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Blood Types

By Gigi Reed, MD November 25, 2026

A person with AB-positive blood is often called a “universal recipient,” and someone with O-negative blood a “universal donor.” The labels sound simple, but what do they actually mean? In a tiny nutshell: people with type A blood react against type B and vice versa, and people who are Rh negative react against Rh positive. These labels describe red blood cells only.

This is just part of the story, but it is a good place to start.

Behind the familiar labels is a system of markers and antibodies. It decides whether donated red cells will circulate safely or be attacked by the recipient’s immune system. Our understanding of it started with a simple laboratory observation: blood cells from different people sometimes clumped when mixed.

In 1900, the Austrian physician Karl Landsteiner noticed that serum, the liquid left after blood clots, from one healthy person could make another person’s red cells clump. He mixed red cells and serum from different people, including himself and his colleagues, and recorded which combinations reacted.

The reactions were not random. They followed patterns that allowed Landsteiner to distinguish three groups, now called A, B and O. He published his findings in 1901. A colleague described the fourth group, AB, a year later.

Landsteiner had observed what is called agglutination. Antibodies in the serum attach to recognizable markers, called antigens, on red cells and link the cells together. In an incompatible transfusion, these reactions can also destroy red cells, a process called hemolysis.

The ABO system is named for the groups it classifies. Type A red cells carry the A antigen, type B cells carry the B antigen, and type AB cells carry both. Type O cells carry neither. The “O” is a letter, not a zero. Landsteiner originally called that group C before the terminology changed.

Here is the interesting part: we are born with the ability to attack red cells that lack our own antigens. People with type A blood, like me, make anti-B antibodies. I could never safely receive type B blood, because my body would clump and quickly destroy it.

People with type B blood have anti-A antibodies. People with type O normally have both. People with type AB normally have neither. These patterns explain why some donor and recipient combinations are safe and others are dangerous.

The plus or minus sign refers to a separate marker, the D antigen of the Rh blood-group system. Someone is Rhesus factor positive when carrying the rhesus D gene (although this is the simplified version). Someone whose cells lack it is Rh negative. Combining these two possibilities with A, B, AB and O gives the eight familiar blood types. The Rh system was uncovered in 1939 and 1940, which also added another major layer to our understanding of compatibility.

You might ask why we focus on the recipient’s antibodies and not the donor’s. There are two reasons. The donor’s antibodies are usually removed before transfusion. Even when some remain, they are heavily outnumbered by the recipient’s antibodies and are unlikely to cause serious clumping.

Plasma is different. In a plasma transfusion, the donor’s antibodies are part of what is given. AB-positive plasma lacks anti-A, anti-B and anti-D antibodies. That makes AB+ the universal plasma donor.

The “universal” labels apply only to red blood cells and to the major ABO and Rh D markers. They do not cover every component of blood or every possible immune reaction. That is why hospitals still test and match blood carefully before any transfusion.

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