

5.6: Oligosaccharides

Learning Objectives

- Differentiate between blood types based on the oligosaccharides attached to the red blood cell surface and blood compatibility related to the blood type.

Oligosaccharides are polymers containing a small number, typically three to ten of monosaccharides. Oligosaccharides include dextrans which are microbial breakdown products of long polysaccharides like starch or cellulose and other glycans linked to lipids or proteins through N- or O-glycosidic bonds. The primary role of the last class is cell recognition and cell adhesion. For example, oligosaccharides attached to red-blood cells define the blood type A, B, AB, or O, depending on the linked oligosaccharides, as described next.

A, B, AB, or O blood types

The membrane of animal plasma cells typically has oligosaccharides comprising 4 to 17 monosaccharides attached to them. Their purpose is cell recognition, i.e., if there is a foreign cell or an object in the biochemical system, it is identified through the surface oligosaccharides and either destroyed or flagged for destruction by the body's immune system. For example, red blood cells have different types based on the oligosaccharides attached to their cell membrane, as shown in Figure 5.6.1.

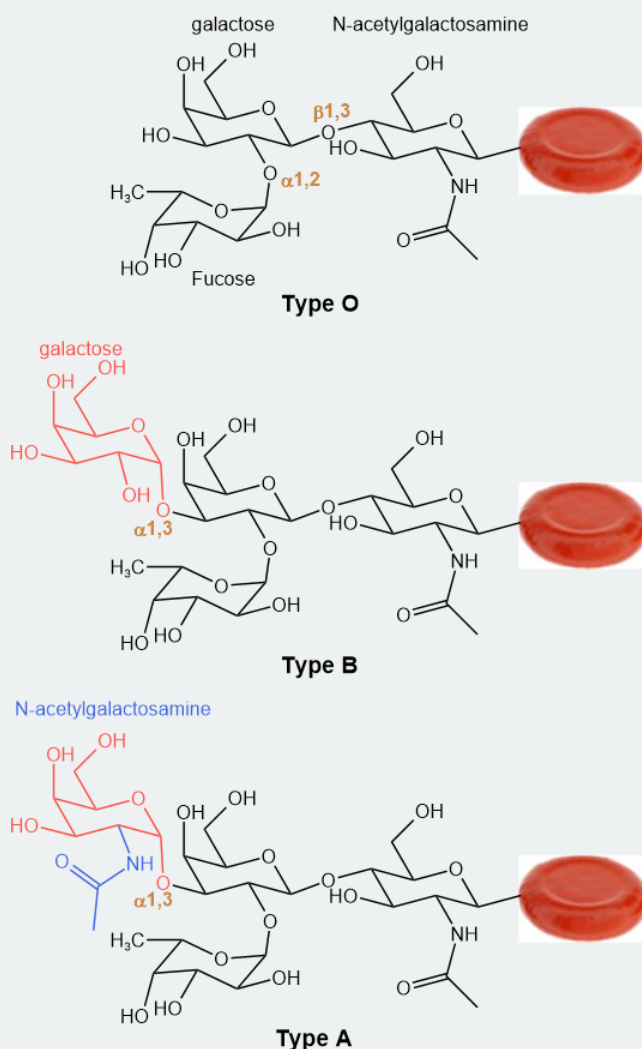


Figure 5.6.1: Oligosaccharide structures of blood type O, type B, and type A. Type AB has type A + type B in it. (Copyright; Public domain)

Blood type O has a combination of N-acetylgalactosamine-galactose-Fucose. This combination is present in all other blood types also. So, Blood type O is not recognized as foreign in any blood type. A person with blood type O can donate blood to every type, i.e., type O is a universal donor. Any class other than type O has some additional monosaccharide attached which is recognized as foreign by blood type O. So, a person with blood type O can accept only type O blood.

Blood type B has an additional monosaccharide, i.e., galactose attached to galactose of type O oligosaccharide. Type B can receive blood from type O or type B and donate to type B or type AB, as shown in Figure 5.6.2

Blood type A has an additional monosaccharide, N-acetyl galactosamine, attached to galactose of type O oligosaccharide. Type A can receive blood from type O or type A and can donate to type A or type AB.

Blood type AB has a mix of type A and type B. Type AB can accept all types, i.e., it is a universal recipient but can donate only to type AB.

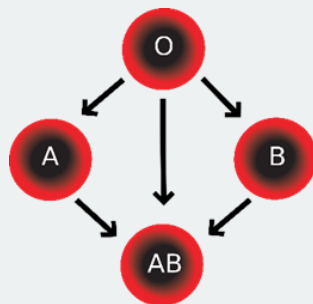


Figure 5.6.2: Diagram showing the blood group compatibility for transfusion purposes.
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