2.1A: Simple Carbohydrates

As shown in the figure below, simple carbohydrates can be further divided into monosaccharides and disaccharides. Mono- means one, thus monosaccharides contain one sugar. Di- means two, thus disaccharides contain 2 sugar units.

Monosaccharides

The 3 monosaccharides are: glucose, fructose and galactose. Notice that all are 6-carbon sugars (hexoses). However, fructose has a five member ring, while glucose and galactose have 6 member rings. Also notice that the only structural difference between glucose and galactose is the position of the alcohol (OH) group that is shown in red.

https://med.libretexts.org/Bookshelves/Nutrition/Book%3A_Intermediate_Nutrition_(Lindshield)/Chapter_2%3A_Macronutrient... Updated: Fri, 05 Jun 2020 09:19:02 GMT Powered by
Figure 2.112 The 3 monosaccharides

Glucose - Product of photosynthesis, major source of energy in our bodies

Fructose - Commonly found in fruits and used commercially in many beverages

Galactose - Not normally found in nature alone, normally found in the disaccharide lactose

Web Link

Not familiar with ring structures, see how glucose forms a ring

Disaccharides

Disaccharides are produced from 2 monosaccharides. The commonly occurring disaccharides are:

- Maltose (glucose + glucose, aka malt sugar) - seldom found in foods, present in alcoholic beverages and barley
- Sucrose (glucose + fructose, aka table sugar) - only made by plants.
- Lactose (galactose + glucose, aka milk sugar) - primary milk sugar

The different disaccharides and the monosaccharides components are illustrated below.
Each of these disaccharides contains glucose and all the reactions are dehydration reactions. Also notice the difference in the bond structures. Maltose and sucrose have alpha-bonds, which are depicted as v-shaped above. You might hear the term glycosidic used in some places to describe bonds between sugars. A glycoside is a sugar, so glycosidic is referring to a sugar bond. Lactose, on the other hand, contains a beta-bond. We need a special enzyme, lactase, to break this bond, and the absence of lactase activity leads to lactose intolerance.

High-Fructose Corn Syrup

Food manufacturers are always searching for cheaper ways to produce their food. One method that has been popular is the use of high-fructose corn syrup as an alternative to sucrose. High-fructose corn syrup contains either 42 or 55% fructose, which is similar to sucrose. Nevertheless, because an increase in high-fructose corn syrup consumption (see figure below) has coincided with the increase in obesity in the U.S., there is a lot of controversy surrounding its use.
Opponents claim that high-fructose corn syrup is contributing to the rise in obesity rates. As a result, some manufactures have started releasing products made with natural sugar. You can read about this trend in the following New York Times article in the link below. Also, manufacturers tried to rebrand high-fructose corn syrup as corn sugar to get around the negative perception of the name. But the FDA rejected the Corn Refiners Association request to change the name officially to corn sugar as described in the second link. The last link is a video made by the American Chemical Society that gives some background on how HFCS is produced and how it compares to sucrose.

Web Links

Sugar is back on labels, this time as a selling point

No new name for high-fructose corn syrup

(Video): Sugar vs. High Fructose Corn Syrup - What's the Difference? (2:41)

References & Links

2. http://www.foodnavigator-usa.com/Mar...eteeners-drops

Links

- Not familiar with Ring structures, see how glucose forms a ring - http://en.wikipedia.org/wiki/File:Gl...to_Haworth.gif
- Sugar is back on labels, this time as a selling point - http://www.nytimes.com/2009/03/21/dining/21sugar.html?_r=1&ref=nutrition
- No new name for high-fructose corn syrup - http://well.blogs.nytimes.com/2012/05/31/no-new-name-for-high-fructose-corn-syrup/?_r=0
Video

Sugar vs. High Fructose Corn Syrup - What's the Difference? - https://www.youtube.com/watch?v=fXMyregmU1g

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