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Lecture title: **Polysaccharides**

Lecturer Affiliation: *Department of Physiology, Biochemistry, and Pharmacology College of Veterinary Medicine, University of Mosul, Mosul,* Iraq

Summary: Carbohydrates composed of ten or more monosaccharide units or their derivatives (such as amino sugars and uronic acids) are generally classified as **polysaccharides.** Polysaccharides are colloidal in size.

In polysaccharides, monosaccharide units are joined together by glycosidic

linkages. Another term for polysaccharides is a ***"glycans".***

Some function of polysaccharides as storage forms of carbohydrates, e.g. starch in plants and glycogen (animal starch) in animals.

Polysaccharides

Polysaccharides (Greek: poly-many) are polymers of monosaccharide units with high molecular weight (up to a million). They are usually tasteless (non-sugars) and form colloids with water. The polysaccharides are of two types :-

Homo polysaccharides and

Hetero polysaccharides

1. **Homopolysaccharides** on hydrolysis yield only a **single type of monosaccharide**. They are named based on the nature of the monosaccharide. Thus, **glucans** are polymers of glucose whereas **fructosans** are polymers of fructose

2. **Heteropolysaccharides** on hydrolysis yield **a mixture** of a few monosaccharides or their derivatives.

Homopolysaccharides:

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 **homopolysaccaride** composed of D-glucose units held by **glycosidic bonds**. It is consists of two polysaccharide

Components water soluble **amylose** (15-20%) and a water insoluble **amylopectin** (80-85%).

Amylose is:

a) **Unbranched chain**.

b) With 200–1,000 **D-glucose** units.

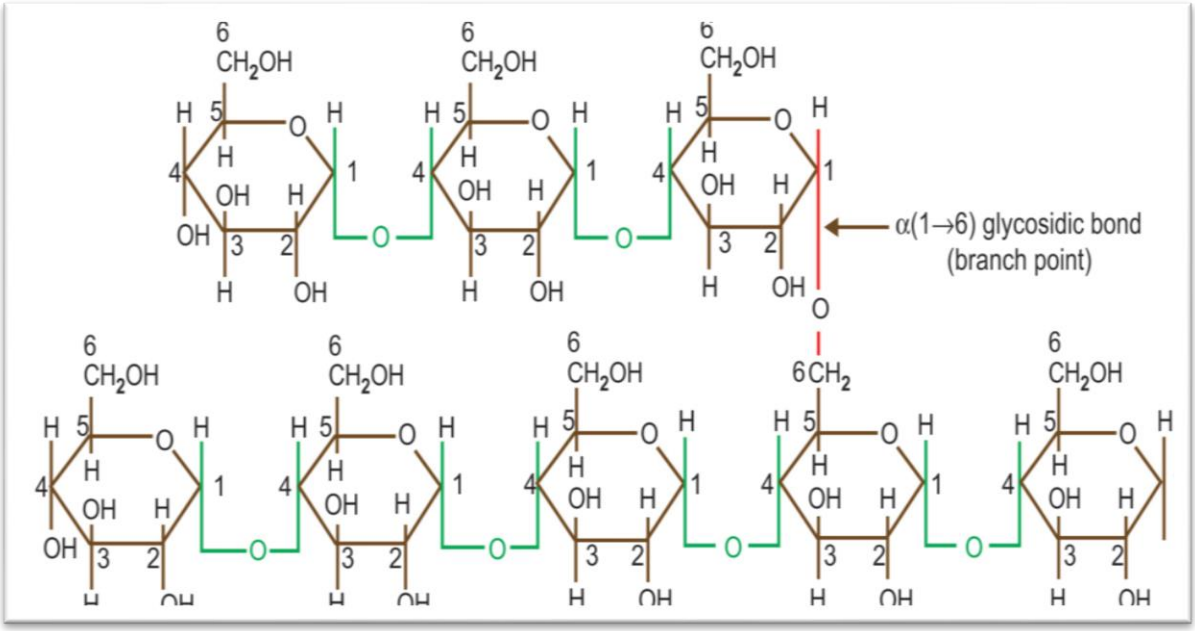
c) Held by **α (1 → 4)** glycosidic linkages.

Amylopectin is:

a) **Branched chain**

b) With 2,000-200,000 D-glucose units.

c) with **α (1 → 6)** glycosidic bonds at the branching points and **α(1 → 4)** linkages .



Structure of amylopectin

Glycogen

It is the reserve carbohydrate in animals. It is stored in **liver** and **muscle**. About 5% of weight of liver is made up by glycogen. Excess carbohydrates are deposited as glycogen.

Glycogen is composed of glucose units joined by α-1→4 links in straight chains. It also has α-1→6 glycosidic linkages at the **branching** points . Molecular weight of glycogen is about 5 million. Glycogen is more branched and more compact than amylopectin.

Functions of glycogen

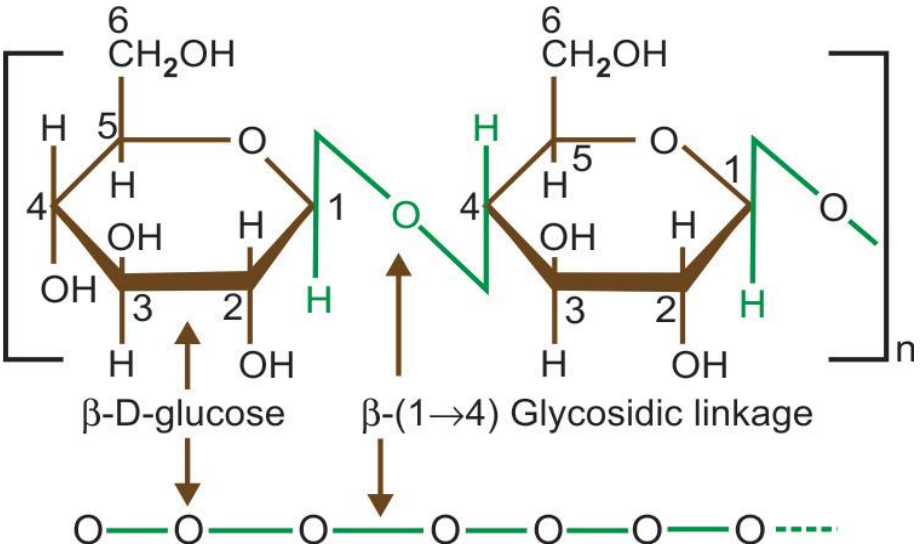
- The function of muscle glycogen is to act as a readily available source of glucose for energy within muscle itself.
- Liver glycogen is concerned with storage and maintenance of the blood glucose .

Cellulose

Cellulose is the chief constituent of cell wall of **plants**. It is an ***unbranched*** *polymer* of glucose and consists of long straight chains which are linked by **β-(1→4)** glycosidic linkages and not α-(1→ 4) as in amylose.

- Since humans lack an enzyme **cellulase** that can hydrolyze the β-(1→ 4) glycosidic linkages, ***cellulose cannot be digested and absorbed*** and has no food value

Unlike starch. however, the ruminants can utilize cellulose **because** they have in their digestive tract microorganisms whose enzymes hydrolyze cellulose



Cellulose