

Difference Between Chitin and Cellulose

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Key Difference - Chitin vs Cellulose

[Cellulose](#) and chitin are two structural [polymers](#) found in nature. Cellulose is a [polysaccharide](#) made from linear chains of [D-glucose](#) monomers. Chitin is also an [organic compound](#) composed of modified glucose monomers which are derivatives of glucose known as N-acetylglucosamines. Cellulose is the most abundant organic polymer found on Earth. Chitin is second only to cellulose from its abundance on Earth. The **key difference** between cellulose and chitin is that **cellulose is the significant structural polymer in the primary [cell walls](#) of the [plant cells](#) while chitin is the main structural polymer found in the fungal cell wall.**

What is Chitin?

Chitin is a polymer which is composed of modified glucose monomers called N-acetylglucosamines. It is an abundant structural polymer which is second only to cellulose by abundance. Chitin is present on fungal cell walls, [exoskeletons](#) of [arthropods](#) and [insects](#). The chemical formula of chitin is $(C_8H_{13}O_5N)_n$. Albert Hofmann determined the structure of chitin in 1929. Chitin is an un-branched structural polysaccharide which contributes to strengthening and protecting organisms.

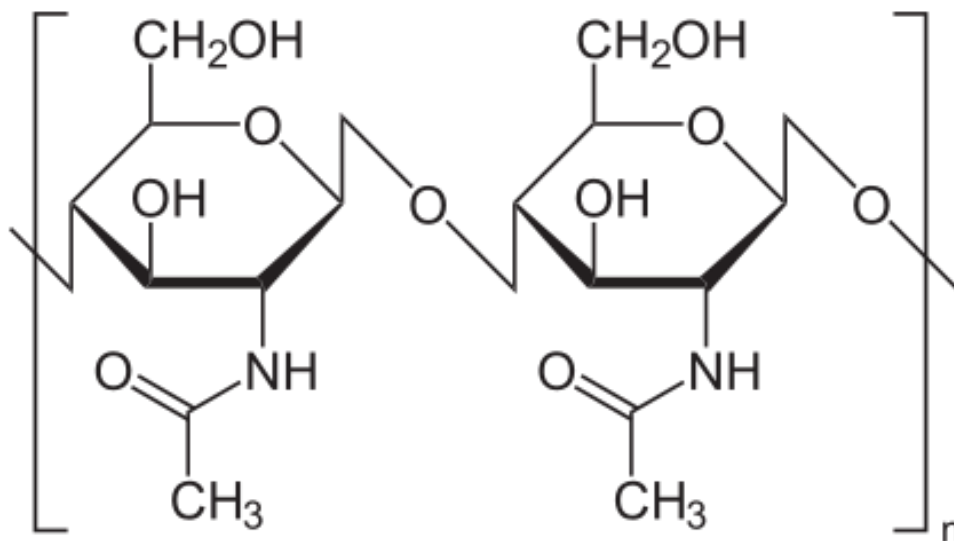


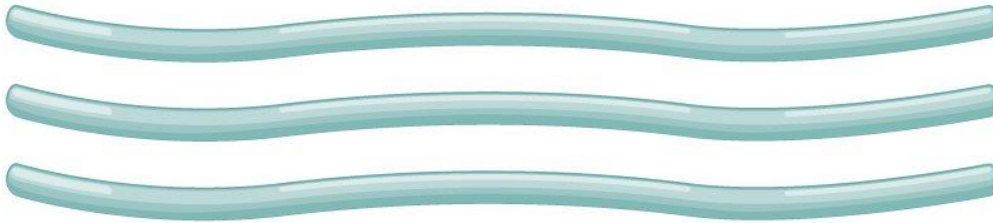
Figure 01: Chitin Structure

Other than the structural and protective functions, chitin has several other functions. Chitin acts as a flocculating agent for wastewater treatment, acts as a wound healing agent, acts as a thickener and stabilizer for foods and pharmaceuticals, etc. And chitin is also used in [dyes](#), adhesives, sizing and strengthening agents for papers.

What is Cellulose?

Cellulose is the most abundant organic polymer on Earth. It is a polysaccharide composed of hundreds to thousands of linear chains (nonbranched) of D-glucose monomers. It is a structural organic compound. Cellulose can be commonly found in the primary cell wall of the plant cells to provide the rigidity to plants. Cellulose is the key structural compound responsible for the strength and toughness of the plant [leaves](#), roots, and stems. And also in [algae](#) and oomycetes, cellulose is found. The chemical formula of the cellulose is $(C_6H_{10}O_5)_n$. And it was first isolated in 1834 by the French chemist Anselme Payen.

Cellulose fibers



Cellulose structure

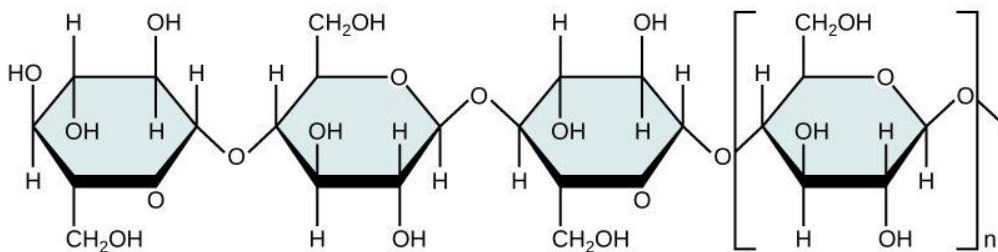


Figure 02: Cellulose Fibers

Since cellulose is a complex polymer, most animals including human cannot digest cellulose. Only [herbivores](#) are capable of [digestion](#) of cellulose easily due to their special digestive sacs. Cellulose synthase is the [enzyme](#) which synthesizes cellulose into plants. Wood, [cotton](#), and paper are rich in cellulose. Cellulose is a major source of fiber in our diet which affects human health. Certain bacteria produce cellulose for the formation of biofilms and cell aggregation.

What are the Similarities Between Chitin and Cellulose?

- Chitin and cellulose are both made from glucose monomers.
- Both are structural polymers.
- Both are linear polymers.
- Both are polysaccharides.
- Both are fiber-forming.
- Chitin and cellulose are [insoluble](#) in water.

What is the Difference Between Chitin and Cellulose?

Chitin vs Cellulose

Chitin is a structural organic polymer made from modified glucose monomers.

Cellulose is a structural organic polymer composed of linear chains of glucose monomers.

Chemical Formula

The chemical formula of chitin is $(C_8H_{13}O_5N)_n$

The chemical formula of cellulose is $(C_6H_{10}O_5)_n$.

Type of Polymer

Chitin is a polymer of N-acetylglucosamine (derivative of glucose).

Cellulose is a polymer of glucose.

Location

Chitin is found mainly in cell walls of fungi, and also in the exoskeleton of [arthropods and mollusks](#).

Cellulose is found mainly in cell walls of plant cells.

Abundance

Chitin is less abundant than celluloses.

Cellulose is the most abundant organic compound on Earth.

Amyl Group

Chitin has an amyl group as a substitution in the glucose molecule.

Cellulose has a hydroxyl group in the glucose molecule.

Nitrogen Molecules

Chitin has nitrogen molecules in its structure.

Cellulose does not contain nitrogen in its structure

Hardness and Stable

Chitin is hard and stabile than cellulose.

Cellulose is less hard and stabile than chitin.

Summary - Chitin vs Cellulose

Chitin and cellulose are most abundant structural organic polymers found on Earth. Cellulose is the primary compound of the cell walls of the plant cells. Chitin is the primary compound of the cell walls of the fungi and exoskeletons of arthropods. Cellulose is a polymer composed of D-glucose monomers. Chitin is a long polymer of N-acetylglucosamine. Both chitin and cellulose are important for the strength and protection of organisms. Both compounds are insoluble in water. This is the difference between chitin and cellulose.

Reference:

1. Maleki, Samaneh Sadat, et al. "Characterization of Cellulose Synthesis in Plant Cells." The Scientific World Journal, Hindawi, 25 May 2016. [Available here](#)
2. "Function of Cellulose in Plants." Actforlibraries.org. [Available here](#)
3. "Chitin." Chitin - New World Encyclopedia. [Available here](#)

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