

HETROPOLYSACCHARIDES

They are also called *mucopolysaccharides* and *glycosaminoglycans*. Mucopolysaccharides consist of repeating disaccharide units. The disaccharide consist of two type of monosaccharides. The mucopolysaccharides are component of connective tissue. Hence, they are often referred as structural polysaccharides. The mucopolysaccharides are also found in mucous secretions. The mucopolysaccharides combines with proteins like collagen and elastin and forms extracellular medium or ground substance of connective tissue. Mucopolysaccharides are also components of matrix bone, cartilage and tendons. The complex of mucopolysaccharides and proteins is called *proteoglycan*. Mucopolysaccharides also function as lubricants and shock absorbers.

Hyaluronic acid (HA)

Structure

The repeating disaccharide of hyaluronic acid consist of glucuronic acid and N-acetyl glucosamine.



Hyaluronic acid

Functions

1. It is present in synovial fluid and function as lubricant.
2. It is also present in skin, loose connective tissue, umbilical cord and ovum.
3. It is present in vitreous of body eye.

Medical importance

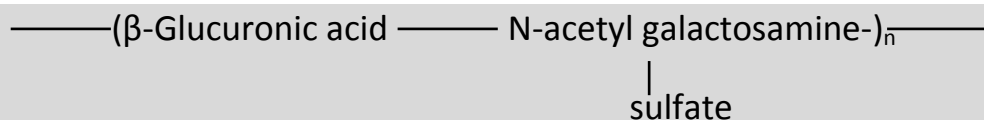
1. As the age advances hyaluronic acid is replaced by dermatan sulfate in synovial fluid. Dermatan sulfate is not good lubricant, hence age related pains develop in old people.
2. In young people, vitreous is clear elastic gel in which hyaluronic acid is associated with collagen. As the age advances the elasticity of vitreous is reduced due to decreased association between collagen and hyaluronic acid. As a result, vision is affected in older people.
3. Hyaluronic acid of tumor cells has role in migration of these cells.

4. Hyaluronic acid is involved in wound healing (repair). In the initial phase of wound healing (repair), hyaluronic acid concentration increases many fold at the wound site. It allows rapid migration of the cells to the site of connective tissue development.
5. Hyaluronic acid helps in scarless repair. If suitable levels of HA are maintained during wound healing scar formation is reduced or even prevented.
6. HA content of skin decreases as age advances this is the reason for increased susceptibility of aged for scar formation.
7. Pneumonia, meningitis and bacteremia causing pathogenic bacteria contain hyaluronate lyase. Hydrolysis of HA by this enzyme facilitates invasion of host by these bacteria.

Chondriotin sulfate A and B (chondriotin-4-sulfate and chondriotin-6-sulfate)

Structure

1. The repeating disaccharide unit of chondriotin sulfates consist of glucuronic acid and N-acetyl galactosamine. N-acetyl galactosamine is sulfated.
2. In Chondriotin-4-sulfate, the 4th carbon atom of N-acetyl galactosamine is sulfated where as in chondriotin-6-sulfate the 6th carbon is sulfated.



Chondriotin sulfate

Functions

1. Chondriotin sulfate are components of cartilage, bone and tendons.
2. They are also present in the cornea and retina of eye.
3. Chondriotin sulfate content decreases in cartilage as age advances.

Heparin

Structure

1. The repeating disaccharide unit of heparin consist of glucosamine and either iduronic acid or glucuronic acid.
2. Majority of uronic acid is iduronic acids. Further amino groups of glucosamine is sulfated.

composed of Fucose, N-acetyl glucosamine, galactose and glucose. The oligosaccharide chains have important functions like:

1. Oligosaccharide present on the surface of erythrocytes are responsible for the classification of blood groups. They determine blood group and hence they are called as *blood group substances*.
2. Oligosaccharides determine the life span of proteins.
3. Cell-cell recognition depends on oligosaccharide chains of glycoproteins.
4. Glycoproteins of some invertebrates function as antifreezing agents. They are known as antifreeze glycoproteins (AFGPs).

Blood Group Substances

1. They are present on membrane of erythrocytes.
2. They determine blood group of individual.
3. Based on presence of a specific blood group substance on the surface of erythrocyte blood groups are as A, B, AB and O groups. It is known as ABO system
4. In this ABO blood group system, A blood group individual contains A blood group substance on his erythrocytes. Moreover his blood contains anti-B antibodies. If he is transfused with B group agglutination occurs. So he can be given only A group blood.
5. Likewise B blood group individual has B blood group substances on erythrocytes and anti A-antibodies in blood.
6. AB blood group individual erythrocyte contains both A and B groups blood substances and he lacks anti-A, anti-B antibodies in blood. Thus AB blood group individuals are considered as universal recipients.
7. In contrast O blood group individual erythrocytes has O group substances, lacks A,B groups substances. Hence they are known as universal donors.

The ABO blood group substances (antigens) present on erythrocyte membrane are glycolipids with oligosaccharide chain. They are shown below:

Fucose Ceramide - oligosaccharide-Galactose- N-Acetylgalactose	A group substance
Fucose Ceramide - Oligosaccharide- Galactose-Galactose	B-group substance
Fucose Ceramide - Oligosaccharide- Galactose	O-group substance