

WHAT'S IN YOUR MILK?



No matter where you are, milk contains the same essential building blocks. The uses for milk and its components, though, go far beyond the products found in the dairy case.

by Hoard's Dairyman staff

MILK. It is known as nature's most nearly perfect food. But when is the last time you actually thought about what makes up this beverage we have on our tables nearly every day? Milk is mostly water (87.6 percent). The other components give milk its color, consistency, and flavor. Most components, though, serve additional purposes beyond this after they are separated from milk's water base.

Water — 87.6 percent of milk's volume

The amount of water in the udder is driven by the cow's lactose (milk sugar) production. The more lactose a cow produces, the more water will be present in the udder. Without water, milk would be too thick (of a yogurt consistency) to remove from the udder. Additionally, without the water provided by milk, newborn calves would dehydrate quickly after birth. While water is the vast majority of milk's volume (7.53 pounds of an 8.6-pound gallon), for producers, it is only valuable when milk is sold as Class I. For most other dairy products, the water is removed before processing.

Lactose — 4.8 percent of milk's volume

Lactose, or milk sugar, is made of glucose and galactose. Unlike fat and protein, the lactose content of milk is fairly consistent between the breeds. Lactose is used primarily as a fermentation base for lactic acid bacteria when producing cultured products, such as yogurt and cheese. Less prominent uses of lactose are in chocolate making (especially milk chocolate), infant formula, and feed for dairy animals. Additionally, lactose is used as low-cost filler in tablets and capsules by the pharmaceutical industry.

The lactose we export is isolated from whey by adding ethanol. Since lactose won't dissolve in ethanol, about 65 percent will be removed.

U.S. lactose exports in 2010 were 605 million pounds (up 25 percent from 2009). Major markets for lactose are Southeast Asia, China, and Japan. New markets are emerging in Oceania, Brazil, and Mexico. The U.S. exported 68 per-

cent of the lactose produced in 2010.

Butterfat — 3.7 percent of milk's volume

Butterfat, commonly known as milkfat, is a staple in the production of a variety of dairy products, including cheese, butter, and ice cream. It is less dense than other milk components, specifically water; therefore, it rises to the top and forms cream when allowed to separate. Butterfat is a major component of milk and cream; both products are labeled and sold according to the fat percentage they contain. The percent butterfat varies considerably by breed, with Holsteins on the low end averaging 3.7 percent. Jerseys, the breed with the highest fat percent, average 5.0 percent.

Casein — 2.4 percent of milk's volume

Casein is the principle protein in milk that gives its white color. Protein content, specifically casein, varies between breeds. Casein has a variety of nonfood uses. It is a primary ingredient in wood adhesives, paper coating, and labeling applications due to its gluing properties. Acidic casein has uses in waterproof paint, putties, paper filler, wooden toys, and aluminum foil. Rennet casein is used to produce a variety of plastics, such as buttons, knitting needles, and jewelry.

Casein is also used to enhance the functional properties (nutritional value) of food. It is used in bakery products, coffee creamer, ice cream, sports drinks, and, of course, cheese. In nondairy products, casein serves one of four purposes: to provide texture, act as a stabilizer, bind water, or emulsify fat (change the environment so that fat and water can mix together more easily).

Ash — 0.7 percent of milk's volume

Ash is an all-encompassing term for the vitamins and minerals milk contains. Milk contains both water soluble (B-complex and vitamin C) and fat soluble (A, D, E, and K) vitamins. These vitamins aid in oxygen transport, metabolism, and help the body use carbohydrates, proteins, and fats. The major minerals, potassium (K), calcium (Ca), and phosphorus (P), also have important roles, including enzyme function and bone development.

Whey protein — 0.6 percent of milk's volume

Whey protein is the protein contained in the liquid remaining after milk has been curdled and strained. Whey has a rich amino acid (the building blocks of protein) profile. It is a by-product of manufacturing cheese or casein. Often, whey protein is used as a nutritional supplement to foster muscle growth. It serves as a sports nutrition supplement for protein drinks and nutrition bars. More surprisingly, whey is in a variety of commercial products, including Cadbury Eggs and Oreos. Whey is also a component of infant formulas and dairy feed.

In 2010, the U.S. exported 997 million pounds of whey protein (29 percent increase over 2009). These exports accounted for 55 percent of the total whey protein production in that year. China and Southeast Asia drove whey protein imports, accounting for over half of total exports.

Milk's components have a variety of purposes, well beyond the roles it plays in traditional dairy foods.

Nonprotein nitrogen (NPN) — 0.2 percent of milk's volume

NPN, like water, is of little value for consumers and processors. The NPN portion of milk is composed of urea and other nitrogen-containing compounds, such as creatine, which help supply energy to muscle cells in the body. About 50 percent of the NPN in milk is urea. Variation in the NPN content of milk between cows is due to variation in urea content. Fluctuations in NPN between farms are a result of management and feeding; there is little NPN difference between the breeds. Nonprotein nitrogen has little nutritional value and does not contribute to cheese yield. Therefore, it does not have the same economic value as "true" milk protein. 

