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Crime Scene Investigation (CSI):
Blood Analysis

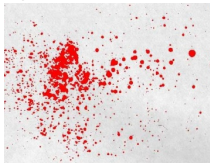
Activity: Blood Splatter Analysis

There are different criteria by which we can analyze blood splatter, and they allow us to determine velocity (strength and direction) of impact, and hypothesize on the type of weapon may have caused it, especially in the absence of a victim. The wound on the victim's body can also give clues as to the type of weapon used to cause injuries, whether they were fatal or not. Finally, blood at the crime scene can potentially reveal other clues: foot prints, hand prints, whether the body was dragged, and it provides some DNA evidence.

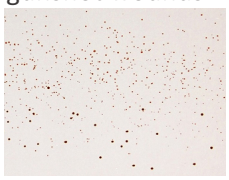
Type of blood splatter

Low Velocity: Low force of impact, droplet diameter between 4 and 8 mm. Possibly from dripping blood

Medium Velocity: Droplet diameter less than 4mm, results from a blunt object impact, a fist, stabbing or artery spray



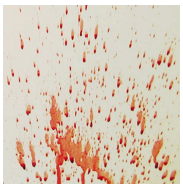
High Velocity: High speed impact, droplets less than 1mm in diameter. Seen in gunshot wounds



Expiratory Blood

Blood coughed up. Resembles high velocity spatter, but with bubbles

Cast-off Stains: When blood flies off an object being swung

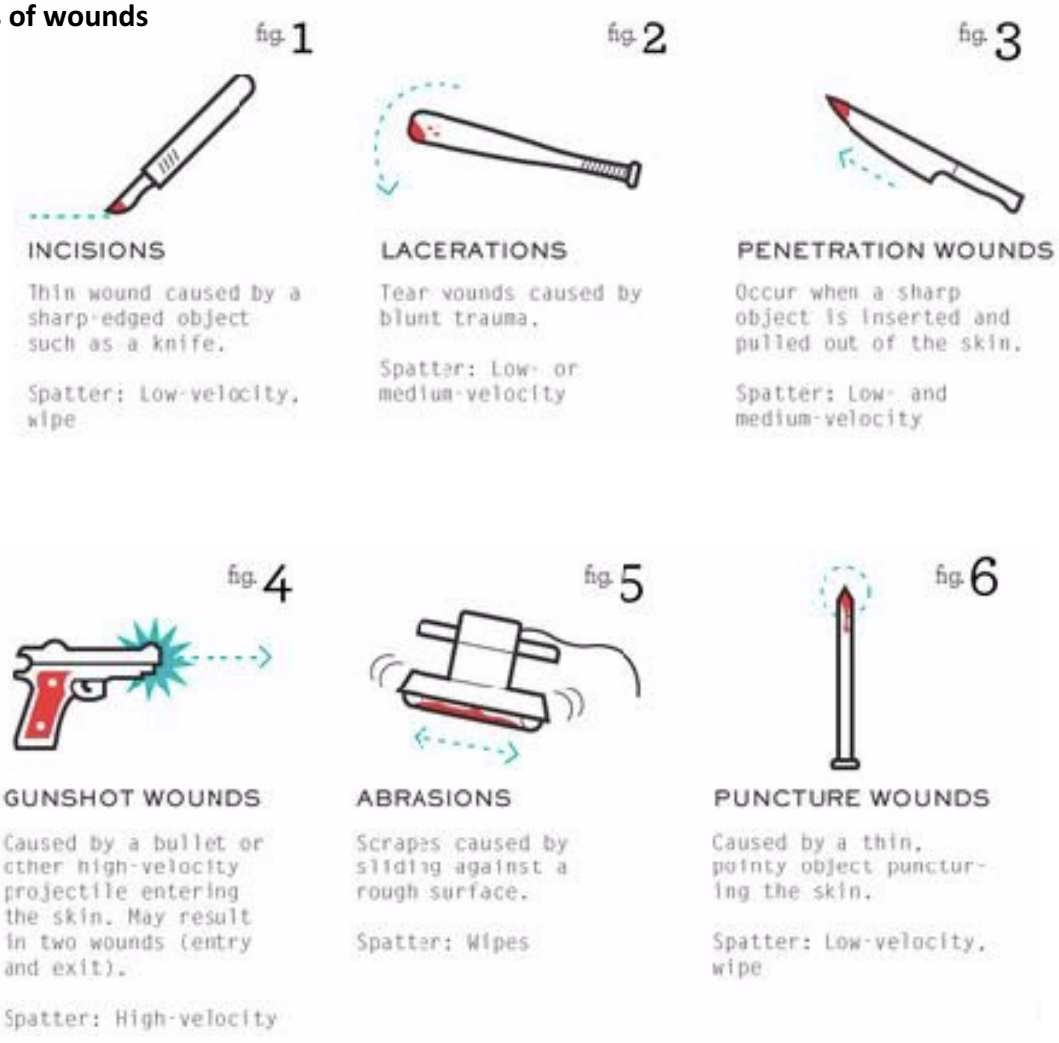


Shadowing: Empty space in the splatter, indicating there was an object blocking the spray

Swipes and Wipes: When blood is smeared on a surface or when a bloody object brushes on a surface

Transfer Pattern: Bloodstain pattern of an object (handprint, shoe print…)

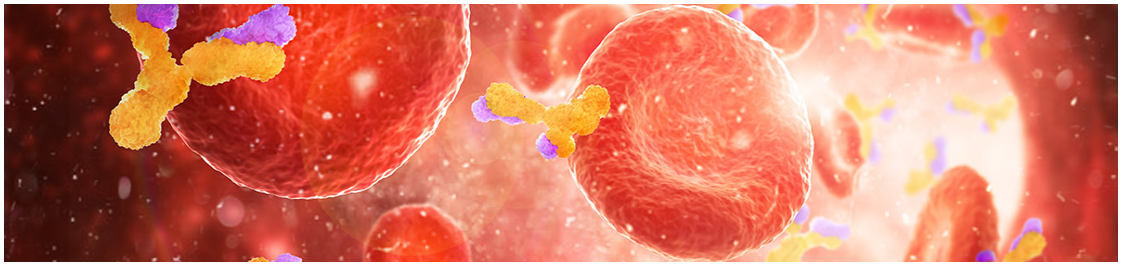
Types of wounds



Source: Forensicnursing.org

In observing these criteria, can you determine what type of weapon was used to kill Caleb? Was it a high, medium or low velocity impact? Did the killer attack from the front or from behind? Refer back to the week one presentation and gather all the clues to reconstruct the scene in your CSI Overview document… Who knows? It might lead you to the real killer!

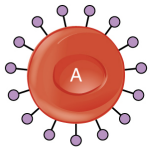
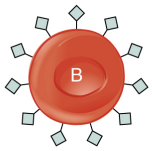
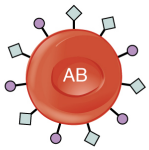
Murder Case Hint #1: Blood Type



A person's blood type is generally determined using the ABO system and the Rhesus (Rh) factor. ABO analysis determines the presence of antigens on the red blood cells, while the Rh factor is either present (+) or absent (-).
Blood type A has A antigens, and anti-B antibodies; Blood type B has B antigens and anti-A antibodies; Blood type AB has both A and B antigens, with no antibodies; Finally, blood type O has no antigens on the red blood cell surface, but carries both anti-A and anti-B antibodies.
This gives eight potential blood types: A+, A-, B+, B-, AB+, AB-, O+ and O-.

Why is this important? Well, in the case of blood transfusions it is important that you do not receive a blood type carrying an antigen that your body would recognize as foreign. This is why O- is the universal donor: there are no antigens that the body could reject. When antibodies attack red blood cell antigens, it causes a process called agglutination: the cells clump up together – this is the basis of blood type analysis.

Blood Type

	A	B	AB	O
Red Blood Cell Type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in Red blood Cell	A antigen	B antigen	 A and B antigens	None
Blood Types Compatible in an Emergency	A, O	B, O	A, B, AB, O (AB^+ is the universal recipient)	O (O is the universal donor)

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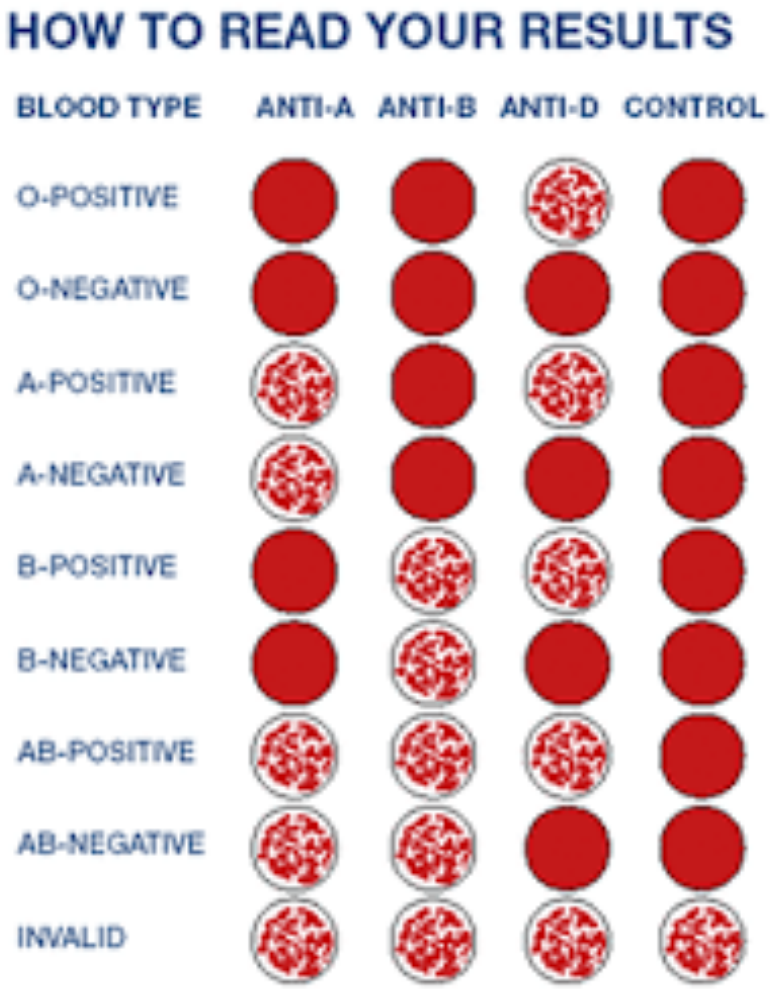
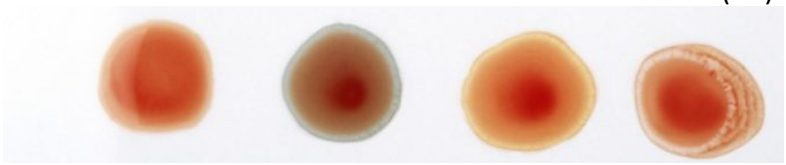
When a blood sample is taken, Anti-A, Anti-B and Anti-D (Rh) antibodies are added separately to drops of the same sample. If the sample remains intact, it does not have the matching antigen (i.e. if the blood does not react to anti-B, it does not have the B antigen

Below is a table showing the expected results for each blood type. You can use it for the activity on the next page, but if you want an extra challenge you can use it to check your answer after doing the work!



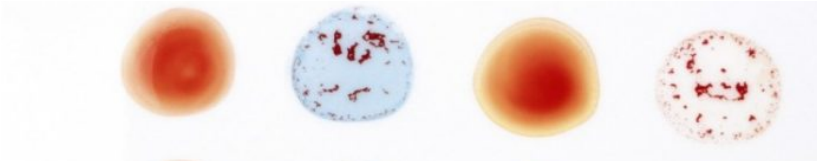
Take a look at the following slides. One of these is a sample of the victim's blood, and the other is from a sample thought to be from the killer. Which one is which? Which suspect might you eliminate after seeing this proof? Don't forget – if you do not know the information, it does not eliminate the suspect!

Control Anti-A Anti-B Anti-D (Rh)



Blood type:_____ Suspect/Victim

Control Anti-A Anti-B Anti-D (Rh)



Blood type:_____ Suspect/Victim