Dear Alice,

Can an A+ person receive any blood type other than their own? If so which ones? Which blood type is the universal receiver and which is the universal donor?

Answer

Dear Reader,

There are four different blood types that are categorized by the presence of A or B antigens (markers to help define invaders to the body). These blood types are further categorized by the presence of another type of antigen, the rhesus (Rh) factor. Those with an A+ (positive) blood type can receive blood types A and O (A+, A-, O+, and O-). Type AB can receive from all the other blood types, making it the universal recipient. Type O, on the other hand, can be donated to all others but can only receive from other type O donors, making it the universal donor. Keep reading for more about the whys and hows of blood types.

Blood types are determined by ABO blood grouping, which is based on two inherited antigens called A and B. An antigen is a marker that consists of proteins and sugars that help the body determine what belongs and what is a pathogen. The presence, or absence, of antigens and antibodies in the plasma will determine which blood type a person can receive. Here are the specific blood types, the antigens they have, and antibodies they produce:

- Type A blood has A antigens and produces B antibodies.
- Type B blood has B antigens and produces A antibodies.
- Type AB blood has A and B antigens and doesn’t produce antibodies.
- Type O blood has no antigens and produces both A and B antibodies.

So, why does this matter? The blood already contains antibodies against any antigens the body doesn’t manufacture itself. For example, someone with type A blood can’t accept B and AB blood types because the body will attack all the B antigens as they’re recognized as invaders. The anti-B serum antibodies in the type A blood will react with the B antigens in the donor blood and result in agglutinated blood (aggregation of red blood cells into clumps) that destroys the donor's cells. This reaction, if severe enough, could cause fever, chills, and low blood pressure. It could also
shut down vital organ function and can be fatal. If someone is type AB, since they have no antibodies against either A or B antigens in their blood, they likely won't experience an immune response to any blood type they receive. On the other hand, if they're type O, they can receive only type O blood because they have antibodies to both A and B antigens in their blood, which will cause an immune response to all other blood types. Here's a list of the different types of blood an individual can receive based on their blood type:

- Type A blood can receive type A and O blood.
- Type B blood can receive type B and O blood.
- Type AB blood can receive type A, B, AB, and O blood.
- Type O blood can only receive type O blood.

While it's theoretically true that the universal recipient blood type is AB and the universal donor blood type is O, it's also good to talk about another antigen carried on a separate gene called the Rh antigen. For those that are Rh+, they can receive both Rh+ and Rh- blood, as it's unlikely to cause a reaction in either scenario. Those that are Rh- generally only receive blood from those that are also Rh-. This helps prevent the introduction of the Rh+ antigen from causing a problem in those that are Rh-. If someone has the A antigen and the Rh antigen, their blood type is A+ (or A positive). If they don't have the Rh antigen, they've got an A- (or A negative) blood type. Based on this logic, the universal donor blood type is O- (or O negative) because it has no A, B, or Rh antigens, and, therefore, won't cause a transfusion reaction in anyone. On the other hand, type AB+ is the universal recipient since there are no antibodies in the blood to cause an immune reaction. Even if someone knows their blood type, health care providers will likely still test the blood before a transfusion to prevent any reactions caused by minor antigens.

Here's to knowing your As, Bs, and Os!

Alice!
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