Bloodstain Science

Forensic Science Lab Activity
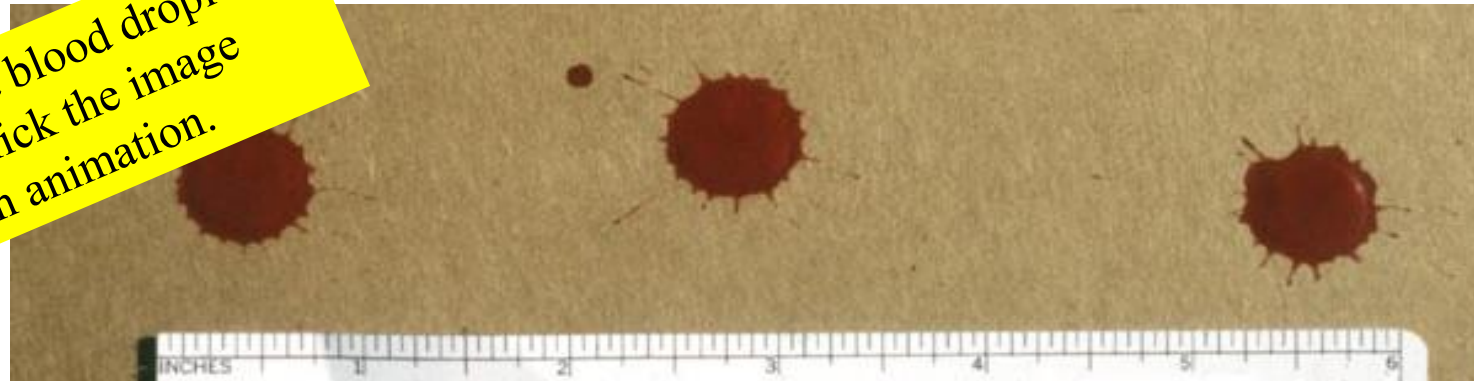
What does the abbreviation BPA represent? Bloodstain Pattern Analysis

What can an investigator learn from the analysis of a blood spatter?
➤ Type and velocity of weapon
➤ Number of blows
➤ Handedness of assailant (right or left-handed)
➤ Position and movements of the victim and assailant during and after the attack
➤ Which wounds were inflicted first
➤ Type of injuries
➤ How long ago the crime was committed
➤ Whether death was immediate or delayed

Source: http://science.howstuffworks.com/bloodstain-pattern-analysis1.htm

How does a blood droplet form? Click the image for an animation.

http://www.crimescenetwo.com/img/popup/book2p2.jpg

How is blood evidence detected at a crime scene?

Light Source

Investigators will first examine the crime scene to look for areas that may contain blood. They may use a high-intensity light or UV lights to help them find traces of blood as well as other bodily fluids that are not visible under normal lighting conditions.


Blood Reagent Tests

These tests, referred to as **presumptive tests**, are used to detect blood at crime scenes based upon the properties of hemoglobin in the blood. Further tests at the crime lab can determine if it is human blood or not.
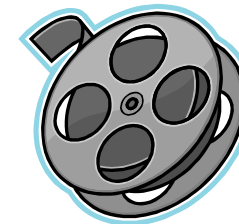
Kastle-Meyer Test Video

Examples:

• **Phenolphthalein** is a chemical that is still utilized today and is usually referred to as the Kastle-Meyer test and produces a pink color when it reacts with hemoglobin.

• **HemaStix** is a strip that has been coated with tetramethylbenzidine (TMB) and will produce a green or blue-green color with the presence of hemoglobin.
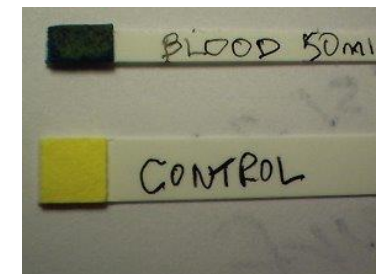
HemaStix

Luminol

This chemical is used by crime scene investigators to locate traces of blood, even if it has been cleaned or removed.

Investigators spray a luminol solution is throughout the area under investigation and look for reactions with the iron present in blood, which causes a **blue luminescence**.

One problem is that other substances also react, such as some metals, paints, cleaning products, and plant materials. Another problem is that the chemical reaction can destroy other evidence in the crime scene.

Luminol Reaction

Fluorescein

This chemical is also capable of detecting latent or old blood, similar to luminol. It is ideal for fine stains or smears found throughout a crime scene. After the solution has been sprayed onto the substance or area suspected to contain blood, a UV light and goggles are used to detect any illuminated areas, which appear greenish-white if blood is present. It may also react to many of the same things as luminol (copper and bleach).


Fluorescein Reaction in UV Light

LCV or **Leuco Crystal Violet**, is one type of chemical process that is used for blood enhancement. Using this test helps to make the blood evidence more **visible** so it can be photographed and analyzed.

Bloodstain Pattern Analysis Terms

- **Spatter** – Bloodstains created from the application of force to the area where the blood originated.

- **Origin/Source** – The place from where the blood spatter came from or originated.

- **Angle of Impact** – The angle at which a blood droplet strikes a surface.

- **Parent Drop** – The droplet from which a satellite spatter originates.

- **Satellite Spatters** – Small drops of blood that break of from the parent spatter when the blood droplet hits a surface.

- **Spines** – The pointed edges of a stain that radiate out from the spatter; can help determine the direction from which the blood traveled.

Satellite Spatters

Spines

Parent Drop
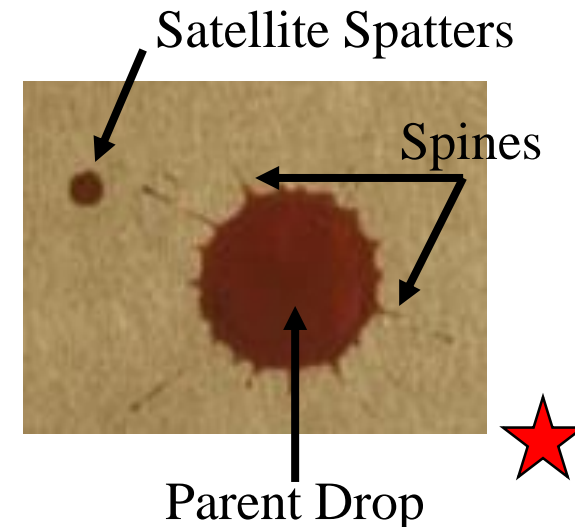
Types of Bloodstain Patterns

- **Passive Bloodstains**
  - Patterns created from the force of **gravity**
  - Drop, series of drops, **flow** patterns, blood **pools**, etc.

- **Projected Bloodstains**
  - Patterns that occur when a **force** is applied to the **source** of the blood
  - Includes low, medium, or high **impact** spatters, cast-off, **arterial** spurting, **expiratory** blood blown out of the nose, mouth, or wound.
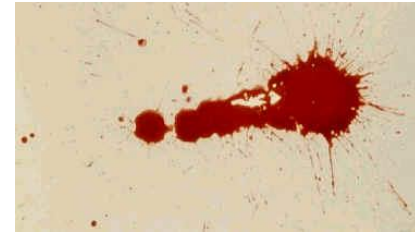
- **Transfer or Contact Bloodstains**
  - These patterns are created when a wet, bloody object comes in **contact** with a target surface; may be used to identify an **object** or **body** part.
  - A **wipe** pattern is created from an object moving through a bloodstain, while a **swipe** pattern is created from an object leaving a bloodstain.