

Blood is a complex, living tissue that contains many cell types and proteins. A transporter, regulator, and defender, blood courses through the body carrying out many important functions.

### Proteins & Blood Types

Distinct molecules called antigens are proteins attached to the surface of red blood cells. There are two different types of antigens: type “A” proteins and type “B” proteins. Each type has different properties. The presence or absence of these antigens determines blood type (see Figure 1).

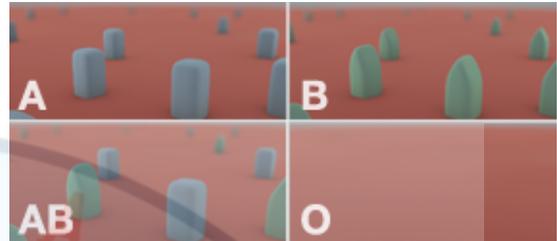


Figure 1

### Blood Type is Genetic

The A and B antigens on the surface of red blood cells are two different alleles of the same gene. The A and B alleles code for enzymes that produce the type A and B antigens, respectively. A third version of this gene, the O allele, codes for a protein that is not functional and does not produce surface molecules. Two copies of the gene are inherited, one allele from each parent. The possible combinations of alleles produce the different blood types, as shown in Figure 2.

alleles	blood type
A+A	A
A+O	A
A+B	AB
B+B	B
B+O	B
O+O	O

Figure 2

### When Blood Types Mix

Blood plasma is packed with proteins called antibodies. The body produces a wide variety of antibodies that will recognize and attack foreign molecules that may enter from the outside world. A person's plasma does not contain any antibodies that will bind to antigens that are part of his or her own body.

When conducting a blood transfusion, it is important to carefully match the donor and recipient blood types. If the donor blood cells have antigens that are different from those of the recipient, antibodies in the recipient's blood recognize the donor blood as foreign. This triggers an immune response resulting in blood clotting. If the donor blood cells have antigens that are the same as those of the recipient, the recipient's body will not see them as foreign and will not mount an immune response. For example, a person with Type A blood will have Anti-B antibodies, which react if there are any blood cells with B antigens.



Figure 3

There are two special blood types when it comes to blood transfusions. People with type O blood do not have any antigens on their red bloods that can trigger an immune response. They are therefore universal donors. People with type AB blood have both A and B antigens and therefore do not have any Anti-A or Anti-B antibodies. They are therefore universal recipients.