

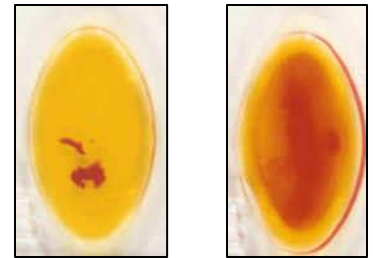
# Lab: Blood Type Fingerprint Mystery

## HONORS BIOLOGY: UNIT 6

**BACKGROUND:** To identify the blood type of an individual, scientist's use of the basic physiological elements found in the blood - the **antigens** on the **erythrocytes** (*red blood cells*) and the **antibodies** found in the **plasma**.

In this blood typing, we will mix the erythrocytes from an individual with known antibodies (immunoglobins-special proteins). There are two bottles containing one of the following; **Anti-A** and **Anti-B antibodies**.

Interpreting the results depends on the reaction of agglutination (*clumping*). If you see agglutination, the antibody in question has found an **antigen** to interact with which means your red blood cells have that antigen on them. In the cases illustrated to the right, we have two different drops of blood added into anti-B serum. Sample #1 on the left has **agglutinated** (or clumped), while the Sample #2 on the right shows **no** reaction.



Sample#1

Sample#2

Another blood marker, the **Rh factor**, is also used to type blood because it is also found on human red blood cells and causes antigen/antibody reactions. These reactions are separate from the so-called ABO reactions described above. In the Rh-factor system, the **Rh antigen** is either present or absent, leading to designations of Rh positive (**Rh+**, antigen present) or Rh negative (**Rh-**, antigen absent). Thus, a person can be O+ or O-, A+ or A-, and so on. A person with O- blood can only receive O- blood. **Anti-D** will be provided in a third bottle to test the **Rh factor**.

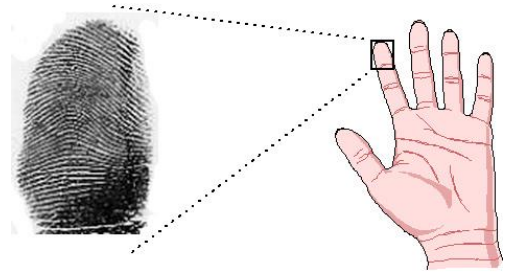
To make life a little easier, here is a table listing the reactions and what they mean:

If your blood agglutinates in antibodies	You are blood type
Anti-A, but not Anti-B	A
Anti-B, but not Anti-A	B
Anti-A and Anti B	AB
Neither Anti-A or Anti-B	O
Anti-D (Test for Rh antigen)	Rh+

**Materials:** Well plates, simulated blood, toothpicks, bottles of simulated antiA, B and D, and fingerprint of perpetrator.

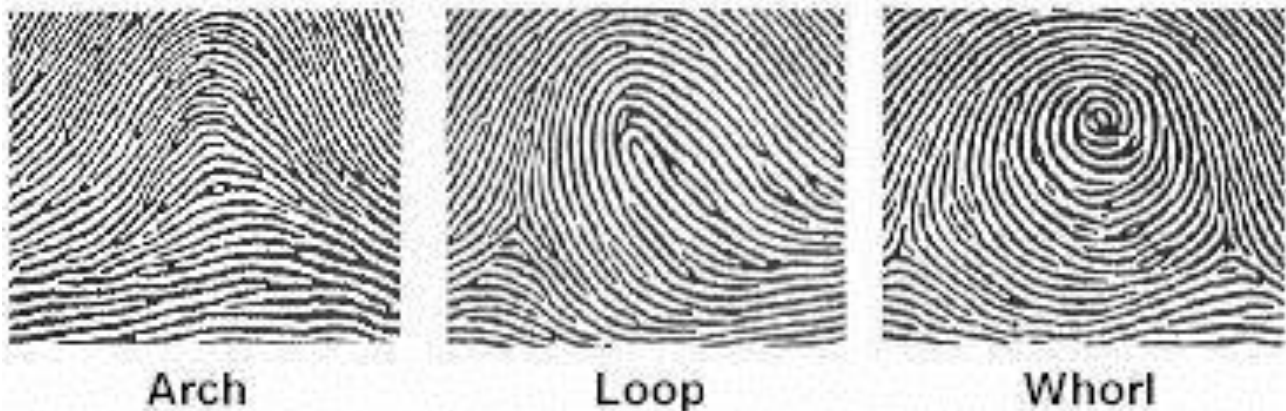
**Fingerprints:** Fingerprints begin forming during the 12th week of gestation, and barring surgical or accidental removal of the finger itself, will remain permanent for the life of the individual.

Fingerprint Identification has been used as a means of positive identification for over one hundred years. No two fingerprints have ever been found to be the same. No two fingerprints on the same hand have ever been found to be the same. Identical, mono zygotic twins will have the same DNA, but will have twenty different fingerprints, between the two twins.



Each fingerprint contains minutiae, or ridge characteristics. Fingerprints are identified to individuals by examining and comparing the ridge characteristics of two different fingerprint impressions to determine if these characteristics occupy the same relative area and position, and if their unit relationship to each other is in agreement.

All fingerprints fit into one of 3 main patterns, **whorl**, **loop**, or **arch**. Fingerprints are an example of incomplete dominance. **Whorl** is dominant (**LL**)- about 70% of population, **loop** is (**LI**)-about 25% of population, and **arch** is recessive (**II**) –about 5% of population.



### Scenario:

A rival school has stolen another school's mascots. The suspect was accident prone and cut themselves breaking the glass to get into school after it was closed and left a trail of blood to the mascot room. You are given a sample of the blood found at the scene to determine their blood type. In addition, fingerprints have also been collected from the door handle of the closet the mascot outfit was kept in. The administration used the cameras to determine height, weight, skin and hair color and have narrowed it down to 10 potential suspects from other schools who have been vocal about their dislike for the rival school and it is up to you to provide the evidence to take the person down!

### Task:

- Determine the **blood type** of the suspect by testing with antibody serums **Anti-A**, **Anti-B**, and **Anti-D**.
- Determine the suspect's **fingerprint type**
- Try to identify the perpetrator from the list of possible suspects with known blood types and fingerprint samples.

## Procedure:

1. Obtain "blood sample" found at the scene and analyze it.
2. Place **20 drops** of suspect's "**blood sample**" into well plate depressions 1, 2 and 3.
3. Add **10 drops** of **anti-A** in **well 1** and stir for 30 seconds. (record dropper number: \_\_\_\_\_)  
**NOTE: all dropper bottle and fingerprint numbers must match.**
4. Add **10 drops** of **anti-B** in **well 2** and stir for 30 seconds. (record dropper-number: \_\_\_\_\_)
5. Add **10 drops** of **anti-D** in **well 3** and stir for 30 seconds. (record dropper-number: \_\_\_\_\_)
6. Record results in **data table #1**.
7. Obtain **fingerprints** collected at the scene. (record fingerprint-number: \_\_\_\_\_)
8. Determine what type of pattern the fingerprints are and match them with the possible suspects.
9. Record data in **data table #2**.
10. **CLEAN UP** your lab area and rinse out well plates.
11. Answer Analysis Questions and CER

### Data Table #1

Well	Agglutination (yes/no)	What does this tell you?
1. Anti-A		
2. Anti-B		
3. Anti-D		

### Data Table #2

Fingerprint pattern found at scene	Other observations about fingerprints

### Data Table #3

Suspect	Blood type	Fingerprint pattern
1.	A +	Arch
2.	B-	Loop
3.	AB+	Whorl
4.	B+	Loop
5.	O+	Whorl
6.	A+	Loop
7.	B+	Whorl
8.	A-	Arch
9.	AB-	Loop
10.	A+	Whorl

## Analysis Questions:

1. What does the information tell you about **blood type**? Support with evidence.
2. What is the **genotype** for the fingerprints found at the scene? *Support with evidence.*
3. What possible fingerprint type(s) could the suspect's parents have? (*Show Punnett square(s) to explain*)

4 **Blood type** is an example of what type of **inheritance**?

How many phenotypes are there?

How many genotypes are there?

5. **Fingerprints** are an example of what type of **inheritance**?

How many phenotypes are there?

How many genotypes are there?

6. Why does it make sense that only **5%** of the population has the **arch** pattern fingerprint? *Explain*

Why is the **Whorl** fingerprint pattern so prevalent (*common*)? (*Use Mendel's Principle of Dominance to explain*)

7. What other **information** would you want if you are the attorney trying to convict and/or defend this suspect? Why would you want this information? (*List at least **three** and explain why*)

### **CER (Claim/Evidence/Reasoning)**

<p><b>Claim:</b> Who stole mascot? (see Data Table #3)</p>	
<p><b>Evidence:</b></p>	
<p><b>Reasoning:</b></p>	