18/12/21.

Polysaccharides

→ Polysaccharides (Glycans) consists of repeat units of monosaccharides or their derivatives, held together by glycosidic bonds

→ They are primarily concerned with two important functions

(1) structural

(2) storage of energy.

→ polysaccharides are linear as well as branched ~~Gb~~ polymers

(2) polysaccharides are of two types

1. Homopolysaccharides - which on hydrolysis yield only a single type of monosaccharide.

4.

(1) Starch

→ Starch is the carbohydrate reserve of plants, which is the most important dietary source for higher animals including man

→ High content of starch is found in cereals, roots, tubers, vegetables etc

→ Starch is a homopolymer composed of D-glucose units held by α-glycosidic bonds

→ Starch consists of two polysaccharide components -

① water soluble amylose and a water insoluble amylopectin

→ Chemically amylose is a long unbranched chain with D-glucose units held by α (1→4) glycosidic linkages

4. Glycogen

→ Glycogen is the Carbohydrate reserve in animals, hence often referred to as animal starch

5) Cellulose

→ Cellulose occurs exclusively in plants

→ It is the most abundant organic substance in plant kingdom

→ Cellulose is composed of β-D glucose units linked by β (α→4) glucosidic bonds

→ Hydrolysis of cellulose yields a disaccharide cellobiose followed by β-D glucose

→ Cellulose is not digested in human.

→ It is a major Component of fiber

→ Amylopectin, on the other hand, is a branched chain with α (1→6) glucosidic bond

→ Starches are hydrolysed by amylase to liberate dextrins and finally maltose and glucose units

2) Dextrins

→ Dextrins are the breakdown products of starch by the enzyme amylase or dilute acids

3) Inulin

→ Inulin is a polymer of fructose i.e. fructosan

→ It occurs in dahlia, garlic, onion etc

→ It is used for assessing kidney function

Chitin

→ Chitin is composed of N-acetyl D-glucosamine units held together by β (1→4) glucosidic bonds

Heteropolysaccharides

→ When the polysaccharides are composed of different types of sugars or their derivatives, they are referred to as heteropolysaccharides or heteroglycans.

Mucopolysaccharides

→ Mucopolysaccharides are heteroglycans made up of repeating units of sugar derivatives namely amino sugars and uronic acids

→ These are more commonly known as glucosaminoglycans (GAGs)

→ Some of the mucopolysaccharides are found in combination with proteins to form muscoproteins or mucoids or proteoglycans

→ Muscproteins may contain up to 95%. Carbohydrate and 5% protein

→ Mucopolysaccharides are essential components of tissue structure.

→ the extracellular spaces of tissue particularly connective tissue - cartilage, skin, blood vessels, tendons consist of collagen and elastic fibers embedded in a matrix or ground substance.

→ The ground substance is predominantly composed of GAGs

The important mucopolysaccharides includes

1) Hyaluronic acid
2) Chondroitin-4-Sulphate
3) Heparin.
4) Dermatan Sulphate and
5) Keratan Sulphate

Hyaluronic acid

→ Hyaluronic acid is an important CHO found in the ground substance of synovial fluid of joints and vitreous humour of eyes

→ It is also present as a ground substance in connective tissues and forms a gel around the ovum

→ Hyaluronic acid serves as a lubricant and shock absorbent in joints

→ Hyaluronic acid is composed of alternate units of D-glucuronic acid and N-acetyl-D-glucosamine.

→ These two molecules form disaccharide units held together by β(1→3) glycosidic bond

→ Hyaluronidase is an enzyme that breaks (β-1-4 linkages) hyaluronic acid and other GAGs

2) Chondroitin Sulphate.

→ Chondroitin is a major constituent of various mammalian tissues (bone, cartilage, tendons, heart, valves, skin, cornea etc

→ structurally Chondroitin-4-sulphate
Consists of repeating units of
disaccharides composed of D-glucuronic
acid and N-acetyl-D-galactosamine.

3) Heparin

→ Heparin is an anticoagulant which
prevent blood clotting
→ It occurs in blood, lung, liver, kidney,
spleen etc
→ Heparin is composed of alternating
units of N-sulfo-D-glucosamine-6-
Sulphate and glucuronic 3-sulfate.

4) Dermatan Sulphate.

→ It mostly occurs in the Skin

→ It consists of repeating units of L-iduronic acid and N-acetyl D-galactosamine

3) Keratan Sulphate

→ It is a heterogeneous GAG with a variable Sulphate content

→ Keratan Sulphate essentially consists of alternating units of D-galactosamine and ~~N-acetylglucos~~ N-acetyl glucosamine

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