

## Unit 9b: Blood: (Spatter Analysis)



By the end of the unit, you will be able to:

- \* Describe how blood flows through the body
- \* Conduct a blood spatter analysis
- \* Discuss the science behind various types of blood spatter patterns
- \* Describe steps and tests used to find and process blood evidence at crime scenes

Unit Vocabulary:

- \* 3 main blood vessels: \_\_\_\_\_
- \* Blood spatter: \_\_\_\_\_
- \* Satellite drops: \_\_\_\_\_
- \* Lines of convergence: \_\_\_\_\_
- \* Point of Origin: \_\_\_\_\_
- \* Passive Drops: \_\_\_\_\_
- \* Arterial gushes: \_\_\_\_\_
- \* Splashes: \_\_\_\_\_
- \* Smear: \_\_\_\_\_
- \* Wipe: \_\_\_\_\_
- \* Swipe: \_\_\_\_\_
- \* Cast off: \_\_\_\_\_
- \* Luminol: \_\_\_\_\_
- \* Kastle-Meyer Test: \_\_\_\_\_
- \* ELISA Test: \_\_\_\_\_

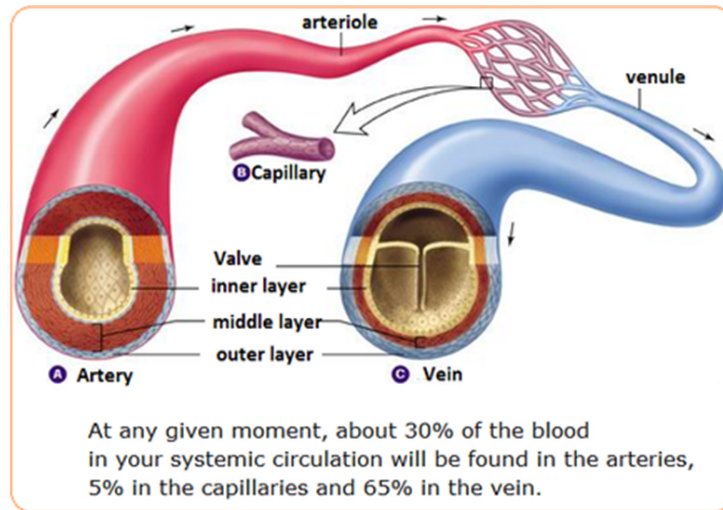
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### Class Evidence or Individual Evidence?

- \* \_\_\_\_\_ is considered \_\_\_\_\_ evidence and is good to \_\_\_\_\_ suspects
- \* \_\_\_\_\_ profiling from blood is considered \_\_\_\_\_ evidence and can help \_\_\_\_\_ a suspect

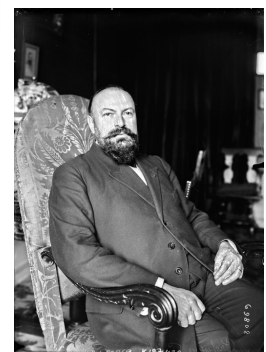
### How does blood travel through the body?

- \* There are 3 main types of blood vessels...
  - \_\_\_\_\_
    - Carry oxygenated blood \_\_\_\_\_ from the heart
    - \_\_\_\_\_ artery is the ONLY artery to carry deoxygenated blood
    - Major arteries include:
      - \_\_\_\_\_ – head and neck
      - \_\_\_\_\_ – legs and feet
      - THERE ARE MANY MORE!
  - \_\_\_\_\_
    - Arteries divide and divide and divide form tiny vessels
    - Supply cells with \_\_\_\_\_
    - \_\_\_\_\_
  - \_\_\_\_\_
    - Capillaries gradually join together with one another to form the larger vessels called veins
    - Carry \_\_\_\_\_ blood toward the heart
    - \_\_\_\_\_ is the only vein that carries \_\_\_\_\_ blood
    - Contain \_\_\_\_\_ to prevent backflow



### What is blood spatter?

- \* A grouping of blood stains constitutes a \_\_\_\_\_
- \* \_\_\_\_\_
- \* Patterns help to \_\_\_\_\_ the events surrounding shootings, stabbings, beating, etc.
- \* In 1939, Dr. Victor Balthazard first researched and analyzed spatter patterns





**The Children's Heart Institute**  
 HASAN ABDALLAH, M.D., FAAP, FAAC

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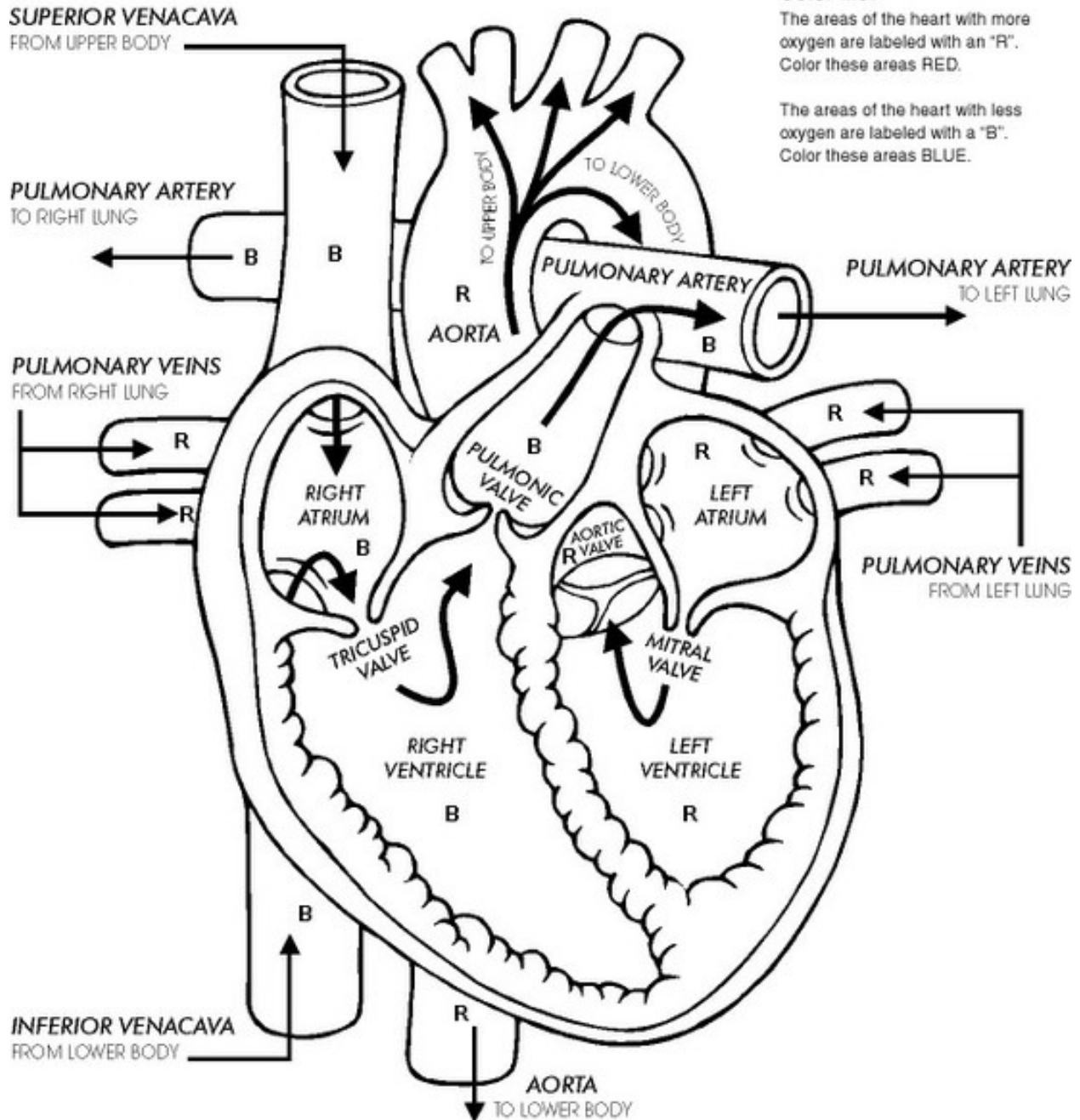
# The Heart

This drawing shows how blood flows through the heart.

**Color Me:**

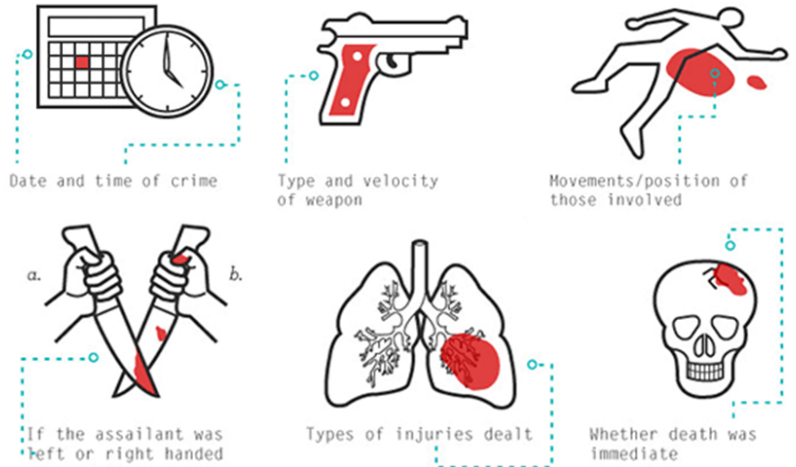
The areas of the heart with more oxygen are labeled with an "R". Color these areas RED.

The areas of the heart with less oxygen are labeled with a "B". Color these areas BLUE.



What can the blood spatter tell us?

- \* The \_\_\_\_\_ of blood traveled
- \* \_\_\_\_\_ of impact
- \* Point of \_\_\_\_\_ of the blood
- \* \_\_\_\_\_ of the blood
- \* \_\_\_\_\_ of death



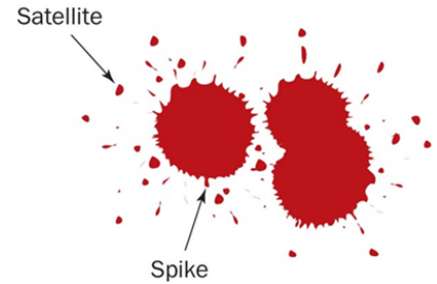
How does blood fall?

- \* \_\_\_\_\_
  - o Blood sticks together as it falls maintaining a \_\_\_\_\_
  - o Blood also resists flattening out when it falls on a flat surface
  - o \_\_\_\_\_ help it maintain a curved shape

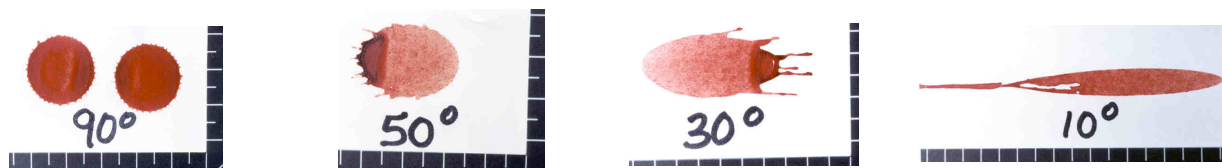


What does the shape of the drop say?

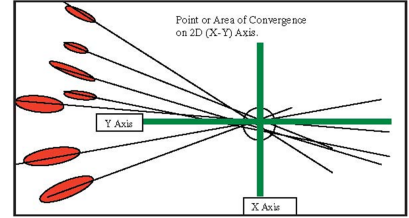
- \* When blood falls from a height, or at a high velocity, it forms \_\_\_\_\_
- \* When the blood falls onto a less-than-smooth surface, the edges may have \_\_\_\_\_, or \_\_\_\_\_
- \* An elongated blood drop indicated blood was traveling from a \_\_\_\_\_ when it landed



- \* The point of impact may appear \_\_\_\_\_ than the rest of the drop, with a \_\_\_\_\_ pointing in the direction of the blood's movement
- \* Smaller, secondary droplets may break off and will \_\_\_\_\_ the moving droplets of blood, allowing scientists to determine \_\_\_\_\_

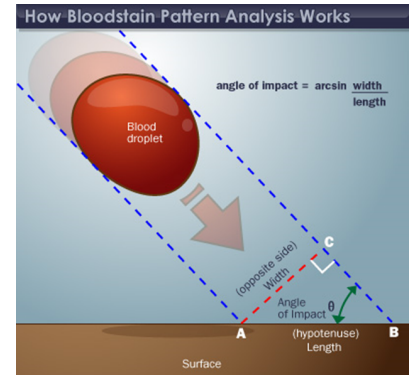


- \* When there are two or more blood spatters, a scientist can draw \_\_\_\_\_ that can pinpoint the location of the blood source


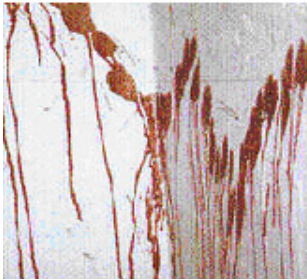






Where did the blood come from? Point of Origin

- \* Measuring the length and width of blood drops and using trigonometry allows us to determine an approximate point of origin.
- \* Only experienced analysts trained in this technique should perform these measurements.
- \* Strings can be placed over blood drops along the axes of the stains at the calculated impact angles, and a resulting point of origin can be visualized in three dimensions.
- \* Angle of impact =  $\frac{\text{the width of the bloodstain in mm}}{\text{the length of the bloodstain in mm}}$ 
  - o Use the answer to figure of the arc sin of that number (opposite side/hypotenuse)



What are the different kinds of blood spatter?

<p>_____</p> <p>Passive fall (90° angle to floor) – circular drops w/ secondary satellites</p> 	<p>_____</p> <p>Results from damage to an artery</p> 	<p>_____</p> <p>Help show position of victim</p> 
<p>_____</p> <p>Bleeding victim touching walls or furniture</p> 	<p>_____</p> <p>Victim moving from one place to another</p> 	<p>_____</p> <p>Victim bleeds heavily</p> 

What are smears?

- \* Smear patterns from a large volume of blood, at \_\_\_\_\_, are often distorted so much that further classification is \_\_\_\_\_ possible
- \* However, transfer patterns occur when a wet bloody surface contacts a second unstained surface creating \_\_\_\_\_ or at least a recognizable portion of the original surface



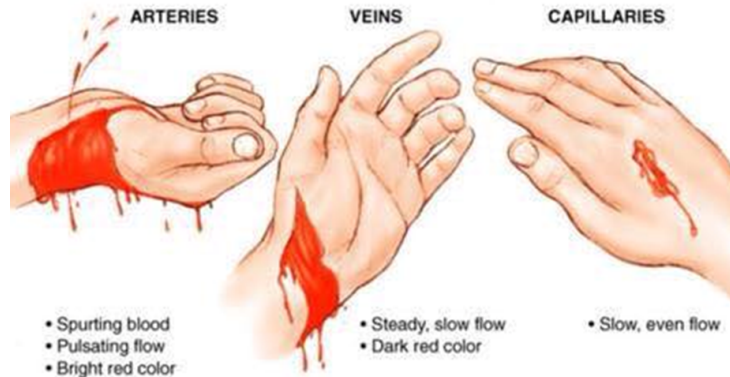
What are the different types of smears?

- \* \_\_\_\_\_
  - o The transfer of blood onto a \_\_\_\_\_ contaminated with blood. One side is usually feathered which indicates the \_\_\_\_\_.
  - o One common pattern at scenes is a hair swipe - a long thin fine line transfer.
- \* \_\_\_\_\_
  - o Created when an object moves through blood that has not completely dried and \_\_\_\_\_



What are gushes?

- \* Arterial spurting usually occurs when an \_\_\_\_\_ and the blood spurts or gushes from the wound in \_\_\_\_\_
- \* It continues spurting as long as the \_\_\_\_\_
- \* \_\_\_\_\_ decelerate from air resistance and produce a pattern \_\_\_\_\_.
- \* The drops strike the surface and then characteristically drip or run downward due to their large \_\_\_\_\_.

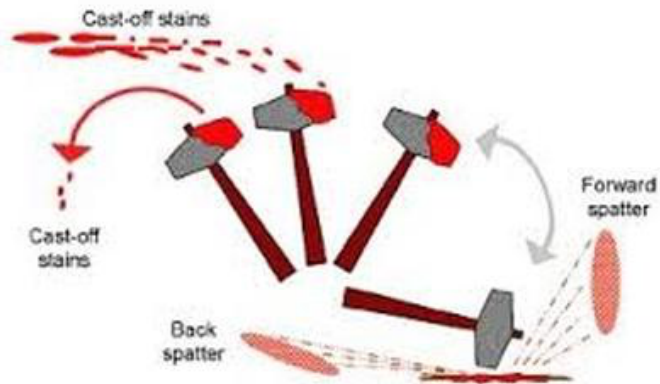


How does speed and velocity impact blood spatter?

	High Velocity	Medium Velocity	Low Velocity
Example			
Size of blood droplets			

What is cast-off?

- \* The movement and the number of swings can often be documented by examining the \_\_\_\_\_.
- \* During a beating with an instrument which produces the bleeding, blood will \_\_\_\_\_ collect on the surface of the instrument from \_\_\_\_\_.
- \* On \_\_\_\_\_ strikes at the same location, blood will adhere to the instrument since it now strikes a \_\_\_\_\_.
- \* When the \_\_\_\_\_, its movement allows small drops of blood to be released from its surface.
- \* Some of these small drops will strike a surface, often a ceiling, at a 90-degree impact angle



How do you know if there is any blood?

- \* Even with the most thorough cleaning, blood leaves residue that is difficult to remove

What is Luminol?

- \* Luminol powder mixed with \_\_\_\_\_ is able to detect \_\_\_\_\_ left behind by blood.
- \* Spray the area and if blood is present it will luminesce for about \_\_\_\_\_.
- \* Reacts with old or new blood, however it \_\_\_\_\_

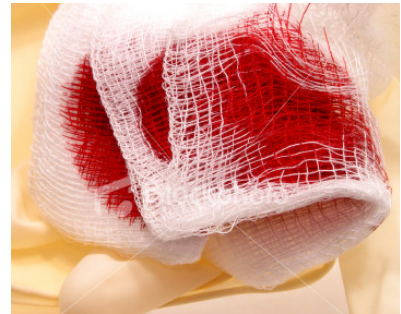


Is it actually blood?

- \* If blood stains or drops are found, confirm they are in fact blood
- \* There are many chemical to test for the presence of blood
- \* \_\_\_\_\_

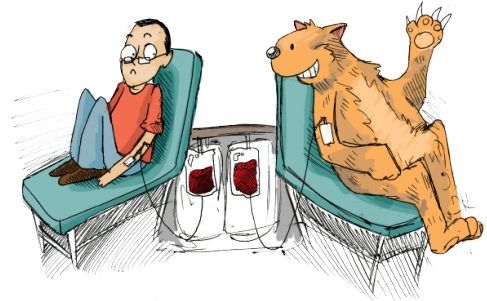
How is blood evidence collected?

- \* To be presented accurately and usefully in court, bloodstain evidence must be recognized, documented, preserved, and correctly evaluated.
  - o When possible, deliver blood or stained object to \_\_\_\_\_.
  - o If unable to deliver to the Laboratory, or if the object must be mailed, \_\_\_\_\_ completely before packaging.
- \* Blood that is in pools should be \_\_\_\_\_ and allowed to air dry. After it dries it should be \_\_\_\_\_ as soon as possible.
- \* Blood should be taken to the lab as quickly as possible; delays beyond \_\_\_\_\_ may make the samples \_\_\_\_\_.
- \* If not completely dry, label and \_\_\_\_\_ or place in a brown paper bag or box and seal and \_\_\_\_\_.
- \* Place only \_\_\_\_\_ item in each container.
- \* Do not use \_\_\_\_\_ containers.



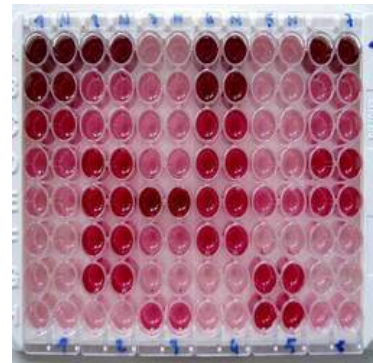
Is the blood even human?

- \* If blood is present, the lab will need to confirm it is human blood
- \* All mammals, except camels and llamas and circular, \_\_\_\_\_
- \* Animals that are \_\_\_\_\_ (birds, fish, etc.) have oval blood cells with a nucleus



So how do we know if it is human blood?

- \* Enzyme-Linked Immunosorbent Assay Test a.k.a. \_\_\_\_\_
  - o Uses \_\_\_\_\_ that react to human blood to tell if mammal blood is from human. However, in rare cases, it can be confused with \_\_\_\_\_
  - o Detects and measures antibodies in your blood



Crime Scene Investigation of Blood Summary

- \* \_\_\_\_\_
  - o \_\_\_\_\_
  - o \_\_\_\_\_
- \* \_\_\_\_\_
  - o \_\_\_\_\_
- \* \_\_\_\_\_
  - o \_\_\_\_\_
- \* Try to determine whose blood it is. If individual information is needed, then do DNA analysis



Name: \_\_\_\_\_ Per: \_\_\_\_\_ Date: \_\_\_\_\_

## Daily YOYO Sheet

Week of: \_\_\_\_\_

**Directions:** Write the answer to the YOYO in the correct box below.

Monday:

Tuesday:

Wednesday:

Thursday:

Friday:

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