1	≥0,1	≥0,1	≥0,1	≥0,1

As can be seen from table 1, A-bacterinum does not affect the content of the main fractions of blood serum proteins of healthy individuals who received A-bacterinum orally.

The lipid metabolism of the body is one of the main exchanges and reacts quite sensitively to external and internal influences of various factors, including the use of A-bacterinum. This reaction is due to lipid-protein interactions in biological

membranes, which are of decisive importance for the functioning of membranes. Structural and functional transformations of lipoproteins are important for the integration of lipid metabolism in the body. Lipid molecules are involved in the regulation of enzyme activity; some of them have biological activity. We were interested in the effect of A-bacterinum on the content of cholesterol and its metabolites in the blood of volunteers before and after taking A-bacterinum. The data obtained are presented in table 2

Table 2

General and neutral lipids, cholesterol blood serum of volunteers who received A-bacterinum / M ± m /

Indicators before and after	Neutral lipids (%)					General lipids gr\L	Chole-sterol mM\L	α-chole-sterol mM\L
	Phospho lipids	Free cholesterol	Low density lipoproteins	Three glycerides	Cholesterol esters			
Before application	20,01± 0,9	16,7± ,8	3,5± 0,3	10,4±1,4	49,9± 0,7	3,5±0,3	5,5± 0,3	1,35±0,1
After application	29,4±3,1	15,4± 1,2	3,9± 0,6	8,74± 1,8	41,5± 1,7	3,3± 0,2	3,1±0,3	0,95±0,1
P	≤0,05	≥0,1	≥0,1	≥0,1	≥0,1	≥0,1	≤0,05	≤0,05

From the data of Table 2 it can be seen that there is a significant difference between the content of cholesterol and α-cholesterol before oral administration of A-bacterin and after, in the direction of reducing its content. The same trend is noted for cholesterol esters. Attention is drawn to a significant increase in phospholipids in the blood serum of persons who took A-bacterinum. The data of indicators of the exchange of lipoproteins and their fractions before and after taking A-bacterinum are presented in Table 3.

Table 3

Lipoproteins and their fractions of the blood serum of volunteers treated with "A-bacterinum" / M ± m /

Indicators before and after	Lipoproteins % / LP /					
	Hilo-micron	β-lipo-protein	pre-β-lipoprotein	α1- lipo-protein	α2- lipo-protein	α1+α2-lipoprotein
Before application	0	43.4±1.9	16.1±0.9	23.6±2.1	13.6±1.9	36.6±2.1
After application	0	42.5±2.1	16.9 ±0.9	24.5±1.3	13.1±1.8	38.3±2.4
P		≥0,1	≥0,1	≥0,1	≥0,1	≥0,1

With regard to the content of lipoproteins and their fractions in the blood serum of volunteers, no special changes were found.

Conclusion. The importance of determining indicators of protein and lipid metabolism when using any probiotic preparations is beyond doubt. Therefore, it was necessary in the process of clinical trials of A-bacterinum to determine the state of these indicators in healthy individuals. It was found that the total protein and protein fractions of the blood serum of volunteers who received "A-bacterinum" did not undergo significant changes before and after its use. The same applies to lipid metabolism in volunteers. A significant difference was noted between the content of cholesterol and α-cholesterol before and after oral administration of A-bacterin in the direction of reducing its content, which, in general, is a positive effect.

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