Application of polysaccharides in biochemistry.

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Commentary

Products derived from polysaccharides are available for ion exchange, for gel permeation or filtration, or for affinity and conventional chromatography, as a gel medium for microbial cultures, for electrophoresis, etc. Polysaccharides are used as emollients, in pharmaceutical formulations, for dental impression materials, powdered powders, hemo stats, and for the treatment of mild intestinal diseases. They are used for plasma replacement and as anticoagulants both in solution and for the superficial treatment of artificial organs. Polysaccharides are converted into bioactive tissues and formed into hollow membranes and fibres for hemofiltration and hemodialysis. You can control the release of active ingredients as polymeric carriers or by microencapsulation. They have been used to increase the healing rate in surgery and burn therapy.

Polysaccharides are important components of interstitial fluids and connective tissue and provide mechanical strength and lubrication. The shorter sequences of saccharides in soluble proteins and on cell surfaces maintain conformation and act as key antigens that interact with soluble and membrane-bound proteins. Similar interactions control inter and intracellular transport of proteins and their elimination from the blood serum; participate in the control of tissue growth through contact inhibition; and they also participate in the determination of blood groups. They can also be used to distinguish normal from malignant cells, in cell surface studies, radio immunoassays, and to target drugs to specific tissues. Similarly, extracellular polysaccharides and surface carbohydrates from bacteria activate the immune system and are used as vaccines and adjuvants.

Polysaccharides consist of simple sugar units linked by oxygen (acetal) bonds between the aldehyde or ketone (carbonyl) function of one monosaccharide and an alcoholic hydroxyl of another monosaccharide unit. Since a carbonyl function and several hydroxyl functions are present in each monosaccharide, polysaccharides can in principle be linear, branched or cyclic. The three types of structure are known. In some cases they are also bound to other substances such as phosphate esters, proteins, lipids and polypeptides. These can form insoluble three-dimensional network structures or materials with complex solubility, liquid crystalline or surfactant properties.

Homo polymers, which are made up of only one type of monosaccharide, come in a variety of classes of copolymers. These can have a regular structure with two to eight different sugars in a repeated order. They can be copolymers with a backbone consisting of two different randomly distributed sugars, or a linear backbone of a single sugar with randomly distributed branches of another sugar. The branching architecture of both homo polymers and copolymers can be greatly varied in the manner of a honeycomb or tree. Block-shaped and interrupted linear copolymers are also known, and aperiodic sequences of sugars in proteins, lipids, and cell surfaces have also been found to have important physiological functions in living organisms. Although the most common class of monomeric units is aldehyde sugars that have six carbon atoms in a six-membered ring (aldohexopyranose), many others are also found. These include sugars with ketone functions instead of aldehyde (ketoses), sugars with five-membered rings (furanose), and sugars with hydrogen or one of many other functional groups that replace the usual hydroxyl groups. Sugars with five carbon atoms are not uncommon, and sugars with eight and nine carbon atoms are also known. Some of them are of great physiological importance. The properties of polysaccharides are deeply influenced by their molecular structure and the resulting super molecular architecture, as well as by the configurations of the individual sugars and functional groups present.

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