Sunday Academy 2011-12
The Forensics of Blood

Description:

The examination of blood provides much information to crime scene investigators. Blood can provide information such as what type of blood it is (A, B, AB, or O) and can be further tested for DNA to determine exactly whose blood it is. Blood spatter patterns can give a Forensic scientist information about where the blood came from, if the victim was moving, what type of wound they suffered and more.

Blood can also be collected and analyzed for information such as drugs ingested, if they had any poisons in their system and other toxicology information.

Objectives:

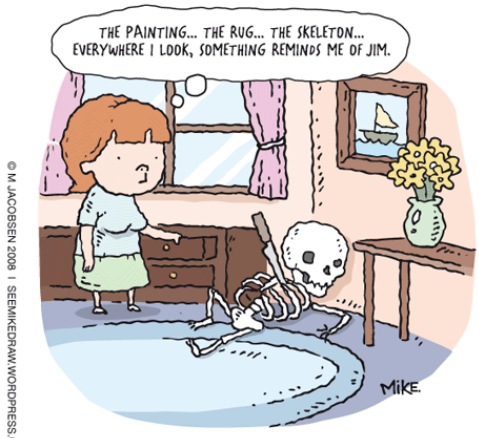
- Students will be able to determine the blood type of several samples.
- Students use data collected from an experiment to determine unknown samples
- Students will analyze various blood spatter patterns to determine at what angle they occurred and from where they came from.
- Students will discuss how blood can be used as a valuable tool in forensics.

Standards covered:

- 11-12.1.1 Explain how models can be used to illustrate scientific principles
- 11-12.2.6 Analyze data using appropriate strategies
- 11-12.6.1 Select and use appropriate technologies, tools, and techniques to solve a problem

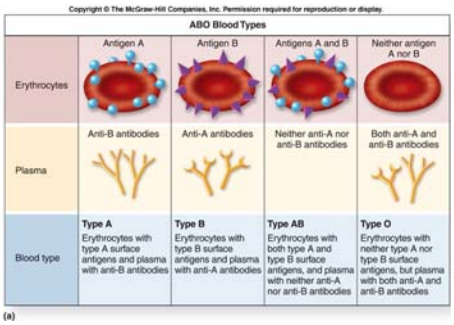
Session Organization

10:30-11:00 General organization
11:00-11:30 Cultural Connection
11:30-12:00 Background information
12:00-12:30 Activity 1
12:30-1:00 Lunch
1:30-3:00 Activities 2, 3, 4, and 5
3:00-3:30 Wrap up and presentations



Activities

1. Determine the blood type of various blood samples
2. Make a standard chart of blood drop diameters and use this to determine unknown blood stains.
3. Direction of blood travel
4. Angle of impact of blood stains
5. Origin of blood spatter



ABO Blood Types

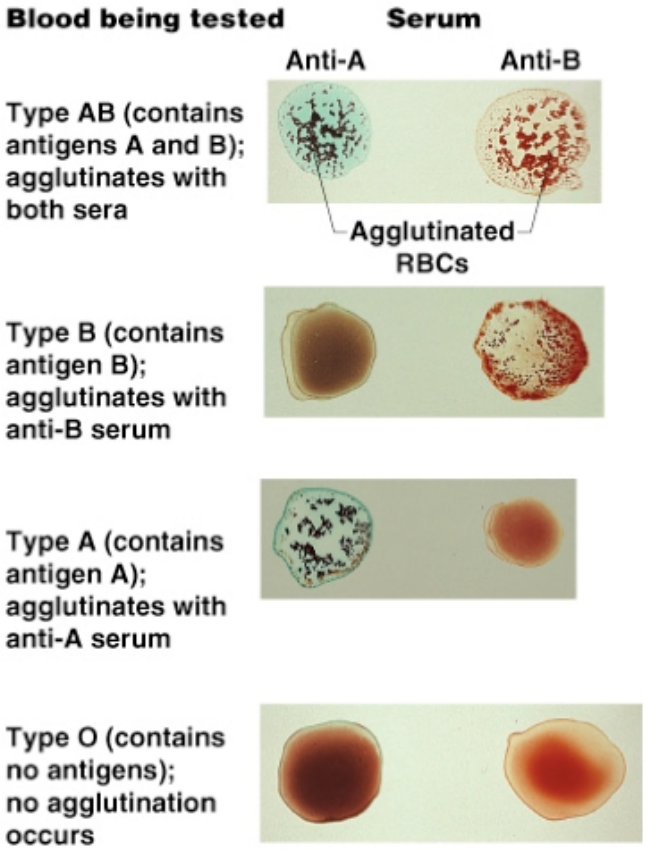
	Antigen A	Antigen B	Antigens A and B	Neither antigen A nor B
Erythrocytes				
Plasma	Anti-B antibodies	Anti-A antibodies	Neither anti-A nor anti-B antibodies	Both anti-A and anti-B antibodies
Blood type	**Type A** Erythrocytes with type A surface antigens and plasma with anti-B antibodies	**Type B** Erythrocytes with type B surface antigens and plasma with anti-A antibodies	**Type AB** Erythrocytes with both type A and type B surface antigens, and plasma with neither anti-A nor anti-B antibodies	**Type O** Erythrocytes with neither type A nor type B surface antigens, but plasma with both anti-A and anti-B antibodies

(a)

Activity One: Determining blood type

Red blood cells have a protein on the surface called an antigen (agglutinogens). Which ever antigen you have on your RBC's determines what blood type you are, for instance if you have A antigen, you are type A, if you have B antigen, you are type B, if you have both antigens, you are type AB and if you have no antigens, you are type O.

In your plasma, you have antibodies that are the opposite of the antigen you have. If you put antibody A with antigen A, they will clump and could cause a person to die. This clumping effect is how blood types are determined. The following chart below illustrates this effect:



Procedure for Blood typing

For each blood sample:

1. Place three drops of blood in the well labeled A and three drops of blood in the well labeled B.
2. To the blood in well A, add two drops of anti-A serum
3. To the blood in well B, add two drops of anti-B serum
4. Using the opposite end of tooth pick, stir the blood and serum together (do not use the same end for each sample)
5. Wait a minute
6. Record the results in the table below:

Results of blood typing test

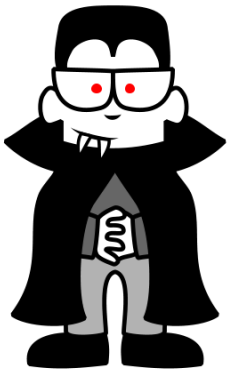
Sample	Anti-A serum	Anti-B serum	Blood type

Conclusions:

1. Why is it important to know a person's blood type before you give them a transfusion?

2. Which blood type is called the universal donor-why?

3. If type O blood is found at a crime scene and your chief suspect is type O, does this mean they are responsible? Explain your answer.



Activity Two-determining the height of blood drops

Procedure:

1. Fill a dropper full of fake blood
2. Position the dropper 25 cm from the surface of a piece of paper
3. Squeeze out a single drop of blood and let it splatter on the paper below.
4. Slide the paper over and repeat this procedure twice for a total of three drops of blood from this height.
5. Allow the blood drops to dry
6. Record any observations of your blood drops
7. Measure their diameter and calculate the average diameter of your drops.
8. Repeat this procedure from the height of 50 cm, 75 cm, 100 cm, 125 cm, 150 cm.
9. Graph your results using height as your independent variable and diameter of blood drop as your dependent variable.
10. Use your graph to determine the height of the unknown blood samples.

Results:

Height of	Diameter of blood droplet (cm)				
Drop (cm)	Trial 1	Trial 2	Trial 3	Average	Observations of drops
25					
50					
75					
100					
125					
150					

Height of unknown samples:

Sample A _____

Sample B _____

Sample C _____

Conclusions:

1. Describe the relationship between the distance the blood dropped and its diameter?

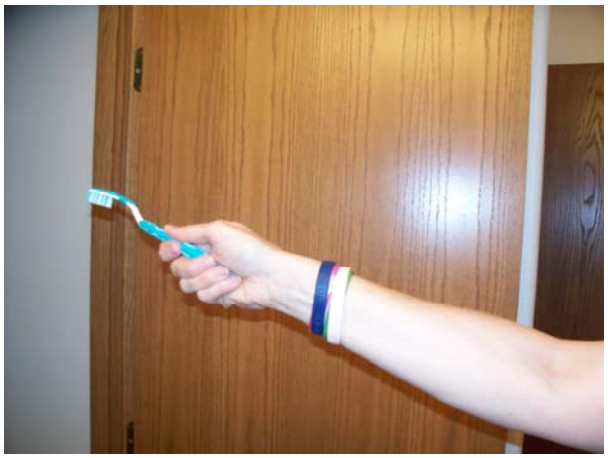
2. How close were you to the accepted answers for your blood drop samples?

3. What possible sources of error could have occurred during this procedure?

Activity 3-Direction of Travel of Blood

Procedure:

1. Lay a piece of paper on the floor
2. Dip a toothbrush in a glass of fake blood
3. Grip the toothbrush in your hand with the bristles of the brush pointing vertically up toward the ceiling
4. Quickly flip your forearm up to form a right angle with your upper arm.
5. Allow the spatter to dry and analyze it.
6. Save this spatter pattern for part D.



Results:
Draw several of the blood drops from your spatter.

1. What observations can you make concerning the droplets' direction of travel?

2. Give a general explanation of spatter patterns and how they can be used in crime scene investigations.

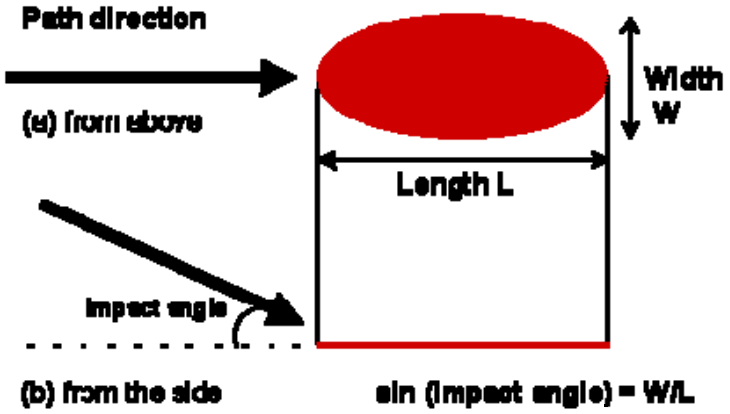
Activity 4-Angle of impact

Procedure:

1. Place a piece of paper on a clipboard
2. Hold the clipboard at a 15° angle using a protractor

3. Hold the dropper of blood so that it is 25 cm above the clipboard
4. Squeeze out a drop of blood on the paper
5. Repeat this procedure for the angles of 30°, 45°, 60°, and 75°
6. Let your drops dry and record the length and width of each drop in the table.

Calculating the angle of impact



Results:

Angle of drop	Elongation (cm)	Width (cm)	Calculated angle
15°			
30°			
45°			
60°			
75°			

Conclusions

1. How do your calculated angles compare to the actual angles of the blood drops?

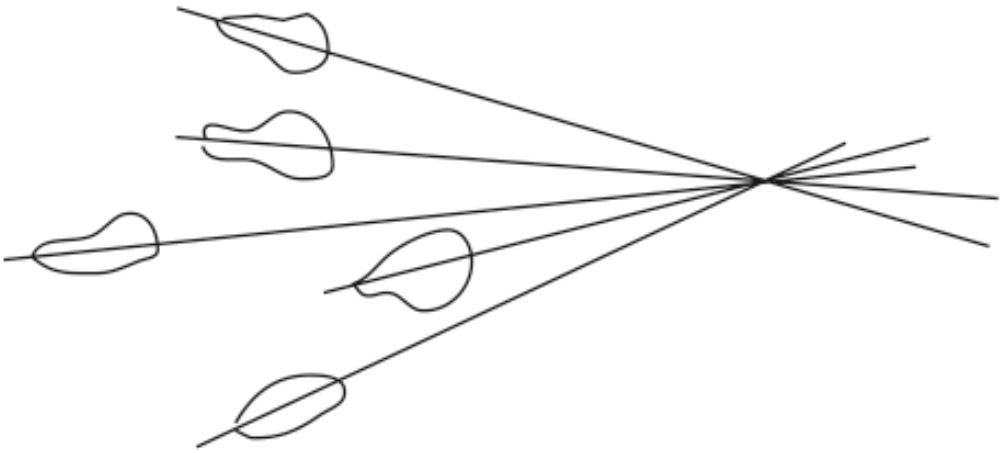
2. If your calculated angles didn't equal your measured angles, what would be some source of error?

3. How does calculated angles of blood spatter help with a crime scene investigation?

Activity 5-Orgin of Blood spatter

Procedure:

1. Using your blood spatter paper from activity 2, select 5 to 7 of your best defined tear drop shaped droplets on the paper.
2. Draw an extended longitudinal axis through the head and the tail of each droplet using a ruler.
3. The point that the lines intersect is the point of origin.



Conclusions:

1. How close were you to the origin of your blood spatter?

2. How can this be used (finding the origin) in crime scene analysis?