Forensics Lesson 7

Blood Evidence

Quiz Date:

Vocabulary



**What makes up our blood?**

* Red blood cells (erythrocytes)-the most abundant cells in our blood; they are produced in the bone marrow and contain a protein called hemoglobin that carries oxygen to our cells.
* White blood cells (leukocytes)-they are part of the immune system and destroy infectious agents called pathogens.
* Plasma-this is the yellowish liquid portion of blood that contains electrolytes, nutrients and vitamins, hormones, clotting factors and proteins such as antibodies to fight infection.
* Platelets (thrombocytes)-the clotting factors that are carried in the plasma; they clot together in a process called coagulation to seal a wound and prevent a loss of blood.

**Blood Facts**

* The average adult has about five liters of blood inside of their body, which makes up 7-8% of their body weight.
* Blood is living tissue that carries oxygen and nutrients to all parts of the body
* Blood carries carbon dioxide and other waste products back to the lungs, kidneys and liver for disposal.
* It also fights against infection and helps heal wounds.
* There are about one billion red blood cells in two to three drops of blood.
* For every 600 red blood cells, there are about 40 platelets and one white blood **cell.**

**Genetics of Blood Types**

* Your blood type is established before you are born by specific genes inherited from your parents.
* You inherit one gene from your mother and one from your father.
* These genes determine your blood type by causing proteins call agglutinogens to exist on the surface of all of your red blood cells.
* What are blood types?
* There are three alleles or genes for blood type: A, B, and O.
* Since we have 2 genes, there are 6 possible combinations.

AA

BB

AO

BO

OO

AB

**Rh Factors**

* Scientists sometimes study Rhesus monkeys to learn more about the human anatomy because there are certain similarities between the two species.
* While studying Rhesus monkeys, a certain blood protein was discovered.
* This protein is also present in the blood of some people.
* The presence of the protein, or lack of it, I referred to as the Rh (for Rhesus) factor.
* If your blood does contain the protein, you blood is said to be Rh positive.
* If your blood does not contain the protein, your blood is said to be Rh negative

**Blood Evidence**

* *Blood samples*-can be analyzed to determine blood type and DNA, which can be matched to possible suspects.
* *Blood droplets*-can be analyzed to give clues to the location of a crime, movement of a victim, and type of weapon.
* *Blood spatter*-can be analyzed to determine patterns that give investigators clues to how a crime might have happened.

**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

**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 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.

**Examples**:

**Phenolphthalein**

* 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**

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

**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.

**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).

**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.

**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.