

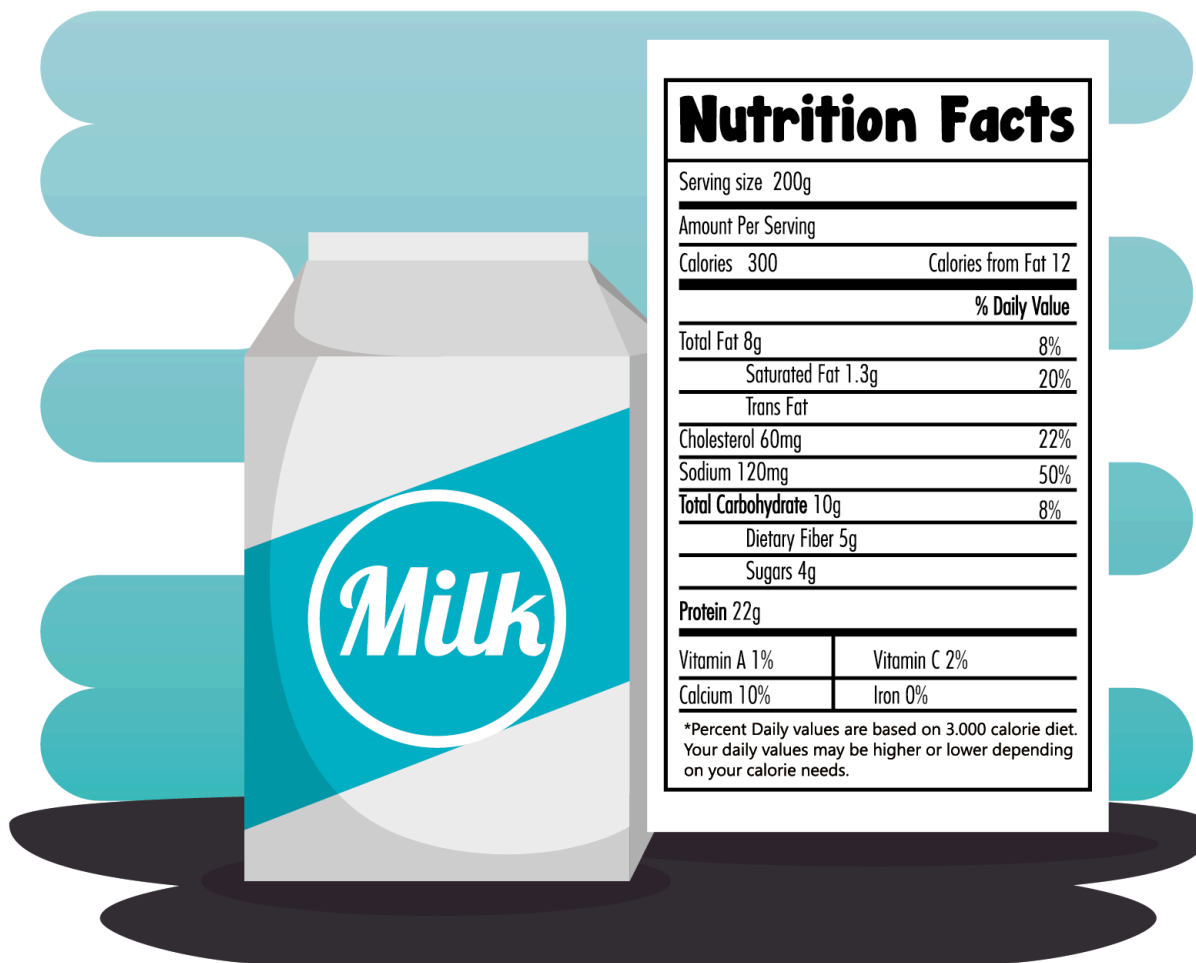
CHEMISTRY OF MILK

EXPLORE 1 LESSON 3



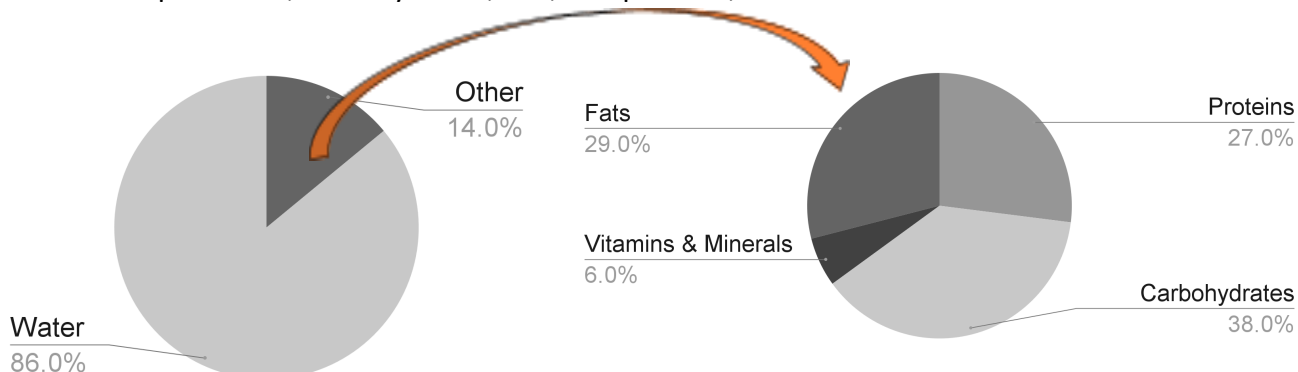
Food and Agriculture
Center for
Science Education

Milk Nutrition Label



Molecular Composition of Milk

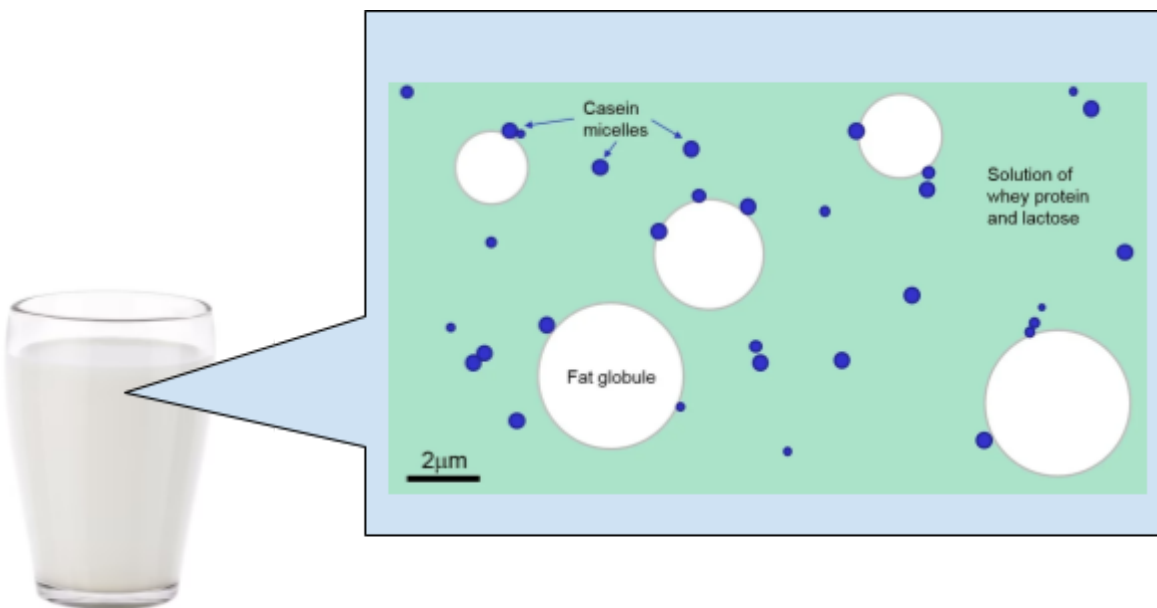
Milk is made up of water, carbohydrates, fats, and proteins, as well as vitamins and minerals.



Milk Chemistry. Milk Chemistry - Cheese Science Toolkit. (n.d.).
<https://www.cheesescience.org/milk.html>

Fats

Milk is an emulsion (a suspension of droplets of one liquid in another) of fat in water. Droplets of fat in milk are typically about 1-3 micrometers in size. Milkfat globules are composed of several different types of fats, such as saturated fats, monounsaturated fats, and polyunsaturated fats. Homogenization of milk breaks up large fat globules into smaller globules that are distributed in the watery phase of milk. Fat-soluble vitamins (A, D, E, and K) are found in the fat globules of milk.



The Chemistry of Milk. Dairy Processing Handbook. (2020, January 30).
<https://dairyprocessinghandbook.tetrapak.com/chapter/chemistry-milk>

Vitamins and Minerals

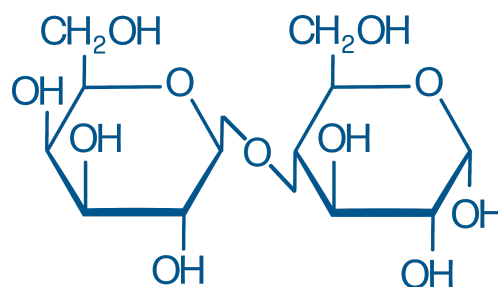
Milk has traces of minerals in digestible forms, including calcium, sodium, and potassium. Vitamins in milk help the body use carbohydrates, protein, and fat. Milk has water-soluble vitamins thiamin (Vitamin B1), riboflavin (vitamin B2), niacin (vitamin B3), pantothenic acid (B5), vitamin B6 (pyridoxine), vitamin B12 (cobalamin), vitamin C, and folate. Milk has fat-soluble vitamins A, D, E, and K; the content level of these vitamins depends on the product's fat content. For example, reduced-fat (2% fat), low-fat (1% fat), and skim milk must be fortified with vitamin A to be nutritionally equivalent to whole milk's natural vitamin D level.

Milk facts. Vitamins & Minerals in Milk | MilkFacts.info. (n.d.).

<http://www.milkfacts.info/Milk%20Composition/VitaminsMinerals.htm#:~:text=Milk%20is%20a%20good%20source,D%2C%20E%2C%20and%20K>

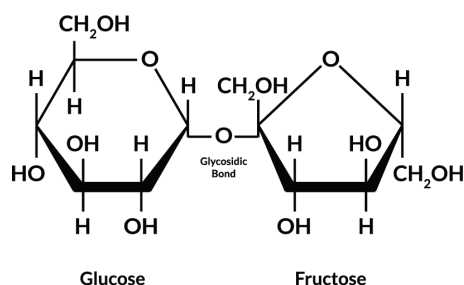
Carbohydrates

A carbohydrate that is uniquely found in milk is a sugar called Lactose. Carbohydrates that are composed of two sugar molecules are called disaccharides. Lactose is a disaccharide, with one sugar molecule called glucose bonded to another called galactose. Lactose is soluble in the water portion of milk and is not as sweet as other sugars.



Lactose

In chocolate milk, the disaccharide sucrose, or table sugar, is added to give the chocolate milk an additional sweet taste. Sucrose is composed of one molecule of glucose bonded to a molecule of fructose.

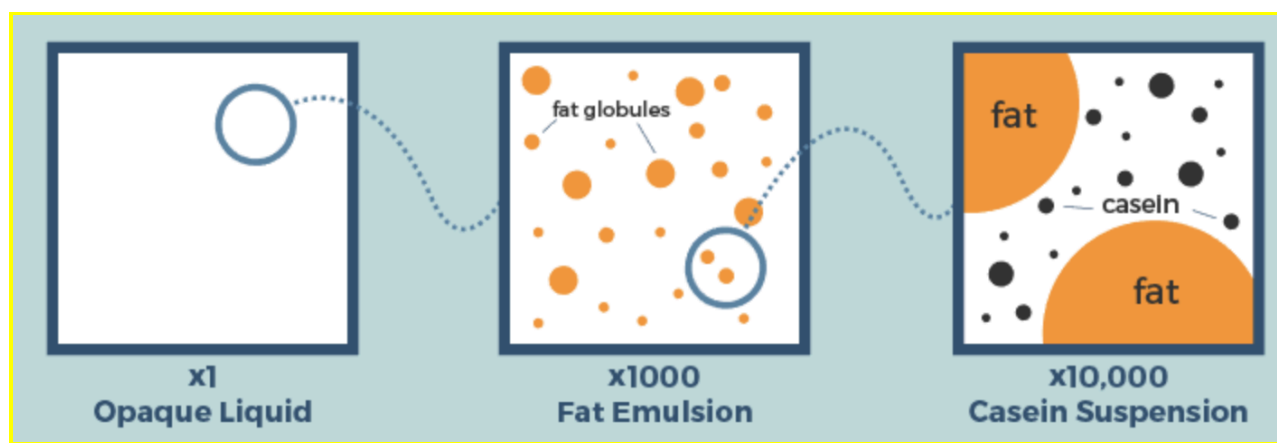


Sucrose

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<https://dairyprocessinghandbook.tetrapak.com/chapter/chemistry-milk>

Proteins

Casein is the main type of protein found in dairy milk and forms 80% of its protein. The remaining 20% of the protein in milk comes from a molecule called whey. Casein is a relatively simple protein molecule with a high number of proline amino acids, making it relatively slow to digest. Whey protein is rapidly digested and has a large number of leucine amino acids. Whey protein, especially lactalbumin, has very high nutritional value, and its amino acid composition is highly regarded as biologically optimal and is often used in the food industry.



Pikosky, M. (2016, July 6). *Whey vs. casein protein: Difference explained*. Whey vs. Casein Protein: Difference Explained | U.S. Dairy. <https://www.usdairy.com/news-articles/whats-the-difference-between-casein-and-whey>

The Chemistry of Milk. Dairy Processing Handbook. (2020, January 30).
<https://dairyprocessinghandbook.tetrapak.com/chapter/chemistry-milk>