THE IMPACT OF METABOLIC PROCESSES DISORDERS ON THE HOMEOSTASIS IN THE BODY CELLS

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The paper studies the influence of metabolic disorders in the body to change the indicators reflecting physical and chemical state of the cell membranes, as well as the concentration of cytoplasmic free calcium ions blood lymphocytes of patients with arthritis. It has been established that in rheumatoid arthritis changes the fluidity of the lipid component of biological cells membranes. Metabolic abnormalities in the body cause changes the homeostasis of calcium ions in peripheral blood lymphocytes.

Keywords: rheumatoid arthritis, lymphocytes of peripheral blood, plasmatic membrane, pyrene, cytoplasmic calcium, Fura-2/AM.

The human body is an accurate, well-balanced mechanism. Calcium ions are involved in the regulation of processes such as muscle contraction, thrombosis, neurotransmitter release, microtubule formation, hormonal responses, exocytosis, tissue mineralization, cell division and adhesion and cell growth. An increase or decrease in the concentration of calcium ions in serum and blood cells leads to various pathological processes. Metabolic changes may be the result of hereditary or acquired disorders of individual proteins, mRNA, signaling pathways, etc. the Consequences of these disorders can be seen not immediately.

In this regard, the aim of this work was to study the state of homestasis in peripheral blood lymphocytes of patients with metabolic disorders.

The study included a group of 15 individuals (12 men and 3 women) diagnosed with rheumatoid arthritis aged 30-45 years. Conditionally, the control group consisted of 10 people (5 men and 5 women), whose history did not have information about the disease rheumatoid arthritis, and biochemical and General blood tests were within the physiological norm. The object of the study was human peripheral blood lymphocytes.Fura-2/AM fluorescent probe (Molecular Samples, SIGMA) was used to measure the intracellular concentration of calcium ions [Ca2+]i. The study determined the values of polarity and microviscosity of annular lipid and lipid bilayer of plasma membranes of peripheral blood lymphocytes.

In patients with rheumatoid arthritis there were no significant changes in the polarity index of different membrane regions

The microviscosity index determines the membrane fluidity and is closely related to the functions performed. The increase in the values of this indicator can be changed due to modification of protein-lipid interactions and lead to significant violations of various functions of the plasma membrane.

In this regard, the indicators of microviscosity of different areas of the plasma membrane of peripheral blood lymphocytes were analyzed. It was found that in patients with rheumatoid arthritis, the microviscosity index in the annular lipid region of the plasma membrane of peripheral blood lymphocytes was 2 times lower than the corresponding values in patients of the control group. In the area of the total lipid bilayer, there is an increase in the microviscosity index by 17 % in relation to the control values

During the study, there were no significant differences in the magnitude of the studied indicators in men and women in the study groups.

Concentrations of cytosolic Ca^{2+} ions in peripheral blood lymphocytes of donors of different sex and age were calculated from the obtained fluorescence spectra of Fura-2/AM probe. As can be seen from table 1 in the presence of metabolic changes in men, regardless of age, there was a significant increase in the concentration of calcium ions in the cytoplasm of peripheral blood lymphocytes by approximately 10–12 %. At the same time, we did not observe age differences in the studied indicator in men.

When determining the concentration of Ca^{2+} in the lymphocytes of female donors after 35 years, an increase by 15 % in this indicator was found. In the presence of metabolic changes in this age group, there was an additional increase in the content of calcium in the cytoplasm of lymphocytes by 13 %.

It has been established that in rheumatoid arthritis, changes of fluidity of the lipid component of biological membranes of cells. Metabolic abnormalities in the body cause changes the homeostasis of calcium ions in peripheral blood lymphocytes.