

Biology 212: Anatomy and Physiology II

Lab #2: BLOOD/HEMATOLOGY

References: Saladin, KS: Anatomy and Physiology, The Unity of Form and Function 7th (2015). **Be sure you have read and understand Chapter 18 before beginning this lab.**

Blood is one of the most important components of the human body. It transports materials (i.e., oxygen, carbon dioxide, hormones, waste products, nutrients, etc.) from one area of the body to another and allows tissues in distant areas to communicate with one another. In addition, blood protects us from harmful things like bacteria and viruses via the coordinated actions of a variety of different types of leukocytes (also known as white blood cells). The average human body contains roughly 5 liters of blood that is constantly being forced through our arteries and veins by the heart.

Many pathologies of the human body involve blood. For example, anemia can result from excess blood loss or the inability to form red blood cells which deliver oxygen to the body or parts of the body. An increased risk of heart disease is associated with elevated levels of LDL (bad) cholesterol, low levels of HDL (good) cholesterol, and high levels of triglycerides in the blood. Abnormal blood clotting, or hemostasis, is associated with such disorders as stroke, pulmonary embolism, or hemophilia.

LEARNING OBJECTIVES:

Upon completion of this lab exercise students will be able to:

Describe the composition of blood plasma

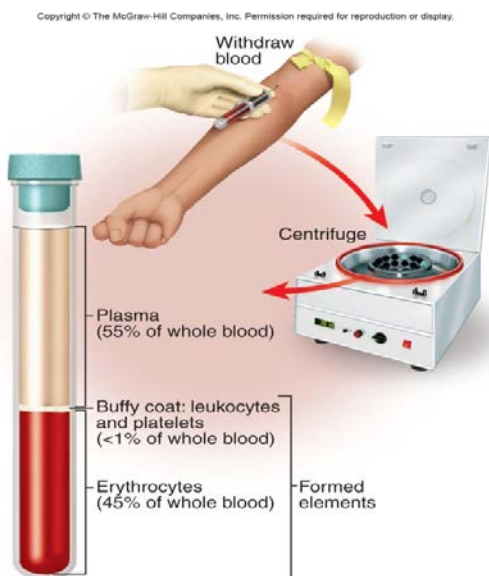
Identify the five types of leukocytes typically seen in human blood and perform a differential white blood cell count

Safely obtain a sample of blood by finger-stick to measure hematocrit and determine ABO and Rh blood types

Describe the roles of hematocrit, mean corpuscular volume, and mean corpuscular hemoglobin in maintaining normal oxygen delivery

Describe how erythrocyte production is regulated

Understand the relationship between blood group antigens and plasma antibodies in immunity



Blood is classified as a type of connective tissue which consists of two fractions:

Formed elements – the cells and cell fragments found in blood

- Erythrocytes (red blood cells)
- Leukocytes (white blood cells)
- Platelets

Plasma – the “liquid/matrix” portion of blood. Blood plasma contains a great deal of water, ions, proteins, antibodies, and clotting factors.

The analysis of blood and its components is very important clinically since the body often changes the composition of blood in response to changes in physiology or disease.

In this lab exercise, we will draw a small blood sample from a finger (not the arm). We will examine the different components of blood as well as look at some of the basic diagnostic tests commonly used in hematology.

Working safely with blood

In this lab exercise, we will be working with human blood (your own or that of your lab partners). *If you are not comfortable with drawing blood, if you know you are sick, if you have history of fainting, if you consider yourself at risk for transmitting a blood born disease, etc., then please do not use your own blood. Work to safely support your peers in your laboratory group.*

While it is unlikely that someone in this class carries an infectious agent in their blood (bacteria, viruses), it is a universal practice in all laboratories to assume that every blood, tissue, or fluid sample is tainted with something harmful. As a result, we will follow the following safety protocols:

- a) Always wear disposable gloves whenever you are handling blood or any materials that have come into contact with blood (even if it is your own).
- b) Any object which has (or may have) come into contact with blood must be disposed of in appropriate receptacles. These are never discarded in the trash.
- c) Any surface which has (or may have) been contaminated with blood or another body fluid must be disinfected.
- d) Even though you have been wearing gloves, wash your hands before leaving the lab.

Disinfecting solutions supplied by the Biology department are available in the lab for your use. Microscope slides, gloves, lancets, paper towels, etc. must be placed in designated “biohazard” receptacles. Your laboratory instructor will discuss these precautions with you.

A. BLOOD PLASMA:

It is important to understand some of plasma’s properties, even though it is not the major focus of this lab. Plasma makes up approximately 55-60% of our blood volume and is nearly 95% water. The remaining 5% of plasma consists of **ions** (also called **electrolytes**), many different **proteins, antibodies, hormones, nutrients, waste products, and clotting factors**. When fresh blood is allowed to settle, the formed elements sink to the bottom and a yellow-tan (straw colored) fluid rises to the top. This yellow fluid is the blood plasma.

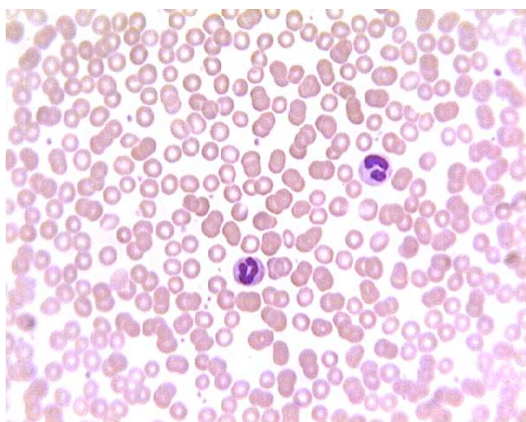
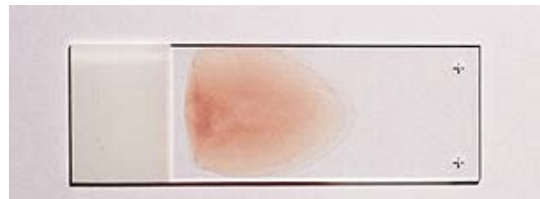
Since plasma is 95% water, it is a major reservoir for water in our bodies and it is considered one of the major “fluid compartments” in the human body. When we become dehydrated our tissues pull water from our plasma and our overall blood volume drops. If we are over-hydrated, the extra fluid volume is added to the plasma where it can eventually be removed by the kidneys and excreted in the urine. In addition to acting as a reservoir for water, plasma also plays an important role in maintaining the pH, or acid/base, balance of the body. Plasma contains buffer molecules which allow the blood and most other tissues of the body to maintain a relatively constant pH of approximately 7.4. Plasma also plays an important role in maintaining body temperature near 98.6°F since water has a great capacity to absorb and release heat. As a result, on a hot day plasma supplies the water in sweat that helps cool our bodies. On a cold day, delivery of warm plasma from our body’s core to our extremities helps keep them warm when we are outside enjoying the Minnesota winter! We will discuss more about the plasma when we study our hematocrits later on in lab

B. FORMED ELEMENTS OF THE BLOOD:

Keep in mind that the formed elements of blood consist of erythrocytes, leukocytes, and platelets. Examine Figure 18.1 and Table 18.6 of your Saladin text and note their appearances.

Exercise 1: Examination of Formed Elements

In this exercise, we will be studying the formed elements of blood using the blood smear slides found in your slide boxes **(Slide #6)**. Since these are prepared slides and have been sterilized, you won't be needing gloves for this exercise.



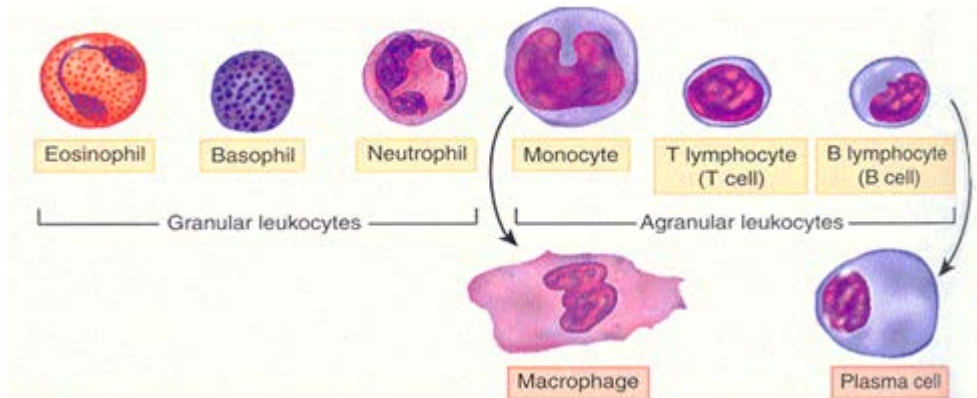
Our focus will be on the morphology of erythrocytes as well as the various different types of leukocytes found in human blood. The identification of the different types of leukocytes is most easily accomplished by looking at the relative size of the leukocyte and also at the structure of the nucleus. The vast majority of the cells that you see on a blood smear will be erythrocytes, which do not have nuclei, so when identifying the different leukocytes, just look for cells that have a dark-stained nucleus.

That being said, you won't be able to identify EVERY cell that has a nucleus since some cells will have been damaged during the processing of the slide. As you proceed, make sure you look at the images in your text book to familiarize yourself with what a "typical" leukocyte looks like and search your slide for that rather than simply picking a random cell and trying to determine its identity. Make sure everyone in your group can identify the various white cells. Figure 18.1, Figure 18.18 and Table 18.6 show what these are supposed to look like, or you can use one of the Histology textbooks in the lab.

Part 1: Erythrocytes: By far, erythrocytes are the most numerous of the cells you will see on a blood smear. From your Bio 211 experience, you will remember that erythrocytes are small (7.5 microns in diameter), round, and have an indented center. Basically, they look like little doughnuts that lack a nucleus. These are red in color because they contain large amounts of the protein **hemoglobin** to which oxygen and carbon dioxide can bind as they are carried in the blood.

Part 2: Platelets: Platelets will often have an irregular shape and will be much smaller than erythrocytes (1-2 microns in diameter). Platelets also lack nuclei since they are actually fragments of a much larger cell which remains in the bone marrow. They tend to stain dark in color. Platelets play a vital role in **hemostasis**, or blood clotting, when blood vessels are injured.

Part 3: Leukocytes: There are two main categories of leukocytes in human blood, **granulocytes** and **agranulocytes**. Examples of each of these are shown in Figure 18.1 and Table 18.6 of your Saladin text. Granulocytes will possess visibly stained granules within the cytoplasm which look like speckles within the cell, while agranulocytes will not. Additionally, granulocytes tend to possess nuclei which are more lobed in appearance and may even make them look like they are multinucleated, while agranulocytes tend to possess more rounded nuclei that we commonly expect to see in most cells. All of the leukocytes are involved in protecting the body from infections or other foreign materials.



Granulocytes:

1. Neutrophils are the most common granulocyte, and in fact they are about half of all the leukocytes in the blood. These cells should be pretty easy to identify based on their sheer numbers. A neutrophil typically possesses a blue nucleus consisting of three or more “lobes” that often can be seen connected by thinner strands. However, some cells may simply appear to have more than one nucleus, even though in reality there is only one. Their cytoplasm contains many small granules, some of which stain red or pink and others of which stain purple or blue

Neutrophils are **phagocytic** cells which play an important role in protecting the body against infections by destroying bacteria, fungi, viruses, and even abnormal or cancerous cells. Their numbers will increase dramatically when an individual is sick with a viral or bacterial infection anywhere in the body, and they are able to leave the blood to easily reach other parts of the body.

2. Eosinophils are much less common than neutrophils, and you may need to spend a few minutes to identify one. They typically have a blue nucleus which has divided into two lobes, and they have large granules in their cytoplasm which stain red or orange because they bind onto a dye called eosin.

Eosinophils are also phagocytic cells like the neutrophils, and they can also leave the blood to get into other tissues of the body. They secrete chemicals which damage multicellular pathogens such as parasites, and they destroy allergens and the antigen/antibody complexes which are formed when the body is fighting an infection.

3. Basophils are even less common than neutrophils and eosinophils, so you will probably have to search for quite a while and be quite lucky to find one. You will probably need to look at different slides. The nucleus of a basophil is blue and is usually curved into a “U” or “S” shape, but it will be very difficult to see because the large granules of this type of cell also stain a dark blue or purple. You will not need to identify a basophil with the light microscope on the lab exam, but even if you are unable to identify any of these you should be familiar with their appearance from the photos in your textbook and you should know their function.

These granules contain histamine and heparin which are released in response to inflammation and tissue injury, and like all of the leukocytes the basophils are able to leave the blood to reach other tissues. Unlike the eosinophils and neutrophils, however, they are not phagocytic. They increase the blood flow into injured tissues and they secrete chemicals which attract other leukocytes to these tissues.

Agranulocytes:

4. Lymphocytes are fairly common in the blood. Since they are agranulocytes, you will see very few if any granules in the cytoplasm of the cells. Lymphocytes in the blood usually appear to be relatively small but they will be larger if the individual has an active infection anywhere in the body. They have large rounded nuclei that may have slight indentations. The nucleus actually is so large that you often will only be able to see a very small, thin ring of cytoplasm surrounding the nucleus. This is in contrast to most other human cells we’ve seen that have a smaller nucleus and a more expansive cytoplasm.

There are at least two functionally different types of lymphocytes known as “B”-lymphocytes (or “B” cells) and “T”-lymphocytes (“T” cells), but they will have the same appearance under the light microscope. A major function of “B” cells is to produce and secrete antibodies needed by the immune system to fight infections. “T” cells play a slightly different role by secreting factors which recruit phagocytes and macrophages to an infection site, while some specialized “T” cells are also able to directly attack damaged or infected cells. You may learn more about these cell types when we discuss the immune system later in this course.

5. Monocytes are relatively large agranulocytes and are usually the largest leukocytes you will see in the blood. They are much less abundant than lymphocytes, but you should still be able to identify them on your slides. The nuclei of monocytes typically stain a slightly lighter blue than the nuclei of other leukocytes and usually have large indentation or a kidney bean appearance.

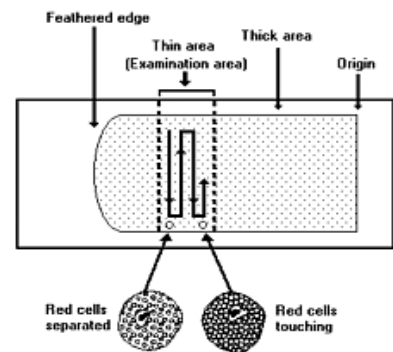
Like all of the leukocytes, monocytes leave the blood and enter other tissues where they will mature into **macrophages** that phagocytose bacteria, viruses, and damaged cell debris.

Exercise #2: Differential White Blood Cell Count

In this exercise, we will be performing what is known as a **differential white blood cell count**. The goal of this clinical test is to assess the relative numbers of different leukocytes in a given blood sample, each of which will be expressed as a percentage of the total number of leukocytes. This is an important diagnostic test since the numbers of certain leukocytes will rapidly change in response to an infection or inflammation of a tissue.

Differential counts are important for the diagnosis of many diseases. For example, a high differential count for lymphocytes may be suggestive of lymphocytic leukemia. A low differential count for neutrophils is often suggestive of radiation exposure or chemotherapy. A high differential count for eosinophils often results from intestinal parasitic infection. Allergic reactions often are associated with high differential count for basophils. A chronic infection such as tuberculosis often results in a high differential count for monocytes.

Again using your blood smear slide (slide #6), you will start at one edge of the slide and systematically keep track of the numbers of different leukocytes you see as you move the slide in a specific pattern as shown in this diagram. Be sure you are not re-counting the same cells. You can ignore all of the erythrocytes and platelets you see since we are only interested in the leukocytes. Keep moving to new adjacent regions of the slide until you have counted and identified 100 leukocytes. Keep track of the numbers in the table below. (You want a total of 100 when you are done.)



Cell Type	Number Observed
Neutrophil	
Eosinophil	
Basophil	
Lymphocyte	
Monocyte	

Total Number of Cells Counted: _____
(this should be 100)

Based on your reading of Chapter 18 of your Saladin text prior to this lab, are these normal percentages of leukocytes in human blood?

If not: the percentages of which leukocytes are too high?

the percentages of which leukocytes are too low?

B. PHYSIOLOGY OF THE BLOOD:

Erythrocytes contain the protein hemoglobin. Examine Figure 18.5 in your Saladin text and note that there are four parts to a hemoglobin molecule. Each part has a **heme** group with an **iron ion (Fe^{2+})** at its center, and this is surrounded by a molecule of the protein **globin** which comes in two forms called alpha or beta. Within the capillaries of the lungs, molecules of oxygen bind onto the iron of each heme group and are carried from the lungs to all tissues of the body. In those tissues, the oxygen is released and diffuses out of the erythrocyte, and carbon dioxide takes its place to be carried back to the lungs.

In this exercise, we will obtain samples of blood from a finger stick to measure your hematocrit, and we will discuss average red cell size (MCV=Mean Corpuscular Volume), and the hemoglobin concentration per red cell (MCH=Mean Corpuscular Hemoglobin).

Your hematocrit is simply the percentage of your blood which consists of erythrocytes. MCV, and MCH are collectively called **Red Blood Cell Indices** and are values that describe the size and hemoglobin content in red cells. Obviously, all of these are important in ensuring that your blood can supply the other tissues of your body with the oxygen they need:

- you must have enough total erythrocytes in your blood (hematocrit)
- those erythrocytes must be the right size and shape
- each erythrocyte must have enough hemoglobin to carry enough oxygen
- that hemoglobin must be able to bind oxygen in the lungs, carry it to other cells of the body, then release it for them to use for aerobic metabolism.

This is a prime example of **homeostasis**: If any one of these is too low or too high, your erythrocytes will not be able to function normally.

Exercise #3: Erythrocytes, Oxygen Carrying Capacity, and Erythropoiesis

Based on your reading of Chapter 18 of your Saladin text prior to this lab, explain each of the following to other members of your lab group:

- a) The meanings of **anemia**, **hypoxia**, and **polycythemia**.
Discuss the causes of each of these, and the effects they have on the body.
- b) Where erythrocytes are produced and released into the blood.
How old and damaged erythrocytes are removed from the blood.
- c) How erythrocyte production is regulated by the hormone **erythropoietin**, including where this hormone is produced.
- d) How erythropoietin and erythrocyte production are affected by **hypoxia** or **hypoxemia**
- e) In terms of intermittent hypoxia experienced during intense exercise, why athletes often have higher than normal hematocrits.
- f) Why cigarette smokers who are exposed to carbon monoxide in the smoke and experience hypoxia often have higher than normal hematocrits?

Exercise #4: Measuring Hematocrit

In order to obtain your own blood to determine your hematocrit, you will be performing a “finger stick” using a lancet with a very small needle. Because you will also be determining your blood type as described in Exercise 7 below, you will also need two slides, three or four clean toothpicks, and antibody solutions (called “antisera”) for specific blood antigens. This will allow you to get blood for both Exercise 4 (hematocrit) and Exercise 6 (blood type) without having to stick yourself a second time.

Before you begin, bring to your lab table an alcohol swab, capillary tube with a colored band on one end, a lancet, and a paper towel. For blood typing, also bring to your lab table two clean slides, a wax pencil, and three antisera: Anti-A, Anti-B, and Anti-D. Mark those slides and add antisera to them as described in Exercise 6.

You are now ready to obtain a blood sample:

1. Wash your hands in warm water and dry vigorously with a paper towel. Hold the hand that you plan to obtain blood from below your waist for a minute or so to allow more blood to flow to the tips of your fingers.
2. Use an alcohol swab to clean the side of the fleshy tip of your ring or middle finger.
3. With your hand still below your waist, prepare the lancet (instructor will demonstrate) and press it firmly against the side of your finger about halfway down your distal phalange (basically off to the side of your fingernail).
4. Lance your finger and wipe away the first small drop of blood that appears with a paper towel.
5. Have one of your team members place the capillary tubes on the edge of the table and have that person hold the tubes in place with their finger. As the second drop appears, move your finger with the drop of blood on it up to one end of the capillary tube – it will automatically flow into the tube by capillary action. You want the tube to be about 1/2 to 2/3rds of the way full, and you may have to squeeze your finger a bit to keep the blood flowing (not too hard though).
6. Place your finger over the other end of the capillary tube and push it into the clay to seal off the end of the capillary tube and place it flat on the paper towel.
7. Gently squeeze your finger to produce another drop of blood and add this to the drop of Anti-A antiserum you placed on one of the slides. Wipe your finger with a paper towel, gently squeeze your finger to produce another drop of blood, and add this to the drop of Anti-B antiserum you placed on one of the slides. Wipe your finger with a paper towel, gently squeeze your finger to produce another drop of blood, and add this to the drop of Anti-D antiserum you placed on one of the slides.
8. Clean up any waste materials and disinfect contaminated objects. *Do not forget to spray disinfectant on the area where you were working! Be Smart - Be Safe.*

In order to determine the hematocrit, which is the proportion of formed elements versus plasma in your blood, we will spin the capillary tubes in a special centrifuge (your instructor will do this). After 3-5 minutes of centrifugation the heavier formed elements will accumulate at the bottom of the capillary tube and the tan/yellow plasma will be seen at the top. The vast majority of the formed elements seen at the bottom of the tube will be erythrocytes, but you will also notice a thin layer of leukocytes and platelets in between the erythrocytes and plasma.

You can easily determine the percentage of formed elements versus plasma in your blood by using a g a millimeter ruler or a fancier hematocrit reader (your instructor will demonstrate).

Use a millimeter ruler to measure two things and record your values in the chart on the right:

- a) The total height of the blood sample, from the clay to the top of the plasma
- b) The height of the erythrocytes, from the clay to the top of the red blood cells

Total height of blood sample _____ mm
Height of erythrocytes _____ mm

Divide the height of the erythrocytes by the total height of the blood sample. This should be a fraction less than “1”. Multiply that fraction by 100 to get your hematocrit.

Fraction: _____ x 100 = Hematocrit _____
--

Subtract your hematocrit from “100”. This is the percentage of your blood which is plasma _____%

“Normal” ranges of a hematocrit are given in you textbook and on many websites. Small deviations are common especially in young women. But all values may be a little low if you had to squeeze your finger to obtain a blood sample. An abnormally high hematocrit reading indicates an excessive number of erythrocytes and is known as **polycythemia**. A low hematocrit is indicative of **anemia**.

Is your hematocrit within the normal range?

C. DETERMINATION OF BLOOD TYPE (ABO AND RH-FACTOR)

In this exercise, we will be determining your blood type. This is determined genetically, so your blood type does not change during your life. Like almost all cells in our bodies, blood cells possess characteristic groups of glycolipids and glycoproteins on the cell membrane that specify “self” versus “non-self”. This allows our immune systems to recognize and attempt to destroy any cells which it views as being foreign. While this is vital to protecting us from things that can harm us, it does present problems in a clinical setting when tissue such as blood is transplanted from one individual to another.

These glycolipids and glycoproteins on the cell surface which may be attacked by our immune systems are known as **antigens**. Every person in this room has a slightly different set of antigens on their cells, making each of us unique. Erythrocytes also contain many antigens on their surfaces, but luckily for us there are only a couple of different antigens that are clinically important. These are the “ABO” and “Rh” antigens which produce the blood groups with those names.

The **ABO blood group** describes one set of antigens found on erythrocytes in human blood. There are four possibilities:

- a) A person with Type A blood will have erythrocytes with the “A” antigen but not the “B” antigen;
- b) A person with Type B blood will have erythrocytes with the “B” antigen but not the “A” antigen;
- c) A person with Type AB blood will have erythrocytes with both the “A” antigen and the “B” antigen;
- d) A person with Type O blood will have erythrocytes with neither the “A” antigen nor the “B” antigen.

In order for our bodies to keep track of “self” versus “non-self” cells, the plasma of our blood will contain **antibodies** which will detect and attack any erythrocytes which have “non-self” antigens.

- a) plasma of a person with Type A blood will contain antibodies that will detect the presence of cells possessing the “B” antigen.
- b) plasma from a person with type B blood will contain antibodies which will detect the presence of cells possessing the “A” antigen
- c) plasma from a person with type O blood will contain antibodies which will detect the presence of cells possessing either the “A” antigen or the “B” antigen
- d) plasma from a person with type AB blood will not contain either of those antibodies

Phenotype (blood type)	Genotype	Antibodies in serum
A	AA or AO	Anti-B
B	BB or BO	Anti-A
AB	AB	None
O	OO	Anti-B and Anti-A

This is summarized in the table to the right.

The **Rh blood group** describes a different antigen found on erythrocytes in human blood, but in this case there are only two possibilities: your erythrocytes either have the Rh antigen (Rh-positive) or they don’t have the Rh-antigen (Rh-negative). Unlike the ABO blood groups, however, anti-Rh (also called Anti-D) antibodies are not normally present in the blood of Rh-negative individuals. They are formed in the plasma of Rh-negative individuals only after exposure to Rh-positive blood cells. This means the first exposure of an Rh-negative individual to Rh-positive blood will initiate an immune response that generates antibodies, but serious problems will not occur because it takes a few days or weeks for the body to build these new -Rh antibodies. Thus, it is the second exposure of an Rh-negative individual to Rh-positive erythrocytes when a life-threatening situation can occur. This is extremely important, for example, during pregnancy when an Rh-negative mother is carrying an Rh-positive fetus for the second time. She will form anti-Rh antibodies when she is exposed to the blood of her first Rh-positive child, and during her second pregnancy with an Rh-positive child these antibodies will cross the placenta to attack the fetus’s erythrocytes. This is called **hemolytic disease of the newborn** or **erythroblastosis fetalis** and often results in death of the fetus or newborn. Fortunately, this situation can be prevented by the administration of a drug called Rhogam to an Rh-negative woman to suppress her production of those anti-Rh antibodies.

These antigens and antibodies of either the ABO blood groups or the Rh blood groups are why transfusion of the wrong blood type to a person often has devastating consequences. For example if a person with Type A blood receives Type B blood, the anti-B antibodies in their plasma will stick to the transfused Type B blood cells and cause them to clump together. If a person with type “O” blood receives either Type A or Type B blood, the anti-A and anti-B antibodies in their plasma will cause the transfused cells to clump together. If an Rh-negative person receives Rh-positive blood, the anti-Rh antibodies in their plasma will cause the transfused cells to clump together. This is called **agglutination**. Large clumps of the transfused cells will create blood clots that quickly occlude blood vessels, often leading to death.

Exercise #5: Blood Transfusion

Discuss with your lab group which types of blood – including both the ABO and Rh groups – can and can not be safely transfused into an individual with each of the following types of blood, and complete this chart.

Recipient Blood Type	What types of blood can safely be transfused into that recipient?	What types of blood can <u>NOT</u> be safely transfused into that recipient?
A-positive blood (that means Type A and Rh-positive)		
B-positive blood		
AB-positive blood		
O-positive blood		
A-negative blood		
B-negative blood		
AB-negative blood		
O-negative blood		

Based on that information, explain to other members of your lab group why a person with Type O-negative blood is considered a “universal donor”, and why a person with Type AB-positive blood is considered a “universal recipient”.

Exercise #6: Determining ABO and Rh Blood Types:

In this exercise we will be using commercial antibodies against either the “A” antigen or “B” antigen to determine your ABO blood type, and a commercial antibody against the Rh antigen to determine if you are Rh-positive or Rh-negative.

Remember: Type A blood will agglutinate (clump together) in the presence of antibodies against the “A” antigen (these antibodies come from plasma of a person with Type B blood), Type B blood will agglutinate in the presence of “anti-B” antibodies, Type AB blood will agglutinate in the presence of either antibody, and Type O blood will not agglutinate at all in the presence of either anti-A or anti-B antibodies. Regardless of the ABO blood type, Rh-positive blood will agglutinate in the presence of Anti-Rh antibodies.

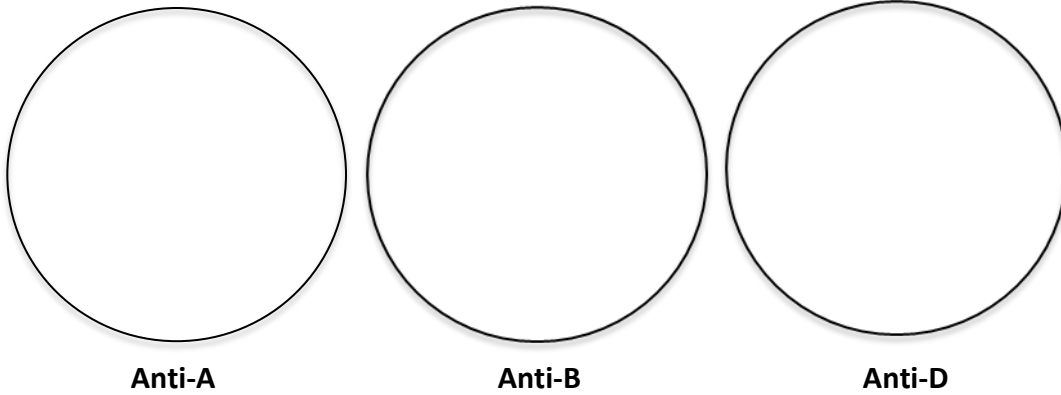
Procedure:

1. Remember to wear your gloves when dealing with blood.
2. Using a wax pencil label one side of a clean microscope slide "A" and the other half "B"
3. Use a wax pencil to label another clean slide "Rh"
4. Place one drop of Anti-A antiserum on the side of the slide you labelled A
5. Place one drop of Anti-B antiserum on the side of the slide you labelled B
6. Place one drop of Anti-Rh (also called "Anti-D") antiserum on the slide you labelled Rh

You can now lance your finger as described for determining your hematocrit

7. Place one drop of blood on the microscope slides next to each of those drops of antiserum and use clean toothpicks to mix each drop of blood with its antiserum.
8. Be careful not to let any of those drops dry out.
9. After one or two minutes, examine the slide to see if the blood exposed to either antibody has clumped. If after 5 minutes you cannot detect any clumping in the presence of either Anti-A or Anti-B antibody, it can be safe to assume that you have type O blood, and if you can not detect clumping in the presence of Anti-Rh antibody you can assume you have Rh-negative blood
10. Remember to clean up your work area and place your used microscope slides in the appropriate biohazard container OR in a container of bleach/water.

Draw your results in the circles below.



What is your blood type, both ABO and Rh? _____

How common is your blood type
(that is, what percentage of people have it?) _____

What types of blood could you
safely receive in a blood transfusion? _____