

FORENSIC SCIENCE----- Serology

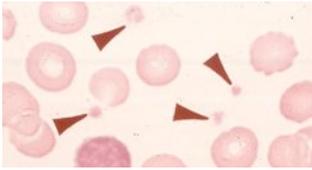
Serology is: _____

I. What is Blood?

A. slightly basic solution made of _____

1. _____ (55% of blood)
fluid portion of the blood which contains:

2. Cells (_____)



a. _____ (Thrombocytes)

-responsible for _____

b. _____ (Leukocytes)

-responsible for _____



c. _____ (Erythrocytes)

-Non nucleus cells

- responsible for _____

- Contain _____ which gives blood its red color

- Contain _____ on their surface

ANTIGEN- _____



B. Physical Properties of Blood

• A healthy adult has _____ of blood in their body

II. Determination of Blood

A. Is it Blood?

1. _____ } used to determine if a visible stain is blood
_____ }
_____ }

2. _____ – use to detect invisible blood stains

B. What species is it? Animal vs Human

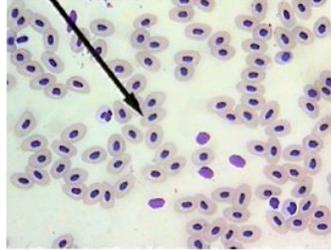
1. _____

2. **Precipitin Test** _____

Remove these antibodies and place on drop of blood. If the blood clots, then it is human.

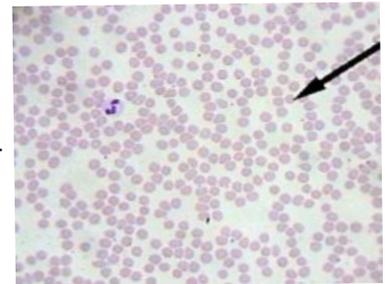
Frog Blood

•Contain _____



Human Blood

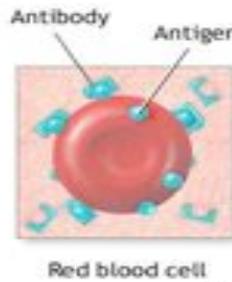
•Contain Smaller numerous non-nucleic _____
•Contain Larger but less numerous _____
•Contain _____



III. Blood Typing

A. Understanding Blood Types

1. Discovered by Karl Landsteiner in _____
He determined:



An antigen is a substance that induces the formation of antibodies because it is recognized by the immune system as a threat

a. All blood groups are defined by _____ on their Red Blood Cells and _____ in their serum

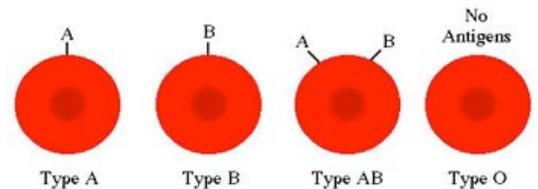
b. For every antigen there exists a specific _____

c. Over _____ different blood antigens exist but only _____ are common.

2. Most common antigens are _____ and _____

a. Red Blood Cells can contain either (____ or ____) both (____), or neither (____) antigen.

b. 4 Blood types exist based on _____ alleles



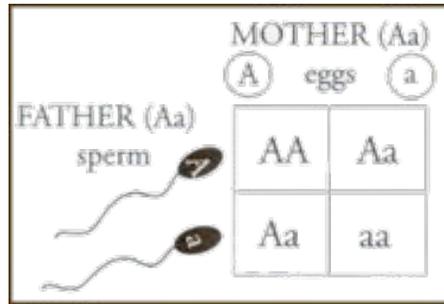
Allele- _____

Homozygous Allele- _____

Heterozygous Allele- _____

PHENOTYPE (outward expression)	GENOTYPE (genes)
Type A blood	AA or AO
Type B blood	BB or BO
Type O blood	OO
Type AB blood	AB

- c. Everyone receives their genes in pairs. One blood type letter comes from _____.
- determination of blood type can be predicted by _____.



Population Distribution of Blood Types in the U. S.

Type	Percent
O	
A	
B	
AB	

3. Rh factor (_____)

In 1940 Landsteiner and Weiner reported the discovery of the Rh factor by studying the blood of the Rhesus monkey _____ of Caucasians, _____ of Black Americans and _____ of all Asians are Rh positive.

- a. Rh is a type of antigen found on _____.
- b. Aka: _____
- c. People who have D antigen = _____
- d. People who do not have D antigen = _____

** Rh- moms will produce antibodies against and Rh+ baby causing problems.

Other blood antigens and enzymes

Less know antigens found on RBC's are _____, _____, and _____

Enzymes include _____

Both enzymes and antigens help _____

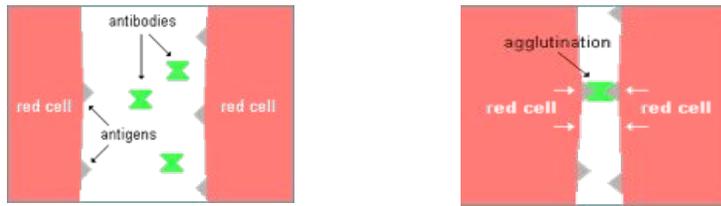
Probability

- Blood typing can show the probability that two samples of blood came from the same source.
- To determine the probability of a person with a particular combination of blood types, change the percentages to fractions and multiply them. (see handout)

B. Determining Blood Types

- 1. Agglutination _____
- Occurs when _____

ie) person with blood type A produces anti-B antibodies which will destroy type B blood (causing agglutination)



Blood Typing

- A blood type has antigen _____ and will agglutinate with _____.
- B blood type has antigen _____ and will agglutinate with _____.
- AB blood type has antigen _____ and _____ and will **NOT** agglutinate with either _____ or _____.
- O blood type has **neither** antigen _____ nor _____ and will agglutinate with either.

Blood Groups

TYPE	ANTIGEN	ANTIBODY	CAN GIVE BLOOD TO	CAN GET BLOOD FROM
A	A	B	A, AB	O, A
B	B	A	B, AB	O, B
AB	A and B	Neither A nor B	AB	A, B, O, AB
O	Neither A nor B	A and B	A, B, O, AB	O

2. Procedure:

Only need _____ antiserums to determine blood type _____ and _____

→ Anti-A serum

- looks normal in _____

- Clots in _____

→ Anti-B serum

- looks normal in _____

- Clots in _____

Blood Reactions to Antiserum

Anti-A Serum	Anti-B Serum	Blood Type
Agglutination	No Agglutination	Type A
No Agglutination	Agglutination	Type B
Agglutination	Agglutination	Type AB
No Agglutination	No Agglutination	Type O

C. Secretors

_____ of people are considered secretors.
 Their blood-type antigens are found in high concentration in their _____ such as:

If you are a secretor, you will have a higher concentration of A and B antigens than does your blood!!

IV. Blood Spatter

A field of forensic study which deals with _____

A. BLOOD DROPLET CHARACTERISTICS

- A blood droplet will remain _____ in space until it drops onto a surface
- Once a blood droplet impacts a surface, a _____.
- A droplet falling from the same height, hitting the same surface at the same angle, will produce _____

B. CONDITIONS EFFECTING BLOODSTAIN SHAPE

1. _____ of the target surface

a. The _____ the surface, the _____ a blood drop will break apart.

-On clean glass or plastic--droplet will have _____



b. The _____ the surface, the _____ a blood drop will break apart.

-On a rough surface--will produce _____



2. Method of Blood Distribution



a. _____ -image is recognizable and may be identifiable with a particular object

b. _____ -wet blood is transferred to a surface which did not first have blood on it



c. _____ -a non-blood bearing object moves through a wet bloodstain, altering the appearance of the original stain

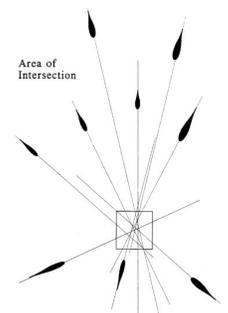
d. _____ blood that is thrown from an object in motion

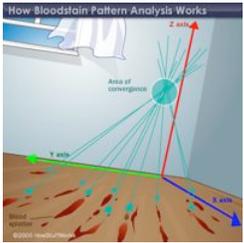
e. _____ blood that is directed back toward its source of energy.

3. Directionality- _____

a. The _____ of the blood stain faces the direction the stain is traveling.

b. _____
The location of the blood source can be determined by drawing lines the various blood droplets to the point where they intersect. This is the blood's origin.



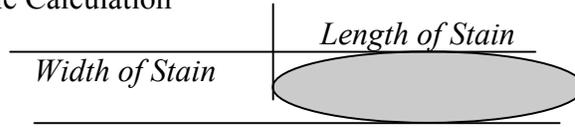


c. _____
 The point of origin the height at which the “blow” occurred.

It is determined by drawing a line from the area of intersection straight up to where to where the angle of impact would intersect

d. _____ angle at which blood strikes a target surface

Impact Angle Calculation

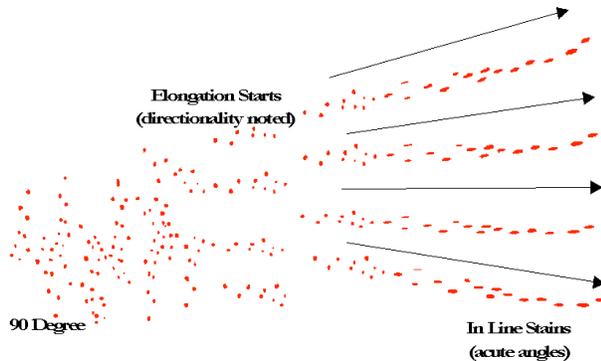


$$\text{Sin-1 of } \frac{\text{width}}{\text{length}} = \text{Impact Angle}$$

IMPACT

- The more _____ the angle of impact, the more _____ the stain.
- _____ angles are perfectly round with _____ angles taking on a more elliptical shape.
- At about _____ the stain will begin to produce a tail.
- The more _____ the angle, the easier it is to determine the direction of travel.

4. _____ (speed) at which the blood droplet left the original surface



Terminal velocity--the greatest speed to which a free falling drop of blood can accelerate in air.

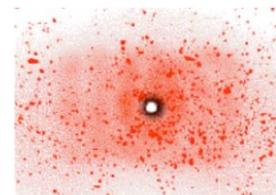
It is dependent upon the _____
 approximately _____

a. Low velocity-- _____



b. Medium velocity-- _____

c. High velocity-- _____



C. Questions Answered by Blood Spatter Interpretation

1. The distance between the _____
2. _____
3. _____ and _____ of impact that produced the bloodshed
4. The position of the _____ during bloodshed
5. Movement of the _____ after bloodshed
6. _____ causing the bloodshed and/or the dispersal of blood.

V. Blood Evidence

- Class evidence for blood would include _____. If you can determine the _____ you would have individual evidence.
- Blood stain patterns are considered circumstantial evidence in a court room. Experts could argue many points including direction of stains, height of the perpetrator, position of the victim, left/right hand, whether the body was moved, etc.