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Phospholipid profiles in development of experimental atherosclerosis

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Abstract

A change in the functional groups and fatty acid composition of phospholipids and cholesterol leads to a change in their phase state, and qualitative and quantitative changes in the lipid composition affect the functional activity of membranes and their protein components, in particular receptors and enzymes.

Key words: atherosclerosis, phospholipids

An important indicator of the activity of phospholipases are fractions of phospholipids, their dynamics during the course of diseases, in connection with this, we studied their main fractions.

phospho- and neutral lipids are still extremely rarely used to analyze the state of lipid metabolism, although this makes it possible to track the effectiveness of patient treatment, understand the mechanisms of action of the studied drugs, and develop treatment regimens in each case.

Phospholipids and cholesterol, interacting with membrane proteins, make up the lipoprotein complex, which is the structural basis of all biological membranes. A change in the functional groups and fatty acid composition of phospholipids and cholesterol leads to a change in their phase state, and qualitative and quantitative changes in the lipid composition affect the functional activity of membranes and their protein components, in particular receptors and enzymes. An increase in the concentration of total lipids and an increase in the

ratio of xc / fl was established , which indicates a violation of the rigidity of cell membranes.

Material and research methods: Experiments were carried out on 30 male rabbits, which, depending on the method of treatment, were divided into 5 groups : 1st - intact (normal), 2nd - rabbits with hypercholesterolemia, 3rd - treatment with ultrax, 4th - treatment with biomaysa, 5th - received mixed treatment.

Biomays (Maysara) is a powder obtained from dried wheat sprouts. The inoculation was carried out for 2 months. The content of phospholipids was studied on the 20th, 40th, 60th and 90th days of hypercholesterolemia. Experimental atherosclerosis was reproduced by daily intragastric administration of cholesterol (0.2 g per kg of body weight for 2 months). Ultrox (Nobel Farm , Turkey) was used as a statin , which was administered at 0.6 mg/kg. Biomays (ORION-SKORPION LLC , Uzbekistan) was administered at the rate of 142 mg/kg 2 times a day .

Determination of the phospholipid composition of erythrocyte membranes. To obtain membranes, erythrocytes were washed three times with 0.9% NaCl solution at 4° C , each time sedimenting the cells by centrifugation at 1500 g for 10 min. Phospholipids were measured by the method. The quantitative content of individual fractions was expressed as a percentage of the total amount of phospholipids .

Discussion

The results of studies of phospholipid fractions in the erythrocyte membrane in the dynamics of the development of experimental atherosclerosis are shown in table № 1.

Table 1

Factions phospholipids	Intact group	days research			
		60-	70-	80-	90-
FH	42.1±0.40	32.4±3.29	29.1±1.71	25.04±1.27	24.35±0.42

LFH	3.4±0.14	11.77±0.24	12.4±0.11	13.35±0.23	16.41±0.43
CM	13.00±0.49	13.35±0.26*	13.65±0.13*	14.10±0.21*	15.47±0.35
PE	8.44±0.42	7.43±0.12*	6.66±0.33	6.34±0.11	5.87 ±0.14
LFE	6.13±0.43	6.56±0.13*	7.32±0.14	7.4±0.03	8.5±0.31
FS	5.00±0.32	5.41±0.12*	5.69±0.32*	6.27±0.15	6.07±0.06
FI	6.10±0.11	5.7±0.09	5.42±0.12	5.1±0.1	4.8±0.24
DFG	6.19±0.24	5.8±0.07*	5.53±0.11	5.22±0.04	4.92±0.36

Note: * P>0.05 in relation to the intact group; in other cases, p< 0.05 in relation to the intact and control groups

The study of phospholipid fractions in the erythrocyte membrane showed a decrease in phosphatidylcholine (PC) in all periods of the study. On the 60th and 70th days of the development of experimental atherosclerosis, the content of PC decreases by 23.1 and 30.9% ($p < 0.05$), respectively, compared with the intact group. A more pronounced decrease in the content of PC was established on the 80th and 90th days of the experiment and it amounted to 40.5 and 42.2% ($p < 0.05$), respectively, compared with the intact group. In experimental animals, we found a sharp increase in the content of lysophosphatidylcholine (LPC) in all periods of the study. On the 60th and 70th days of the study, the content of LPC significantly increased in comparison with the intact group by 3.5 and 3.6 times ($p < 0.05$), respectively, in relation to the intact group. On the 80th day of his experiment, his increase was 3.9 times compared with the intact group ($p < 0.05$). The most pronounced increase in LPC was established on the 90th day of the experiment and it amounted to 4.8 times ($p < 0.05$) in relation to the intact group.

Conclusions. An increase in the content of LPC in experimental rabbits causes damage to the endothelium of microvessels, which is expressed in the appearance of defects in the lipid bilayer of the membrane and the appearance of ion channels in it, as well as a decrease in barrier properties and an increase in membrane permeability, which contributes to the development of edema,

hemorrhagic changes in organs and tissues. An increased amount of LPC also indirectly indicates the activation of phospholipases , which selectively destroy membrane lipids. Therefore, an increase in the content of LPC in the erythrocyte membranes is one of the causes of violations of the perivascular link of microcirculation.