Blood Laboratory

In this laboratory exercise you will be asked to (1) identify specific blood cell types on a model and (2) determine the blood type of a blood sample.

Identification of blood cell types

Below you have a chart identifying the types of cells found in a blood sample. These cell types can be divided with three categories: white blood cells (leukocytes), red blood cells (erythrocytes), and platelets (thrombocytes). The main function of the erythrocytes is to carry gases (oxygen and carbon dioxide) in the blood. Leukocytes, on the other hand, are more important for the immune response. White blood cells are generally divided into two categories, based on the appearance of the cells. Granulocytes have granules (grains) in their cytoplasm. The granules are actually sacs containing chemicals that are used as weapons to destroy invading microorganisms, especially bacteria. Agranulocytes lack cytoplasmic granules or have very small granules. Each type of white blood cell has its own function, as you can see below. The platelets, which are cell fragments, are involved in the clotting process.

Procedure:

1. Identify the following cell types on the blood model:
   - erythrocytes, thrombocytes, neutrophils, basophils, eosinophils, monocytes, lymphocytes

2. Identify the functions for each of these cell types.

Blood typing

Human blood types are based on the presence/absence of certain glycoproteins found on the surface of our red blood cells. These glycoproteins are referred to as antigens, because they are capable of causing an immune response. There are two major types of red blood cell antigens: the ABO system and the Rh factor.

ABO system

A person with only the “A” antigen present on the surface of the red blood cells has type A blood. An individual with only the “B” antigen present has type B blood. If a person has both “A” and “B” antigens present, then they have type AB blood. Finally, if a person has neither of these antigens present, then he/she has type O blood.
In addition to the antigens, an individual also has antibodies to the antigens that they lack. The appearance of these antibodies is thought to be due to prior exposure of the immune system to these “foreign” or “not-self” antigens very early on in life. Someone with type A blood lacks B antigens, so their blood will contain A antigens and antibodies to antigen B (anti-B antibodies). Someone with type B blood lacks A antigens, so their blood will contain B antigens and anti-A antibodies. People with type AB blood have both antigens, so they lack antibodies to either “A” or “B” antigens, and people with type O blood have both anti-A and anti-B antibodies.

If an individual needs a blood transfusion, it is important to make sure that they receive blood from someone with a compatible blood type. To determine if blood types are compatible, you should look at the antibodies present in the recipient (person getting blood) blood and the antigens present in the donor (person giving blood) blood.

For example:

Can an individual with type A blood safely receive a transfusion from someone with type B blood?

a. What antigens and antibodies are present in the recipient (A) blood?

A antigens, anti-B antibodies

b. What antigens are present in the donor (B) blood?

B antigens

c. Will the antibodies in the recipient blood find something to bind to in the donor blood?

Yes. The anti-B antibodies will bind to the B antigens in the donor blood. The antibodies do not destroy the foreign blood cells, rather they mark the cells for destruction by other components of the immune system.

d. Are these compatible blood types? No.

The antibodies (anti-B) binding to the B antigens in the donor blood will cause the donor’s cells to clump, or agglutinate. This clumping of the donor’s cells is damaging and perhaps even fatal. The clumped cells can get stuck in small blood vessels and block blood flow to body cells. Or they may break open, releasing their cargo of hemoglobin. The hemoglobin then clogs the filtering system in the kidneys, causing death.

Rh system
The presence or absence of the Rh factor on the surface of the red blood cells is also an
important component of blood type. People with the Rh factor have a positive blood type, and
people that lack the Rh factor have a negative blood type. An Rh-negative person will not form
anti-Rh antibodies unless he or she has been exposed to the Rh factor, usually either through a
bad blood transfusion or birth. If an Rh-negative person is mistakenly given Rh-positive blood,
it will stimulate the production of anti-Rh antibodies. A transfusion reaction (agglutination) will
not occur with this transfusion, because it takes time for the body to start making anti-Rh
antibodies. If this person was to receive a second transfusion of Rh-positive blood, however, the
antibodies in the recipient’s plasma will react with the antigens in the donated blood.
Agglutination will occur and may lead to death.

Blood Typing Procedure

1. Place three drops of blood into each of the three wells (marked A, B, and Rh) on your
   plastic plate.
2. Place three drops of anti-A antibody into the well marked A.
3. Place three drops of anti-B antibody into the well marked B.
4. Place three drops of anti-Rh antibody into the well marked Rh.
5. Mix each sample for approximately 30 seconds with a toothpick.
6. Determine the blood type for your subject.

   Subject : ___________________________  Blood Type: __________

If agglutination occurs in a well, this means that the antibody that you added found something to
bind to. If you look at the first example below, adding the anti-A antibody did not cause
agglutination, so the A antigen is not present. Adding the anti-B antibody did not cause
agglutination, so the B antigen is not present. Adding the anti-Rh antibody did cause
agglutination, meaning that the Rh antigen is present. So, this person’s blood type is O+.