Celloboise

It also contains two glucose units but they are joined in β(1→4) linkage. It is formed from cellulose.

Trehalose

It also contain two glucose units. The glycosidic linkage is α(1→1). So, it is a non-reducing disaccharide. It is a major sugar in insect hemolymph.

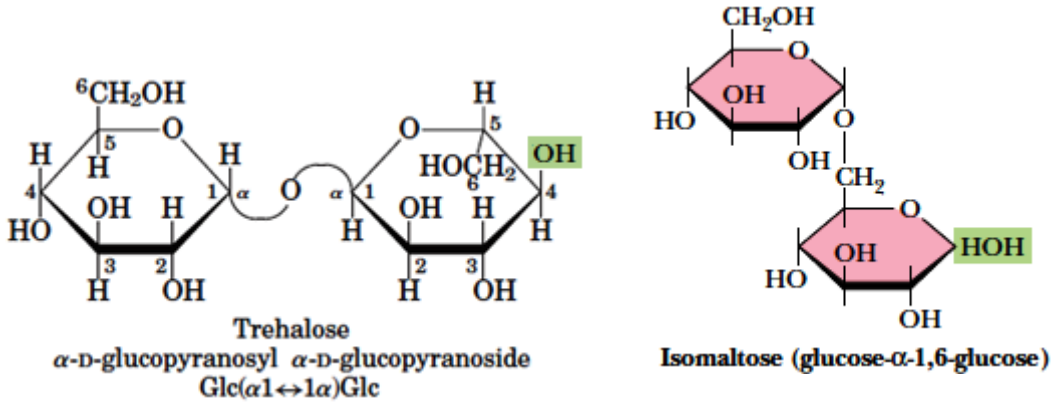

Figure (1.13) Other Disaccharides

Oligosaccharides Occurrence

Oligosaccharides chain are found in glycoproteins where they have important functions. Oligosaccharides are also important constituents of glycolipids present in cell membrane.

POLYSACCHARIDES

They are polymers of monosaccharides. They contain more than ten monosaccharide units. The monosaccharides are joined together by glycosidic linkage.

Classification of Polysaccharides

Polysaccharides are classified on the basis of the type of monosaccharide present. The two classes of polysaccharides are homo-polysaccharides and hetro-polysaccharides.

(*a*) **Homopolysaccharides:** They are entirely made up of one type of monosaccharides. On hydrolysis, they yield only one kind of monosaccharide.

(*b*) **hetropolysaccharides:** They are made up of more than one type of monosaccharides. On hydrolysis they more than one type of monosaccharides.

Homopolysaccharides

Important homopolysaccharides are starch, glycogen, cellulose, dextran and inulin and chitin. All these contain glucose as repeating unit. Other name for Homopolysaccharides are homoglycans.

Starch

Structure

1. It contain of two parts. A minor amylose component and major amylopectin component.
2. Amylose is a straight- chain polymer of glucose units. α(1→4) glycosidic linkage is present between glucose units.
3. In contrast amylopectin is a branched molecule (Fig. 1.14). In the linear portion of amylopectin (1→4) glycosidic linkage exist between glucose units whereas α(1→6) glycosidic linkage exist at branch points between glucose residues. The branching occurs in amylopectin for every 2-30 glucose units.
4. Amylose has helical coil secondary structure and usually 6 glucose residue make one turn (Fig. 1.14). Because of branching secondary structure of amylopectin is random coil structure.

Function

1. It is major polysaccharide present in our food.
2. It is also called as storage polysaccharide because it serve as reserve food material in plants.
3. It is present in food grain, tuber and root like rice, wheat, potato and vegetables.

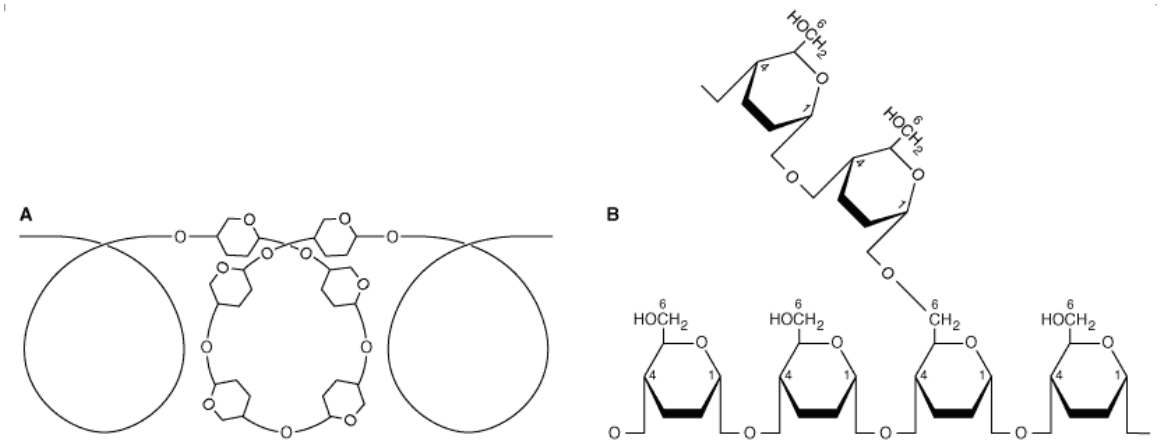

Figure (1.14) Structure of starch. (A) Amylose, showing helical coil structure. (B) Amylopectin, showing α(1 → 6) branch point.

Glycogen

Is the storage polysaccharide in animals and is sometimes called animal starch. It is a more highly branched structure than amylopectin with chains of 12–14 D-glucopyranose residues (in α(1→4) glycosidic linkage) with branching by means of α(1 →6) glycosidic bonds.

Structure

1. The structure of glycogen is similar to that of amylopectin of starch. However, the number of branches in glycogen molecule is much more than amylopectin (Fig. 1.15).
2. There is one branch point for 6-7 glucose residues.

Function

1. It is the major polysaccharide (carbohydrate) in human body.
2. It is mainly present in liver and muscle.
3. It is also called as animal starch.

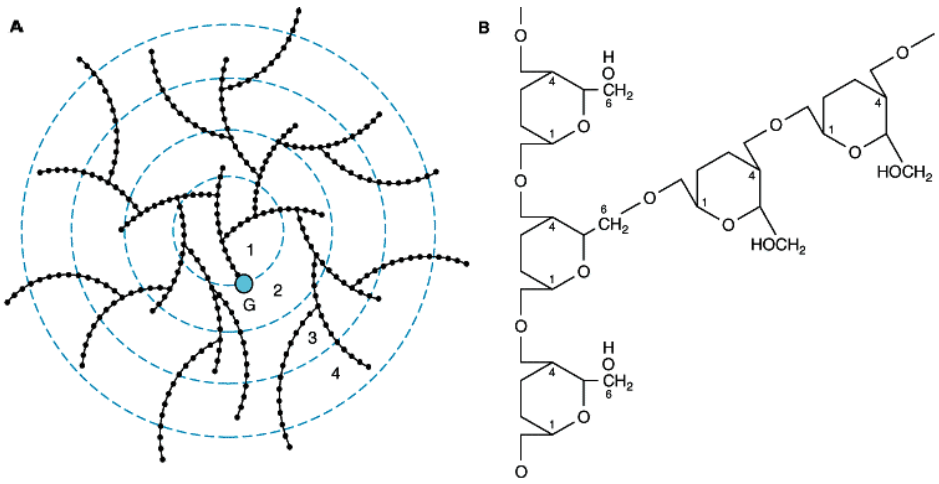

Figure (1.15) The glycogen molecule. (A) General structure. (B) Enlargement of structure at a branch point. (G, glycogenin, the primer molecule for glycogen synthesis

Inulin

It is a polysaccharide of fructose (and hence a fructosan). β(1→2) glycosidic linkage is present between fructose units. found in tubers and roots of some plants. It is readily soluble in water and is used to determine the glomerular filtration rate, but it is not hydrolyzed by intestinal enzymes.

Dextrans

Are intermediates in the hydrolysis of starch. It has a structure similar to amylopectin. Glucose units are linked by α(1→6) glycosidic bond and α(1→3) glycosidic linkage is present between glucose units at branch points. It is used

in clinical medicine to maintain plasma volume dextran. Dental plaque is due to dextran synthesized from sucrose by oral bacteria.

Cellulose

Is the chief constituent of plant cell walls. It is insoluble and consists of β-D-glucopyranose units linked by (1→4) bonds to form long, straight chains strengthened by cross-linking hydrogen bonds. Mammals lack any enzyme that hydrolyzes the 1→4 bonds, and so cannot digest cellulose. It is an important source of "bulk" in the diet, and the major component of dietary fiber. Microorganisms in the gut of ruminants and other herbivores can hydrolyze the linkage and ferment the products to short-chain fatty acids as a major energy source. There is some bacterial metabolism of cellulose in the human colon.

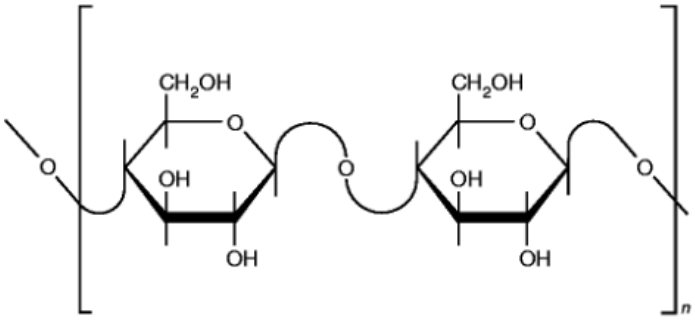

Figure (1.16) structural unit of cellulose

Chitin

Is a structural polysaccharide in the exoskeleton of crustaceans and insects, and also in mushrooms. It consists of N-acetyl-D-glucosamine units joined by β(1→4) glycosidic bonds.