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DETERMINATION BLOOD TYPES BY ABO SYSTEM

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Currently, more than 250 red blood cell antigens have been identified, which are grouped into more than 20 antigen systems. 13 systems are of clinical significance: ABO, Rh-Hr, Kell, Duffy, MNSs, Kidd, Lewis, Lutheran, Diego, Auberger, Dombrock, and I.

Keywords: *erythrocytes, antigens, Rh factor, transfusiology, leucocyte antigens;*

Human erythrocytes contain antigens of several antigenic systems simultaneously, and each antigenic system may consist of a dozen or more antigens. The main antigenic systems are considered to be the ABO and Rh factor antigenic systems. Other systems are not essential in practical transfusiology, so they are called secondary.

Leukocyte antigens. Leukocyte antigens are localised in the membrane of leukocytes. They may be similar to erythrocyte antigens, or they may be specific. The latter belong to the leucocyte antigens [21,22,23,24].

Currently, about 70 leukocyte antigens have been identified, which are divided into three groups:

- Common Leucocyte Antigens (HLA - Human Leucocyte Antigen)
- Polymorphonuclear Leucocyte Antigens.
- Lymphocyte Antigens.

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HLA-system is of great importance in blood, leucocyte and platelet transfusion, in tissue transplantation. Antigens of this system are called histocompatibility antigens. Antigens of polymorphonuclear leukocytes may play a role in the occurrence of non-haemolytic post-transfusion reactions. The role of lymphocyte antigens is currently poorly understood.

Platelet antigens

Platelet antigens are localised in the membrane of platelets. Platelets contain antigens similar to erythrocytic and leucocytic antigens (HLA), as well as specific antigens, which are referred to as platelet antigens. In haemotransfusion practice, they have no special significance [5,6,7].

Plasma antigens.

Plasma antigens are united into 10 antigenic systems, on the basis of which plasma (serum) blood groups are distinguished. Plasma antigens are localised on the surface of plasma protein molecules and represent complexes of amino acids or carbohydrates.

Cellular antigens are of primary importance in clinical transfusiology [1,2,3,4].

GROUP ANTIGENS

The presence of antigens in the blood presupposes the existence of antibodies. Currently, antibodies with the same name have been identified for almost all known blood antigens (anti-A, anti-B, anti-Rhesus, anti-Kell, etc.). Unlike antigens, blood group antibodies are not always present in humans. Only to the antigens of the ABO group system is the presence of antibodies mandatory. These antibodies (agglutinins α and β) are present in the blood plasma throughout life, combining in a certain way with agglutinogens (antigens) of red blood cells [19,20,21].

Blood group antibodies are divided into innate (agglutinins α and β) and isoimmune, which are formed in response to the ingestion of foreign group antigens (antibodies of the Rh factor system) [16,17,18].

Congenital antibodies are complete antibodies (agglutinins) and cause agglutination (sticking) of erythrocytes containing the corresponding antigen. They

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show their properties better in vitro at low temperatures and react less strongly at high temperatures. Therefore, they are referred to as cold antibodies.

Isoimmune antibodies are incomplete antibodies. They are difficult to absorb and are not destroyed by heat. These antibodies are thermal (most active at 37°C and above) and agglutination occurs only in a colloidal medium [13,14,15].

ANTIGEN-ANTIBODY INTERACTION MECHANISM

In the process of interaction between antigen and antibody two phases are distinguished:

Phase 1 - the actual interaction of antigen and antibody;

Phase 2 - manifestations.

In the first phase no changes visible to the eye or in the light microscope are not revealed. Antibody joins the antigenic determinant of one blood cell (fixed on the cell) with its active centre and enters into interaction [10,11,12].

In the second phase, after fixation of antibodies on the surface of blood cells, a complex of proteins from blood plasma (complement) joins the antigen-antibody complex. Then the formed antigen-antibody-complement complex destroys (lyses) the cell membrane. Visually it is manifested as agglutination (sticking of erythrocytes), or as cytolysis (destruction of blood cells). Haemolysis of red blood cells occurs [6,7,8,9].

The ABO system is the main system that determines the compatibility or incompatibility of transfused blood. Compatibility is the combination of donor and recipient blood in terms of antigens and antibodies, in which no immunological interactions occur. The basis for dividing people by blood groups in the ABO system is the isoagglutination reaction. Isoagglutination is a reaction between serum and erythrocytes of the same species of animal, resulting in sticking of erythrocytes. The adhesion of erythrocytes of one species of animal by the serum of another species is called heteroagglutination. Isoagglutination is an immunological reaction between agglutinogens (antigens) and agglutinins (antibodies) [1,2,3,4,5].

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