2.3.2

ABO Blood Group System

Through an arrangement known as the **ABO blood group system,** each erythrocyte in the human body may be classified into one of four different groups based upon the existence of antigens labeled “A” and “B”. Under this system, an individual possessing red blood cells with the **type A** antigen is said to have type A blood, whereas an individual possessing red blood cells with the type B antigen is said to have **type B** blood. The third ABO blood type is an example of genetic codominance, as it is possible for an individual to possess red blood cells incorporating both type A and type B antigens. An individual with this blood type is said to have **type AB** blood. Finally, an individual possessing red blood cells incorporating neither type A nor type B antigens is said to have **type O** blood.

Based on the brief introduction above, it was noted that the immune system does not make antibodies against its own cells, however, it does make antibodies against foreign cells. In the case of blood, the body will make antibodies against the ABO types that are not their own. For example, type A plasma contains anti-B antibodies, type B plasma contains anti-A antibodies, type AB plasma contains neither antibody, and type O plasma contains both anti-A and anti-B antibodies.

The importance of blood typing becomes evident when a **transfusion,** or blood transfer, becomes necessary. Any condition that results in massive amounts of blood loss or that decreases the blood’s ability to carry oxygen may necessitate a transfusion. If an individual receives blood of a type incompatible with their own, the aforementioned process of agglutination may occur potentially resulting in blood clots, kidney damage, and death.

For example, if an individual with type A blood receives a transfusion containing type B blood, anti-B antibodies within the bloodstream (of the recipient) will recognize and bind the foreign type B antigens (of the donor), thus initiating the process of agglutination. Hopefully it now makes sense why individuals with type AB blood are sometimes referred to as **universal recipients** (they don’t contain any antibodies) and why individuals with type O blood are known as **universal donors (the don’t have antigens).** Stated again, individuals with type AB blood can receive any type of blood because they possess neither anti-A nor anti-B antibodies. Thus, they are universal recipients. Individuals with type O blood can donate blood to an individual of any blood type because their erythrocytes possess neither type of surface antigen. Thus, no antibodies will react to these erythrocytes, and these individuals are universal donors.

There is an exception to this universal donor rule, however. Although a recipient’s antibodies will not react to type O erythrocytes, any antibodies within the donated type O blood *will* react to antigens on the recipient’s blood cells. In order to avoid problems from donor antibodies, red blood cells are spun down to pack them, and then re-suspended in saline prior to transfusion.

Although antibodies are typically only generated following exposure to a specific antigen, agglutination may occur upon initial exposure to an incompatible ABO blood type. Owing to this, scientists hypothesize that alternative means of antigen exposure likely exist through exposure to foods and bacteria that contain similar antigens as the ABO blood system.