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INVESTIGATIONS OF BLOOD GROUPS AND THEIR ANTIGENS

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The clinical significance of donor-recipient incompatibility by erythrocyte antigens is dominant, since hemolysis is usually accompanied by organ and functional disorders of varying severity. It is no coincidence that the majority of erythrocyte antigens were discovered when studying the cause of PTO or hemolytic disease of the newborn (HDN) due to allo-sensitisation of a woman by fetal erythrocytes inherited from the father [1,2,3].

Keywords: *hemolytic disease of the newborn, immune response, immunological reactions, erythrocyte antigens;*

It is important to note that many erythrocyte antigens are highly immunogenic, i.e. capable of eliciting an immune response in the recipient upon their first entry into the body. In addition, receptors carrying erythrocyte antigens are located on the surface of cells and are easily accessible to antibodies, which combine to form an antigen-antibody complex that triggers all subsequent immunological reactions. To date, about 300 erythrocyte antigens have been discovered, grouped into 30 group systems [4,5,6,7,8].

Each system is assigned a letter designation and a number, which basically corresponds to the order of discovery of the system.

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There are a large number of structures (factors) on the surface of human blood cells that can play the role of antigens, i.e. when they enter the body of another person, they stimulate an immune response: the production of antibodies and lymphocytes sensitized to them. They are also called isoantigens ('iso' - equal), as they are found in members of the same species, unlike heteroantigens, which are found in other mammalian species. Such antigens divide humans as a species into groups [8,9,10,11,12].

The science that studies isoantigens and isoantibodies is called isoserology. The founder of the science of blood groups is Karl Landsteiner, who in 1901 described the differences in the blood of people, later labelled as AB0 blood groups. The doctrine of blood groups formed the basis for the scientific and practical development of the blood transfusion method. For a long time, information about the group differences of blood cells applied only to erythrocytes. Later it became known that such differences are inherent in other cellular elements: leukocytes (HLA system, DR, etc.), platelets, as well as blood plasma proteins [13,14,15,16].

Each person has his or her own unique set of antigens. They can cause immunological incompatibility (during transfusion of blood and its components, pregnancy, organ transplantation), development of autoimmune reactions. The most important for transfusiology is to take into account the group properties of red blood cells, as they primarily determine compatibility in blood transfusion. Blood groups are certain combinations of group factors (antigens) on human erythrocytes. Currently, a number of antigenic systems of erythrocytes have been discovered and studied: AB0, Rh-Hr, MNSs, Kell, Duffy and others [17,18,19,20,21,22].

The AB0 and Rh-Hr (Rhesus) systems are of greatest importance in blood transfusion. Group antigens are hereditary, innate properties of blood that do not change during a person's life. Erythrocyte antigens are called agglutinogens because they make erythrocytes stick together (agglutinate) under the influence of antibodies (agglutinins). Antibodies to red blood cells are formed in response to ingestion of another person's red blood cells or red blood cell antigens and are immunoglobulins by

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nature. Depending on the origin, a distinction is made between natural and immune antibodies [23,24].

The application of the described system allows to improve the quality of studies at the pre-analytical stage due to standardisation of sample collection procedures, to ensure stabilisation and preservation of sample nativity during their storage and transportation; to increase the protection of personnel and reduce labour costs during the collection and processing of biological material. Thus, the use of safe vacuum blood collection systems contributes to the solution of the priority task of modern clinical laboratory diagnostics - to ensure high quality and reliability of the results of laboratory tests and, in addition, guarantees a reduction in the total cost of working time for laboratory tests [3,4,5,6,7,8,9].

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