

BLOOD and BLOOD SPATTER

I. Composition of Blood

Blood is a circulating tissue consisting of three types of cells: _____ blood cells, _____ blood cells, and _____. These cells are suspended in a liquid known as _____. Plasma is similar to _____ water in composition. It carries dissolved proteins, such as antibodies, hormones, and clotting factors, and nutrients such as glucose, amino acids, salts, and minerals.

A. Blood Cells

Each blood cell performs a different function.

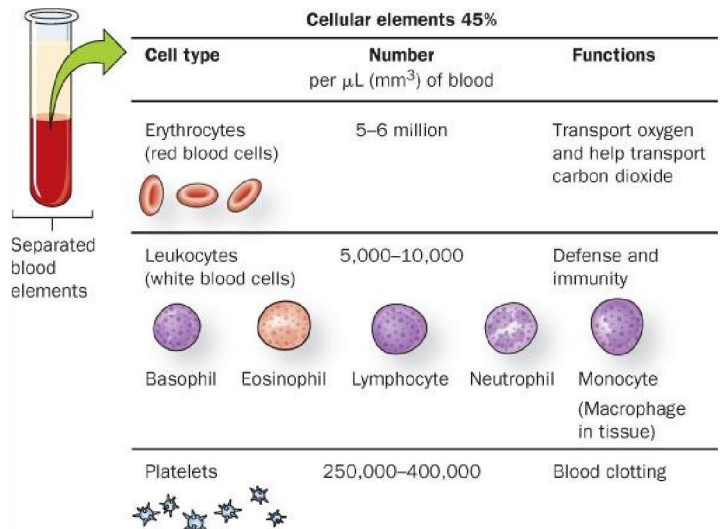
- Red Blood Cells: carry the gases _____ and _____

Hemoglobin in red blood cells is responsible for transporting _____ to cells and for the _____ color of blood

- White Blood Cells: Fight _____ and _____

- Antibodies: _____ which assist in the immune response (fighting bacteria, viruses, parasites)

- Platelets: aid in blood _____ and are involved in repairing damaged blood _____

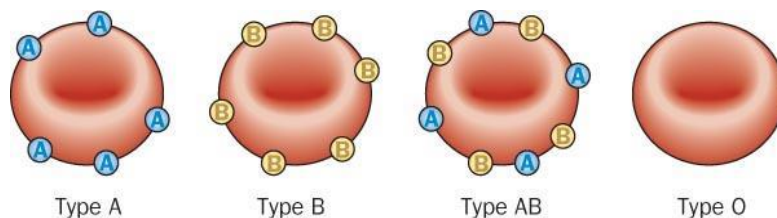


B. Blood Typing

Because many different people share the same type of blood, blood evidence is considered to be _____ evidence. By typing the blood found at a crime scene, it is possible to line a suspect to a crime scene or to exclude a suspect. However, matching blood types does _____ prove guilt.

1. A and B Proteins

A and B proteins are found on the _____ of some red blood cells. If a person's blood contains only protein A, he/she has type _____ blood. If a person's blood contains only protein B, he/she has type _____ blood. If a person's blood contains both protein A and B, he/she has type _____ blood. If a person's blood lacks protein A and B, he/she has type _____ blood.

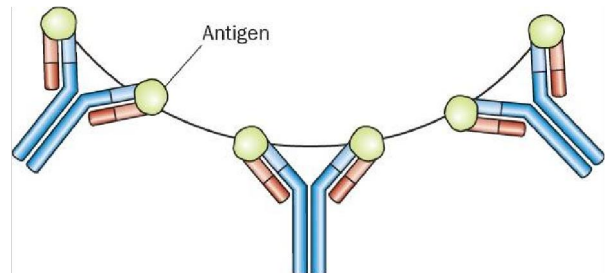


2. Rh factor

This is another type of protein associated with the red blood cells. 85% of the human population has a protein called Rh factor on their red blood cells. Blood that has the Rh factor is designated _____ while blood that does not have this factor is designated _____.

3. Antibodies

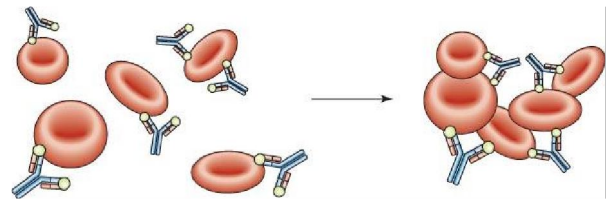
White blood cells identify foreign proteins and secrete antibodies. The antibodies are _____ shaped protein molecules that bind to the molecular shape of an _____, fitting like a puzzle.



When a foreign invader is recognized, an attack is launched. This is called the _____ - _____ response.

4. Agglutination

This is the _____ of the red blood cells when the arms of the Y-shaped antibody attach to the red blood cells.



5. Blood Typing Tests

Blood typing is a way to identify and match blood samples. When blood is tested and types, the presence of three red blood cell proteins are looked for: _____, _____ and _____

C. Probability and Blood Types

Given the frequency of different genes within a population, it is possible to determine the probability or chance that a particular blood type will appear within a particular population.

ABO			MN			Rh		
Type	Percent	Fraction	Type	Percent	Fraction	Type	Percent	Fraction
A	42%	42/100	MM	30%	30/100	Rh +	85%	85/100
B	12%	12/100	MN	48%	48/100	Rh-	15%	15/100
AB	3%	3/100	NN	22%	22/100			
O	43%	43/100						

What percentage of the population would have Type A+ blood?

What percentage of the population would have Type O-, MN?

II. Crime-Scene Investigation of Blood

In an attempt to hide evidence, a perpetrator may try to remove blood evidence by cleaning the area. Although a room may look perfectly clean and totally free of blood after a thorough washing of the walls and floor, blood evidence still remains.

Red blood cells contain hemoglobin, the iron-bearing protein that carries oxygen. To detect hemoglobin, an investigator mixes _____ powder with _____ in a spray bottle. The mixture is then sprayed on the area to be examined for blood. The _____ from the hemoglobin, acting as a catalyst, speeds up the reaction between the peroxide and the Luminol. As the reaction progresses, _____ is generated for about 30 seconds on the surface of the blood sample. Once found, there are several steps used in processing a bloodstain, and each can provide a different kind of critical information:

1. Confirm the stain is blood.

- Kastle-Meyer test: If blood is present, a dark _____ color is produced.
- Leukomalachite green: This chemical undergoes a color change, producing a _____ color in the presence of blood.

2. Confirm the blood is human.

ELISA test (Enzyme Linked Immunosorbent Assay): involves an _____ - _____ reaction. Human blood is injected into a small animal to produce antibodies against human blood. These antibodies are isolated and stored. When a sample of human blood is mixed with some of these anti-human antibodies, a positive reaction will occur, and the presence of human blood is confirmed.

3. Determine blood type.

Blood collected from a crime scene is tested using specific antibodies. The person's blood type is determined by examining antigen-antibody reactions. Remember, the resulting match is considered _____ evidence. However, if the blood does not match, then a particular person may be excluded as a suspect.

4. Gathering DNA evidence

Restriction Fragment Length Polymorphism (RFLP) DNA analysis/testing is commonly statistically individualizing (one out of several million or several billion) and it has withstood rigorous court challenges on its validity. The limits however, is that this method also usually requires a _____ sample size to obtain significant results.

Polymerase Chain Reaction (PCR) DNA analysis-based testing works well on degraded samples and _____ samples (pinhead size). However this method is not as statistically individualizing as RFLP.