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A Brief Note on Transfusion Therapy of Blood and Blood Products

Mohammad Atif Hossain*
Department of Medicine, Gadjah Mada University, Daerah Istimewa Yogyakarta, Indonesia

About the Study

The first documented transfusion happened in the early 1600s, and there was only sporadic progress in transfusion medicine over the next three centuries, with most of it focused on cross-species whole blood transplants. The red cell antigen-antibody system was not discovered until the early 1900s, when Austrian Karl Landsteiner discovered that an individual's serum reacted with the red cells of some but not all other persons.

Red Blood Cell membranes have a sequence of glycoprotein moieties, or antigens that give each cell its own identity. The hormone erythropoietin regulates the process of red blood cell formation from hemopoietic stem cells. On the cell surface, there are two types of genetically determined antigens: type A and type B. One, both, or neither of these antigens may be present in any given person. These antigens are known as agglutinogens because they cause the RBC to agglutinate. The ABO blood group categorization is based on the presence or absence of agglutinogens, and the blood types are designated as A, B, or AB. Neither the A nor the B agglutinogens are present in blood type O.

Antibodies form against conventional red cell agglutinogens that are not present in the specific patient within the first year of life. These agglutinins are immunoglobulin IgM and IgG kinds, and they are most likely formed by agglutinogens found in food, microorganisms, or foreign sources other than blood transfusions. Anti-A antibodies, or agglutinins, form spontaneously in the plasma in the absence of type A agglutinogens (blood types B and O). Anti-B antibodies arise in the absence of type B agglutinogens (blood types A and O). There are no agglutinins generated when both A and B agglutinogens are present (blood type AB).

When noncompatible blood types are combined, the response between red cell antigens and their matching agglutinins causes red cell death. There are up to 300 distinct red cell antigens, but the A and B antigens are the most relevant in clinical practise; The potentially deadly agglutination can occur with the initial transfusion of ABO-incompatible blood. Because transfusion of Rh-positive blood to an Rh-negative patient can result in the production of Rh antibodies, the Rh system is also very essential.

Following a second exposure to the Rh antigen, these antibodies might cause acute hemolysis. D is the most antigenic of the 40 antigens in the Rh system, but others can also induce the formation of antibodies in recipients who don't have the antigen, complicating future transfusions. The Kell (K and k alleles), Duffy (Fya and Fyb), Kidd (Jka and Jkb), and MNS (M and N and closely associated S) systems are other antigen systems in which antibodies could potentially produce hemolytic responses. Other antigen systems are rarely used in transfusion therapy, with the exception of specific patient groups that may require many transfusions, such as patients with sickle cell anemia. In transfusion medicine, several blood products can be prepared and used as replacement therapy; however, four of these products are more commonly used in general practice. They are RBCs, Fresh Frozen Plasma (FFP), platelets and cryoprecipitate.

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***Address for Correspondence:** Dr. Mohammad Atif Hossain, Department of Medicine, Gadjah Mada University, Daerah Istimewa Yogyakarta, Indonesia; E-mail: atifhossain.mohammad43@rediffmail.com*

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