

Insoluble Dietary Fiber Composed of Monosaccharides

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Description

Monosaccharides with three carbon atoms are referred to as trioses, those with four are known as tetroses, those with five are pentoses and those with six are hexoses and so forth. These two classification systems are often combined. Nowadays, the term is generally understood in the biochemical context, which excludes compounds with only a few carbons and encompasses many organic carbohydrates that deviate from this formula. For instance, while the above representative formulas might seem to capture the commonly known carbohydrates, ubiquitous and abundant carbohydrates often diverge from this. For example, carbohydrates often exhibit chemical groups such as N-acetyl as seen in chitin, sulfate as seen in glycosaminoglycans, carboxylic acid and deoxy modifications as seen in fucose and sialic acid.

Ketohexose and carbon ketone

Monosaccharides are classified based on three different characteristics: The position of their carbonyl group, the number of carbon atoms they contain and their chiral handedness. If the carbonyl group is an aldehyde, the monosaccharide is an aldose; if the carbonyl group is a ketone, the monosaccharide is a ketose. For example, glucose is an aldohexose, a six-carbon aldehyde, ribose is an aldopentose, a five-carbon aldehyde and fructose is a ketohexose, a six-carbon ketone. Saccharides and their derivatives encompass many other vital biomolecules that play key roles in the immune system, reproduction, preventing pathogenesis, blood clotting and growth. Carbohydrates are essential to nutrition and are found in a wide variety of natural and processed foods. Starch, a polysaccharide, is abundant in cereals (such as wheat, maize and rice), potatoes and processed foods made from cereal flour, like bread, pizza or pasta. Sugars appear in the human diet mainly as table sugar (sucrose, extracted from sugarcane or sugar beets), lactose (abundant in milk), glucose and fructose, which occur naturally in honey, many fruits and some vegetables. Cellulose, a polysaccharide found in the cell walls of all plants, is one of the main

components of insoluble dietary fiber. Although it is not digestible by humans, cellulose and insoluble dietary fiber in general help maintain a healthy digestive system by facilitating bowel movements. Beans, lentils, lupins, peas and peanuts are all examples of grain legumes. They are utilized as a vital ingredient in vegetarian meat and dairy substitutes and are becoming increasingly popular on the global market as a source of plant-based protein. Different polysaccharides contained in dietary fiber include resistant starch and inulin, which feed several microorganisms in the gut microbiota and are used by these bacteria to produce short-chain fatty acids.

Complex carbohydrates

In scientific literature, the term carb has many synonyms, such as sugar (in the broad sense), saccharide, ose, glucide, hydrate of carbon or polyhydroxy compounds with aldehyde or ketone. Some of these terms, notably carb and sugar, are also used with other meanings. In food science and in many informal contexts, the term "carb" often refers to any food that is particularly rich in complex carbohydrates like grains, bread and pasta or simple carbohydrates like sugar found in candies, jams and sweets. This colloquial usage is sometimes confusing because it conflates chemical structure and digestibility in humans. In the strict sense, sugar is used for sweet, soluble carbohydrates, many of which are used in human food. However, not all carbohydrates conform to this precise stoichiometric definition (*e.g.*, uronic acids, deoxy-sugars such as fucose), nor are chemicals that do conform to this definition necessarily termed carbohydrates (*e.g.*, formaldehyde and acetic acid). Monosaccharides are the primary fuel source for metabolism, being used both as an energy source (glucose being the most important in nature as it is the product of photosynthesis in plants) and in biosynthesis. When monosaccharides are not immediately needed, they are often converted into more space-efficient (*i.e.*, less water-soluble) forms, often polysaccharides. In many animals, including humans, this storage form is glycogen, especially in liver and muscle cells.