## BIOMOLECULES

# POLYSACCHARIDES

## POLYSACCHARIDES

• They are formed by polymerisation of 11 to thousands of monosaccharide monomers.

 $C_6H_{12}O_6)_n \longrightarrow (C_6H_{10}O_5)_n + (H_2O)_{n-1}$ 

Monosaccharide Polysaccharide

- General formula (C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>)<sub>n</sub>.
- They are tasteless and insoluble in water.
- In a polysaccharide chain (like glycogen), the right end is called the reducing end and the left end is called non-reducing end.
- Depending upon the composition, polysaccharides are of two types.

### A. Homopolysaccharides or Homoglycans

Made up of only one type of monosaccharide monomers. For example - starch, cellulose, glycogen, inulin, chitin.

## B. Heteropolysaccharides or Heteroglycans

These are formed by condensation of more than one type of monosaccharide monomers. e.g., agar, hemicellulose, arabagalactans, arabaxylans, pectin etc.

## 1. Starch

- This is the reserve food in plants.
- It is found in abundance in cereal grains (wheat, rice, maize), legumes (pea, gram, beans), potato, banana etc.
- Starch can hold I<sub>2</sub> molecules in the helical portion and starch-I<sub>2</sub> is blue in colour.

### 2. Glycogen

- It is a main reserve food in animals, bacteria and fungi.
- Glycogen is stored in muscle cells and liver cells.

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#### 3. Inulin

- Linear polymer of fructose units.
- It is water soluble polysaccharide.
- It is not metabolised in human body and filtered through kidney. It is therefore, used in testing of kidney function (glomerular filtration).

## 4. Cellulose

- It is a homopolysaccharide of β-D glucose.
- It is the main structural component of cell wall of plants, some fungi and protists.
- Cellulose is the most abundant organic substance of the plants & also on earth.
- It cannot be digested by the human beings, because they lack the enzyme cellulase, required to digest cellulose.
- Cellulose does not contain complex helices and hence cannot hold I<sub>2</sub>.

## 5. Chitin

- Chitin is the second most abundant organic compound in nature.
- It is present in the exoskeleton of arthropods and in the cell walls of fungi.
- The monomer of chitin is N-acetyl glucosamine.

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### 6. Hyaluronic acid (Animal cement)

• It is found in skin, vitreous humour of the eye, the umbilical cord, synovial fluid.

### 7. Heparin

- It is secreted by mast cells.
- It is an anticoagulant.

### 8. Agar-Agar

• It is a polysaccharide found in few red algae such as Gracillaria, Gelidium etc. It is important as tissue culture medium.

## Functions of carbohydrates

- **1.** They are the primary source of energy. Normally body obtains 58 to 65% of its required energy from the carbohydrate. Glucose acts as most common respiratory substrate.
- 2. Ribose & Deoxyribose are used in the formation of RNA, DNA, ATP, NAD, FAD etc.
- **3.** Starch in plants & glycogen in animals are the stored form of food.
- **4.** Cellulose is used in the formation of cell wall.
- 5. Chitin forms exoskeleton in arthropods and few fungal cell wall.

## MUCOPOLYSACCHARIDES

Slimy polysaccharides with capacity to bind proteins and water are called mucopolysaccharides. In plants, mucilage is a common mucopolysaccharide.

## Special Points :

1. **Peptidoglycan -** Present in cell wall of bacteria.

- Composed of N - acetyl Glucosamine + N - acetyl muramic acid + peptide chain of 4-5 amino acids

2. Agar-Agar - It is a mucopolysaccharide which is obtained from some red algae - Gracilaria, Gelidium, Chondrus. It is composed of 0-galactose and L-galactose unit (1, 3 linkage) and after every 10<sup>th</sup> unit a sulphate group is present. It is used for preparing culture medium.

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**3. Difference between gums and fevicol :** Gums are natural mucoplysaccharides while fevicol is synthetic rubber based adhesive.