

Biochemistry of disaccharide, types and properties

M.SC. SEMESTER II CC07

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Introduction

Disaccharides are found in plants, obtained from sugar cane, sugar beet and maple tree sap. Sucrose, maltose, lactose and trehalose are some of the disaccharides. **Disaccharide**, also called **double sugar**, any substance that is composed of two molecules of simple [sugars](#) ([monosaccharides](#)) linked to each other. Disaccharides are crystalline water-soluble [compounds](#). The monosaccharides within them are linked by a glycosidic bond (or glycosidic linkage), the position of which may be designated α - or β - or a combination of the two (α -, β -). Glycosidic bonds are [cleaved](#) by [enzymes](#) known as glycosidases. The three major disaccharides are [sucrose](#), [lactose](#), and maltose.

In the bacterium *Escherichia coli*, energy is derived from the metabolism of disaccharide and oligosaccharide sugars and other small molecules.

Lactose (milk sugar)

Lactose, [carbohydrate](#) containing one [molecule](#) of [glucose](#) and one of [galactose](#) linked together. Composing about 2 to 8 percent of the [milk](#) of all mammals, lactose is sometimes called milk [sugar](#). It is the only common sugar of animal origin. Lactose can be prepared from [whey](#), a by-product of the cheese-making process. Fermentation of lactose by microorganisms such as *Lactobacillus acidophilus* is part of the industrial production of [lactic acid](#). Human [lactose intolerance](#) is indicated by diarrhea and abdominal bloating and discomfort; lactose intolerance also may be a cause of diarrhea in newborns.

[Dairy product: Lactose](#)

[Lactose](#) is the principal carbohydrate found in milk. It is a disaccharide composed of one molecule each of the monosaccharides (simple sugars) [glucose](#) and [galactose](#). [Lactose](#) is an important food source for several types of fermenting bacteria.

[Lactose](#), which consists of galactose and glucose, is the principal sugar of milk. It is synthesized in the mammary gland; UDP-galactose and glucose react to form lactose; UDP is also a product

Dietary supplement, any [vitamin](#), [mineral](#), [herbal](#) product, or other ingestible preparation that is added to the diet to benefit [health](#).

Dietary supplements are used worldwide and represent a broad category of ingestible products that are distinguishable from conventional foods and [drugs](#). In the [United States](#), dietary supplements are defined as products (other than [tobacco](#)) intended to supplement the diet that contain at least one of the following ingredients: vitamin, mineral, herb or botanical (including extracts of herbs or botanicals), [amino acid](#), metabolite, or any combination thereof. In short, products such as multivitamins, [garlic](#) tablets, [fish oil](#) capsules, probiotics, natural weight-loss aids, and certain types of energy drinks are examples of dietary supplements.

Dextrin, class of substances prepared by the incomplete [hydrolysis](#) of [starch](#) or by the heating of dry starch. Dextrins are used chiefly as [adhesives](#) and as [sizing](#) agents for [textiles](#) and [paper](#).

Sucrose, or **table sugar**, [organic compound](#), colourless sweet-tasting [crystals](#) that dissolve in water. Sucrose (C₁₂H₂₂O₁₁) is a disaccharide; [hydrolysis](#), by the [enzyme invertase](#), yields “[invert sugar](#)” (so called because the hydrolysis results in an inversion of the rotation of plane polarized light), a 50:50 mixture of [fructose](#) and [glucose](#), its two [constituent monosaccharides](#).

Sucrose occurs naturally in [sugarcane](#), sugar beets, [sugar maple](#) sap, dates, and [honey](#). It is produced commercially in large amounts (especially from sugarcane and sugar beets) and is used almost entirely as [food](#).

Maltose

Maltose, also known as malt sugar, is formed from two glucose molecules. Malt is formed when grains soften and grow in water, and it is a component of beer, starchy foods like cereal, pasta, and potatoes, and many sweetened processed foods. In plants, maltose is formed when starch is broken down for food. It is used by germinating seeds in order to grow.

Properties

Sucrose

White, sweet, crystalline, non reducing since both reducing groups involved in linkage yields a molecule each of glucose and fructose on hydrolysis.

Maltose

Hard crystalline, less sweet than sucrose, reducing sugar because only one reducing group forms the linkage yields 2 molecules of glucose on hydrolysis.

Lactose

Hard, crystalline, less sweet than sucrose, melting point 203° C, reducing sugar because the reducing group of galactose does not take part in linkage, yields 1 molecule each of glucose & galactose on hydrolysis.

Trehalose

White, crystalline. Melting point 200-215° C. non-reducing sugar because the reducing groups of glucose are involved in linkage. Yields 2 molecules of glucose on hydrolysis.

The glycosidic bond can be formed between any hydroxy group on the component monosaccharide. So, even if both component [sugars](#) are the same (e.g., [glucose](#)), different bond combinations (regiochemistry) and [stereochemistry](#) (*alpha*- or *beta*-) result in disaccharides that are [diastereoisomers](#) with different chemical and physical properties. Depending on the [monosaccharide](#) constituents, disaccharides are sometimes crystalline, sometimes water-soluble, and sometimes sweet-tasting and sticky-feeling. Disaccharides can serve as [functional groups](#) by forming glycosidic bonds with other organic compounds, forming [biosides](#).