

## Forensic Science Guided Notes: Blood Typing

Forensic Serology study blood, blood groups, and other bodily fluids for identification purposes following a crime.

Around 1900, Karl Landsteiner discovered that there are at least four kinds of human blood. These kinds are determined by the presence or absence of specific antigens, also known as agglutinogens on the red blood cells. These antigens are known as A or B.

Antibodies, or Agglutinins against antigens A or B begin to build in the blood plasma shortly after birth. The levels of antibodies peak about 8-10 years old and decline through the rest of a person's life.

Humans normally produce antibodies against the antigens that are not on their erythrocytes (red blood cells). Therefore if a person had the following antigens, they would produce the opposite antibodies. Antibodies are shaped so that they fit the opposite antigens.

Human containing this Antigen	Produces this Antibody
A antigen <u>A blood</u>	<u>B Antibodies</u>
B antigen <u>B blood</u>	<u>A Antibodies</u>
<u>Both</u> A or B antigens <u>AB</u>	<u>No Antibodies</u>
<u>Neither</u> A or B antigens <u>O</u>	<u>Both A &amp; B Antibodies</u>

Blood type is based on the antigens, not the antibodies, a person possesses. The 4 blood types are A, B, AB, and O. Type O blood (no A or B antigens) is the most common in the United States. The percentage of people in the U.S. with this blood type is 45 percent. Type A is then the most frequent with 39% of the population. Type B is 10% percent and Type AB is the most rare with 4%.

In 1940, Landsteiner and Wiener discovered another group of antigens on the surface of red blood cells called RF Factors. They are called Rh factors because they were first found in Rhesus monkeys. An individual who possesses the antigens are designated Rh positive (Rh+). An individual who lacks the antigens are designated Rh negative (Rh-). Antibodies to the Rh factors are not normally present in the plasma, but are produced upon exposure to Rh factors. Example: Exposure to Rh factors can occur during blood transfusions (if Rh+ blood is transfused to an Rh- recipient) or when an Rh+ mother carries an Rh- fetus.

Agglutination is the clumping of blood cells. When a foreign antigen is found by the antibody, the antibody is designed to attach itself to the foreign antigen. This process kills the foreign blood types and can also tell medical and forensic scientists the type of blood. Finding the blood type of an unknown sample is simple. Forensic scientists treat the unknown samples of blood with known samples of antibodies. If the clumping occurs only in the sample that anti-A was added, the blood type is A. If clumping occurs only in the anti-B mixture, the blood type is B. If agglutination occurs in both samples, the blood type is AB. If no agglutination occurs, the sample is blood type O. Any sample that agglutinates in the presence of anti-Rh serum is considered positive.