WEEK NINE

Glycogen

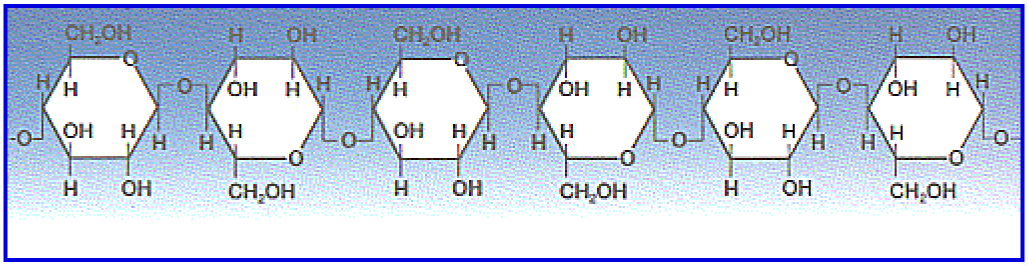
Animals store excess glucose by polymerizing it to form **glycogen**. The structure of glycogen is similar to that of amylopectin, although the branches in glycogen tend to be shorter and more frequent. Glycogen is broken back down into glucose when energy is needed (a process called glycogenolysis). The liver and skeletal muscle are major depots of glycogen.

Structural Polysaccharides

plants use different **polysaccharides**, such as cellulose, for structural purposes in their cell walls. The exoskeleton of many arthropods and mollusks is composed of chitin, a **polysaccharide** of N-acetyl-D-glucosamine.

Cellulose

Cellulose is probably the single most abundant organic molecule in the biosphere. It is the major structural material of which plants are made. Wood is largely cellulose and lignin while cotton and paper are almost pure cellulose. Cellulose is derived from D-glucose units, which condense through β(1→4)-glycosidic bonds. Cellulose is a straight chain polymer: unlike starch, no coiling or branching occur Cellulose is a polymer made with repeated glucose units bonded together by *beta*-linkages. Humans and many other animals lack an enzyme to break the beta-linkages, so they do not digest cellulose. Certain animals can digest cellulose, because bacteria possessing the enzyme cellulose are present in the gut. Classical examples are ruminant and termites.

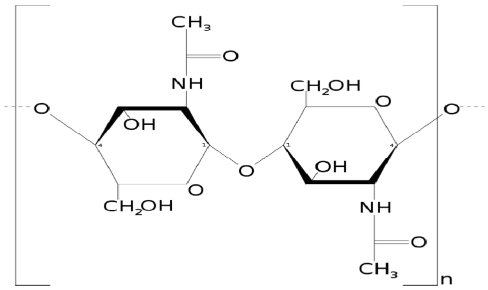


Hemicellulose

Hemicellulose is a polysaccharide related to cellulose that comprises ca. 20% of the biomass of most plants. In contrast to cellulose, hemicellulose is derived from several sugars in addition to glucose, including especially xylose but also mannose, galactose, rhamnose, and arabinose. Hemicellulose consists of shorter chains - around 200 sugar units. Furthermore, hemicellulose is branched, whereas cellulose is unbranched.

Chitin

is a homopolymer of N-acetyl-D-glucosamine, with units joined by beta 1-> 4 bonds. Chitin is found in organisms as diverse as algae, fungi, insects, arthropods, mollusks, and insects. Chitin is a long-chain polymer of a N-acetylglucosamine, a derivative of glucose, and is found in many places throughout the natural world. It is the main component of the cell walls of fungi, the exoskeletons of arthropods such as crustaceans (e.g. crabs, lobsters and shrimps) and insects, the radulas of mollusks and the beaks of cephalopods, including squid and octopuses. Chitin has also proven useful for several medical and industrial purposes. Chitin may be compared to the polysaccharide cellulose and to the protein keratin. Although keratin is a protein, and not a carbohydrate like chitin, keratin and chitin have similar structural functions.



N-acetylglucosamine

Uses

Agriculture

Most recent studies point out that chitin is a good inducer for defense mechanisms in plants.[4] It was recently tested as a fertilizer that can help plants develop healthy immune responses, and have a much better yield and life expectancy.[5] The Chitosan is derived from chitin, which is used as a biocontrol elicitor in agriculture and horticulture.

Industrial

Chitin is used industrially in many processes. It is used in water purification, and as an additive to thicken and stabilize foods and pharmaceuticals. It also acts as a binder in dyes, fabrics, and adhesives. Industrial separation membranes and ion-exchange resins can be made from chitin. Processes to size and strengthen paper employ chitin.

Medicine

Chitin's properties as a flexible and strong material make it favorable as surgical thread. Its bio-degradibility means it wears away with time as the wound heals. Moreover, chitin has some unusual properties that accelerate healing of wounds in humans.[7].