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TITLE REPORT ON BLOOD GROUPING

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EXPT HAEMATOLOGICAL TECHNIQUES

AIM To carry out blood grouping, cross matching and determine the rhesus factor

Present in various samples of blood

INTRODUCTION

The membranes of human red cells contain a variety of blood group antigens, which are also called agglutinogens. The most important and best known of these are the A and B antigens but others are present. In the ABO system, The A and B antigens are inherited as mendelian dominants, and individuals are divided into four major blood types on this basis. Type A individuals have the A antigen, type B have the B, type AB have both, and type O have neither. The A and B antigens are complex oligosaccharides that differ in their terminal sugar. An H gene codes for a fucose transferase that adds a terminal fucose, forming the H antigen that is usually present in individuals of all blood types (Figure 32–10). Individuals who are type A also express a second transferase that catalyzes placement of a terminal N-acetylgalactosamine on the H antigen, whereas individuals who are type B express a transferase that places a terminal galactose. Individuals who are type AB have both transferases. Individuals who are type O have neither, so the H antigen persists. Antibodies against red cell agglutinogens are called agglutinins. Antigens very similar to A and B are common in intestinal bacteria and possibly in foods to which newborn individuals are exposed. Therefore, infants rapidly develop antibodies against the antigens not present in their own cells. Thus, type A individuals develop anti-B antibodies, type B individuals develop anti-A antibodies, type O individuals develop both, and type AB individuals develop neither. When the plasma of a type A individual is mixed with type B red cells, the anti-B antibodies cause the type B red cells to agglutinate. Blood typing is performed by mixing an individual’s red blood cells with antisera containing the various agglutinins on a slide and seeing whether agglutination occurs.

In addition to the ABO system of antigens in human red cells, there are systems such as the Rh, MNSs, Lutheran, Kell, Kidd, and many others. There are over 500 billion possible known blood group phenotypes, and because undiscovered antigens undoubtedly exist, it has been calculated that the number of phenotypes is actually in the trillions. The Rh factor, named for the rhesus monkey because it was first studied using the blood of this animal, is a system composed primarily of the C, D, and E antigens, although it actually contains many more. Unlike the ABO antigens, the system has not been detected in tissues other than red cells. D is by far the most antigenic component, and the term Rh-positive as it is generally used means that the individual has agglutinogen D. The D protein is not glycosylated, and its function is unknown. The Rh-negative individual has no D antigen and forms the anti D agglutinin when injected with D-positive cells. The Rh typing serum used in routine blood typing is anti-D serum. Eighty-five percent of Caucasians are D-positive and 15% are D-negative; over 99% of Asians are D-positive.

Unlike the antibodies of the ABO system, anti-D antibodies do not develop without exposure of a D-negative individual to D-positive red cells by transfusion or entrance of fetal blood into the maternal circulation. However, D-negative individuals who have received a transfusion of D-positive blood (even years previously) can have appreciable anti-D titers and thus may develop transfusion reactions when transfused again with D positive blood. The basic mechanism of antigen-antibody reaction has the effect of ultimately removing or inactivating the antigenic substance and forms one of the important mechanisms of immunity. Antibodies are a class of globulins also called the immunoglobulins. They are produced by B-Lymphocytes through their transformation inti plasma cells on exposure to antigen substance. The several classes of immunoglobulins include IgG, IgM, IgA, IgD and IgE, and they are present in plasma and other certain sites such as secretions from mucous membranes and cell surfaces. A second exposure to the same antigen leads to a quicker and greater production of antibody than the first occasion. The transfusion of blood from one person to another for therapeutic purposes can lead to various reactions of the antigen-antibody type unless care is exercised.

Landsteiner in 1909 showed two findings, first, if an agglutinogen of the ABO is present on the red cells of a person the corresponding agglutinin is absent from the plasma of the person. Secondly if the agglutinogen is absent from the red cells the corresponding antibody is present in the plasma of the person.

MATERIALS AND EQUIPMENTS

Saline suspension

Anti-a serum

Anti-b serum

Ant-D serum

Glass slides

Pipettes

Cover slip

Microscope

20% Bovine albumin

PROCEDURE

1.Testing Blood Group

I)After pricking, place two separate drops of the saline suspension on the red cells on the glass slide

II)One drop of anti a serum was added to one and anti b serum added to the other

III) The pipettes and the test tubes were marked with markers

IV) Rocking the slide for 5 min

V) It was examined macroscopically against a white background

VI) A cover slip was placed and examined under the microscope, fine degrees of agglutination were seen

VII) The agglutinated masses of red cells were observed if they could break up easily

2. Rhesus factor

I) A drop of the red cells was mixed in saline suspension was mixed with 20% Bovine albumin on a glass slide and agglutination was observed

II) A drop of anti Rh serum was added to the bovine albumin and red cells and observed if agglutination occurs

3. Cross Matching

I) A drop of red cell suspension was set with a drop of serum

II) A mixture that contains a drop of Bovine albumin was set up

III) Both were examined for agglutination

DISCUSSION

The experiment was carried out successfully, and it involved fourteen students who volunteered themselves for the process. One student performed the role of a lab technician and she prepped them by sterilizing the finger with a swab and injecting them in order to withdraw the blood specimen from them.

The results from the exercise were in line with the norm that was expected. Most students were O+ while the rest were from other blood groups as outlined in the results above

According to the research that has been published below is the spread of the blood groups in the whole world.

1. O+ 42%

2. A+ 31%

3. B+ 15%

4 AB+ 5%

Hematology is the branch of medicine concerned with the study of the cause, prognosis, treatment, and prevention of diseases related to blood. It involves treating diseases that affect the production of blood and its components, such as blood cells, hemoglobin, blood proteins, bone marrow, platelets, blood vessels, spleen, and the mechanism of coagulation. Such diseases might include hemophilia, blood clots (thrombus), other bleeding disorders, and blood cancers such as leukemia, multiple myeloma, and lymphoma.

A blood type also known as a blood group is a classification of blood, based on the presence and absence of antibodies and inherited antigenic substances on the surface of red blood cells. These antigens may be proteins, carbohydrates, glycoproteins, or glycolipids, depending on the blood group system. Some of these antigens are also present on the surface of other types of cells of various tissues. Several of these red blood cell surface antigens can stem from one allele or an alternative version of a gene and collectively form a blood group system.

The ABO blood group system involves two antigens and two antibodies found in human blood. The two antigens are antigen A and antigen B. The two antibodies are antibody A and antibody B. The antigens are present on the red blood cells and the antibodies in the serum. Regarding the antigen property of the blood all human beings can be classified into 4 groups, those with antigen A (group A), those with antigen B (group B), those with both antigen A and B (group AB) and those with neither antigen (group O).

There is an agglutination reaction between similar antigen and antibody for example, antigen A agglutinates the antibody A and antigen B agglutinates the antibody B. Thus, transfusion can be considered safe as long as the serum of the recipient does not contain antibodies for the blood cell antigens of the donor.

The ABO system is the most important blood-group system in human-blood transfusion. The associated anti-A and anti-B antibodies are usually immunoglobulin M, abbreviated IgM, antibodies. It has been hypothesized that ABO IgM antibodies are produced in the first years of life by sensitization to environmental substances such as food, bacteria, and viruses, although blood group compatibility rules are applied to newborn and infants as a matter of practice. The original terminology used by Karl Landsteiner in 1901 for the classification was A/B/C; in later publications "C" became "O"

The Rh system is the second most significant blood-group system in human-blood transfusion with currently 50 antigens. The most significant Rh antigen is the D antigen, because it is the most likely to provoke an immune system response of the five main Rh antigens. It is common for D-negative individuals not to have any anti-D IgG or IgM antibodies, because anti-D antibodies are not usually produced by sensitization against environmental substances. However, D-negative individuals can produce IgG anti-D antibodies following a sensitizing event: possibly a fetomaternal transfusion of blood from a fetus in pregnancy or occasionally a blood transfusion with D positive RBCs. Rh disease can develop in these cases.

Rh negative blood types are much less common in Asian populations (0.3%) than they are in European populations (15%). The presence or absence of the Rh(D) antigen is signified by the + or − sign, so that, for example, the A− group is ABO type A and does not have the Rh (D) antigen.

A pregnant woman may carry a fetus with a blood type which is different from her own. Typically, this is an issue if a Rh- mother has a child with a Rh+ father, and the fetus ends up being Rh+ like the father. In those cases, the mother can make IgG blood group antibodies. This can happen if some of the fetus' blood cells pass into the mother's blood circulation (e.g. a small fetomaternal hemorrhage at the time of childbirth or obstetric intervention), or sometimes after a therapeutic blood transfusion. This can cause Rh disease or other forms of hemolytic disease of the newborn in the current pregnancy and or subsequent pregnancies. Sometimes this is lethal for the fetus; in these cases, it is called hydrops fetalis. If a pregnant woman is known to have anti-D antibodies, the Rh blood type of a fetus can be tested by analysis of fetal DNA in maternal plasma to assess the risk to the fetus of Rh disease. One of the major advances of twentieth century medicine was to prevent this disease by stopping the formation of Anti-D antibodies by D negative mothers with an injectable medication called Rho(D) immune globulin. Antibodies associated with some blood groups can cause severe hemolytic disease of the newborn, others can only cause mild and others are not known to cause the disease.

In blood typing, the blood type tests are performed through addition of a blood sample to a solution containing antibodies corresponding to each antigen. The presence of an antigen on the surface of the blood cells is indicated by agglutination. In these tests, rather than agglutination, a positive result is indicated by decolorization as red blood cells which bind to the nanoparticles are pulled toward a magnet and removed from solution.

Cross-matching is a test performed before a blood transfusion as part of blood compatibility testing. Normally, this involves adding the recipient's blood plasma to a sample of the donor's red blood cells. If the blood is incompatible, the antibodies in the recipient's plasma will bind to antigens on the donor red blood cells. This antibody-antigen reaction can be detected through visible clumping or destruction of the red blood cells, or by reaction with anti-human globulin.

CONCLUSION

In a nut shell, hematological techniques are important in the diagnosis of anemia, infection, hemophilia, blood-clotting disorders, and leukemia. It involves treating diseases that affect the production of blood and its components, such as blood cells, hemoglobin, blood proteins, bone marrow, platelets, blood vessels, spleen, and the mechanism of coagulation. Such diseases might include hemophilia, blood clots (thrombus), other bleeding disorders, and blood cancers such as leukemia, multiple myeloma, and lymphoma.

REFERENCES

1. E.A. Letsky; I. Leck; J.M. Bowman (2000). "Chapter 12: Rhesus and other haemolytic diseases". Antenatal & neonatal screening (2nd ed.). Oxford University Press. ISBN 978-0-19-262826-8

2. Maton, Anthea; Jean Hopkins; Charles William McLaughlin; Susan Johnson; Maryanna Quon Warner; David LaHart; Jill D. Wright (1993). Human Biology and Health. Englewood Cliffs NJ: Prentice Hall. ISBN 0-13-981176-1.

3. Fauci, Anthony S.; Eugene Braunwald; Kurt J. Isselbacher; Jean D. Wilson; Joseph B. Martin; Dennis L. Kasper; Stephen L. Hauser; Dan L. Longo (1998). Harrison's Principals of Internal Medicine. McGraw-Hill. p. 719