

Many Milks

Around the world you'll find people drinking dairy milk from a variety of sources including camels, water buffalo and sheep. Gone are the days in American grocery stores when cow's milk was the only kind found. Today, American consumers can find a variety of milks including those from animals, nuts, beans and grains. They are located on general grocery shelves, in coolers and in the natural foods section.

Are all milks and non-dairy beverages nutritionally equal? Can they be interchanged in recipes with the same success? Why might one choose an alternate to cow's milk? We'll explore many dairy milks and non-dairy beverages in this publication.

Dairy milk, which comes from animals, is a good, natural source of many vitamins and minerals including calcium. In addition, it is often fortified with vitamins A and D. Non-dairy milks, or non-dairy beverages, may or may not be equal nutritionally to dairy milk. They may or may not be fortified with nutrients to make them nutritionally closer to dairy milk. However, non-dairy beverages are great for those with milk allergies, religious beliefs or lactose intolerance.

Dairy milk and non-dairy beverages may bear the USDA Organic Seal. This seal indicates the product has met strict guidelines. Research has not shown organic milk to be more nutritious than non-organic.(1)

Types of Dairy and Non-Dairy Products

Let's first look at some products found on the market today.

Cow's Milk comes in a variety of options from whole (no less than 3.25 percent milk fat), 2%, 1%, non-fat, buttermilk, flavored, dry and a variety of creams. It is a good source of high-quality protein and contains calcium. It is usually fortified with vitamins A and D.

Goat's Milk is a good source of high-quality protein that is higher in calcium, vitamin B6, potassium and niacin than cow's milk. It does not contain as much B12 or folate as cow's milk. The fat globules in goat's milk tend to be easier to digest because they are not as large as those found in cow's milk. However, those with lactose intolerance or milk allergy may or may not tolerate goat's milk any better than cow's milk. Goat's milk can be found in full and lower-fat varieties.(2)



Soy milk is made from ground soybeans and filtered water.(2) It may contain sweeteners and flavors. It is often fortified with vitamins and minerals to better compare to cow's milk.

Rice Milk is typically made from brown rice and filtered water. It may have some oil added. It also may be fortified with vitamins and minerals. It tends to be sweeter than cow's milk.(2)

Almond Milk is made from ground almonds and filtered water. It typically contains sweeteners and other ingredients. Some of the added ingredients improve the shelf-life. It may be fortified with vitamins and minerals.(2)

Coconut Milk is made with finely grated coconut meat that is steeped in hot water and then filtered. Regular coconut milk is higher in fat and calories than cow's milk. Note: cream of coconut is not the same as coconut milk.(2)



Hemp Milk is made from shelled hemp seeds and filtered water. Most contain some sweetener. It is usually fortified with vitamins and minerals. Hemp seeds used in milk making are not the variety of hemp from which marijuana is harvested. It tends to have a "grassy" flavor.(2,3)

Other Seed, Nut and Whole Grain Milks can be made with a variety of seeds, nuts and whole grains. There are many on American grocery shelves including oat and hazelnut milks. In other countries you may find potato milk.(2)

Raw Milk from cows, sheep, goats and other animals has not been pasteurized. It may contain bacteria and viruses that could cause illness in humans.(4) It is illegal in most states to sell raw milk for human consumption. Research has not shown a difference in nutrition between pasteurized and raw milk.(5)

Terms to Know

A variety of terms can be seen on a carton of milk or non-dairy beverage. Below is a brief explanation of some of the more common terms.

Homogenized means the fat globules of pasteurized dairy milk have been broken up so they stay distributed throughout the liquid and don't rise to the top.(6)

Pasteurized indicates the dairy milk has been heated to a specific temperature for a specific amount of time to kill harmful bacteria and organisms including those that cause typhoid fever, tuberculosis and diphtheria. Louis Pasteur developed the process in 1864.(7)

Lactose is the main carbohydrate or sugar found naturally in dairy milk. Lactose is broken down into glucose and galactose during digestion in the small intestine.(8)

Lactose Intolerance occurs in those individuals who lack enough of the enzyme lactase. Lactase breaks down lactose into smaller, more easily digested sugars. Those with intolerance to lactose may experience symptoms in as little as 15 minutes after consuming foods containing it. However, individuals vary and those with lactose intolerance may be able to eat milk products that contain small amounts of the milk sugar.(8)

Milk Allergy is an allergic reaction to the protein components of dairy milk. Those with a milk allergy must avoid all dairy milk and products containing it.(8)

Casein is a mixture of proteins in dairy milk that is white, tasteless and odorless. It is very nutritious. It can be separated from other dairy milk components with rennin and is the basis for cheese.(9)

Whey is the watery part of dairy milk that forms along with curd when milk coagulates. It is a mixture of lactose, water, minerals, vitamins, some protein and a little fat.(10)

Fortified indicates vitamins and minerals have been added to the milk or non-dairy beverage beyond what would normally be found in the product. Dairy milk and many non-dairy beverages are fortified with vitamins A and D.(5)

Grade A is a dairy milk rating indicating the milk has been produced, stored, handled, processed and transported in a manner conform to strict milk law standards for quality and sanitation.(5) Grade B dairy milk is often used in cheese making.(11)

UHT (Ultra-High Temperature) is a type of pasteurization where raw dairy milk is heated from 280°F to 302°F for at least 2 seconds, followed by rapid cooling to 40°F. This pasteurization process provides for a much longer shelf-life in the refrigerator.(12)

Shelf Stable indicates the item can be safely stored at room temperature or ‘on the shelf.’ These products do not need to be refrigerated until after they are opened.(13) Shelf stable milk and non-dairy beverages are often sold in aseptic packaging.

Aseptic Packaging indicates “the food or beverage is sterilized by quick exposure to ultra-high heat, rapidly cooled to an ambient temperature and filled into sterilized containers that are then sealed in a commercially sterile environment. The aseptic packed is not processed further.”(14)

The Fat Content

Table 1 shows the percent of calories from fat, saturated fat and cholesterol in several dairy and non-dairy beverages. The 2010 Dietary Guidelines for Americans recommend we get no more than 7 to 10 percent of our total calories from saturated fat and consume less than 300 mg of cholesterol each day.(15) For improved overall health one should choose products that are lower in fat, saturated fat, and cholesterol.

Table 1 - Fat, Saturated Fat and Cholesterol in Selected Milk or Non-Dairy Beverages(16, 17)

MILK VARIETY (1 cup)	PERCENT of CALORIES FROM TOTAL FAT	PERCENT of CALORIES FROM SATURATED FAT	MILLIGRAMS of CHOLESTEROL
Whole (3.25% milk fat) (cow's)	48	28	24
2% Milk (cow's)	36	23	20
1% Milk (cow's)	21	14	12
Skim (Low-fat) Milk (cow's)	2	1	5
Whole (goat)	54	35	27
Soy (regular)	44	6	0
Soy (light)	13	0	0
Coconut	97	87	0
Almond	67	0	0
Rice	16	0	0
Hemp	22	3	0

Different brands may have slightly different amounts of fat, saturated fat, and cholesterol. The Nutrition Facts panel on the label of the product provides accurate information for the specific brand.

Figuring the Amount of Fat

There are approximately nine calories in one gram of fat. To calculate the percentage of total calories from total fat, multiply the grams of total fat by 9 and divide that number by the number of calories per serving. Multiply the answer by 100. The result is the percent of calories from fat.

$\begin{aligned} &(\text{grams of total fat per serving in product} \times 9) \\ &\div \text{number of calories per serving} \times 100 \\ &= \text{percent of calories from fat} \end{aligned}$
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You can also take the Calories from Fat and divide it by Calories, as listed on the Nutrition Facts panel, and multiply the answer by 100 to get the same result. Remember, some figures on food labels have been rounded to the nearest whole or legal number.

How Much Calcium?

We often consume dairy milk and milk products because they are good sources of calcium. Recommendations for daily calcium intake for different ages and stages of life are found in Table 2. The amount of calcium in some dairy milk and non-dairy beverages is provided in Table 3. Calcium, along with other nutrients, helps build strong bones and teeth and helps our hearts beat.

Table 2 – Recommended Dietary Allowance (RDA) for Calcium(18)

Age	Amount
1-3 years	700 mg
4-8 years	1,000 mg
9-18 years	1,300 mg
19-70 years	1,000 mg
71+ years	1,200 mg

Table 3 – Calcium Content in Selected Dairy Milk or Non-Dairy Beverage(16)

MILK VARIETY 1 cup	AMOUNT (mg)
Whole (3.25% milk fat) (cow)	276
2% Milk (cow)	293
1% Milk (cow)	305
Skim Milk (cow)	299
Whole (goat)	327
Soy (regular)	301
Soy (light)	199
Coconut	41
Almond	200
Rice	293
Hemp	428

Source of Important Nutrients

Dairy milk is a good source of several nutrients our bodies need. How our bodies use these nutrients are outlined below. When choosing a non-dairy beverage it is best to look for one that compares nutritionally to dairy milk. Check the non-dairy beverage label for the word fortified. The other place for information to compare is the Nutrition Facts panel.

Calcium is a mineral needed for our heart, muscles and nerves to function properly. It also is needed for blood to clot.(19)

Protein is made of amino acids that are used in all parts of the body to build and repair tissue.(8)

Phosphorus is a mineral that is a major part of bones and teeth, helps every cell in the body generate energy and is part of DNA and RNA. Almost all foods have some phosphorus. Protein-rich foods like dairy milk contain the most.(8)

Potassium is a mineral that helps maintain normal blood pressure, make muscles contract and transmit nerve impulses.(8)

Vitamin D helps the body absorb calcium.(20) The amount of vitamin D added to dairy milk is government regulated at a minimum of 400 IU (international units) per quart. Therefore, any fortified dairy milk will have about the same amount of vitamin D. Fortified non-dairy beverages are usually brought to a level similar to their dairy equivalents. Non-dairy milk is fortified with a plant-based source of vitamin D known as D2. Dairy milk is usually fortified with D3, an animal-based source of vitamin D.(21)

Vitamin B12 (cobalamin) helps your body use fatty acids and some amino acids. It is a vital part of every cell in the body. It works with folate to make red blood cells. It is found in dairy milk and other animal products. Some foods may be fortified with vitamin B12.(8)

Riboflavin (vitamin B2) helps produce energy in all cells of the body.(8) It is destroyed by ultraviolet light, one reason for milk being packaged in cardboard or opaque containers.

Milk for Babies, Infants and Children

In 2008 the American Association of Pediatrics revised their recommendation for whole milk after weaning. For children without a family history or risk of obesity, heart disease or high cholesterol, whole milk is fine from 12 months to 2 years of age. For those between 12 months and 2 years of age with a family history of obesity, heart disease or high cholesterol the recommendation is to consume reduced-fat or 2% milk.(22)

Cow's milk is not recommended for children under the age of 12 months because the high protein content is difficult for infants to digest. Other nutrients in cow's milk also make it unsuitable for infants. The Academy of Nutrition and Dietetics recommends parents consult with their healthcare provider around the child's first birthday to determine the appropriate time to switch from formula to cow's milk.(23)

Substituting Dairy Milks and Non-Dairy Beverages

We use dairy milk for many things. We drink it, pour it over cereals, use it in soups, make custards and puddings and add it to many kinds of recipes. Dairy milk serves many purposes in recipes. In baked goods it enhances crust color, delays staling, adds to the softness of the crust, provides flavor and richness, gives yeast breads a finer crumb and allows custards to firm up properly.(24) We use dairy milk in hot dishes and soups for flavor, creaminess and enhanced nutrition. Because it is generally neutral in flavor, dairy milk can be used in both savory and sweet recipes.

Non-dairy beverages may or may not perform the same way in all recipes. In hot foods, some non-dairy beverages may curdle faster than dairy milk depending on the additives in them.(25) Some of the qualities dairy milk brings to baked goods may or may not be provided by a non-dairy beverage.

Generally, one kind of milk or non-dairy beverage may be substituted 1:1, or cup for cup, in any recipe that calls for cow's milk. Depending on the liquid used as a substitute, you may have to decrease the sugar, add a little healthy oil or alter the leavening agent.(2)

When choosing a substitute, consider the flavor profile of the product you want to use. Will the flavor affect the finished product? Some products do not get their primary flavor from milk, so you may not notice any difference. Also, think about the role the milk product plays in the final

product. Will the color make a difference? Does the recipe rely on qualities of dairy milk like protein or sugars to produce a desirable end product?

Consider the nutritional profile of the dairy milk or milk alternative. Some alternatives are higher in sugar or fat than regular milk. Others do not provide a good source of calcium or other nutrients for which we usually look to dairy milk.

Some non-dairy beverages have added sweeteners. These additives may make the product unsuitable for savory dishes. When used in sweet dishes you may have to decrease the amount of sugar in the recipe.

Considerations for Dairy Milk or Non-Dairy Milk Choices

Cost is a consideration as many non-dairy milk options are expensive. Some may cost \$12 or more per gallon. In addition, goat's milk tends to be more expensive than cow's milk. It may cost \$15 or more per gallon.

Health Issues are a consideration since non-dairy milk options are great for those with milk allergy or lactose intolerance. Some non-dairy milk options may be good for those looking to decrease their overall fat or saturated fat intake. In addition, some non-dairy milk options contain plant-based phytochemicals which are currently being studied for their overall positive effect on health.

Fat content is often a concern since milk from animals naturally contains saturated fat and cholesterol. When choosing dairy milk, it is best to choose milk with the lowest fat content possible for overall heart and general health. Cholesterol is found only in animal products.

Flavor is a consideration since the flavor profile of dairy milk or milk alternate should help achieve your goal. Each brand of milk will most likely have a slightly different flavor profile. You may have to try a variety of brands before finding one you like. Flavors in dairy milk are affected by the time of year, the animal food and other factors. Non-dairy milk flavors vary widely by brand and processing methods.

General Tips

We have focused on dairy milk and non-dairy beverages in this publication. We all make many choices about our foods every day. In addition, new products are often introduced to the marketplace. Today we have many options for dairy and non-dairy beverages. Our choices for dairy milk and non-dairy beverages can be based on many pieces of information. Each of us has to decide what is most important for our situations. With our own situations in mind the following are some reminders, tips and pointers to consider when selecting dairy or non-dairy beverages.

- Milks from most sources when consumed as beverages are best when cold. Aseptic or shelf-stable boxes can be refrigerated before opening. They **must** be refrigerated after

opening. Most milk and non-dairy beverages in shelf-stable packages will be good for 5 to 7 days after they are opened.(2)

- Shake non-dairy varieties well before use. Some components of non-dairy beverages settle to the bottom over time.
- Compare the Nutrition Facts panels. Choose the product with the nutrition profile you want. For overall health, when possible, choose the products with less saturated fat and cholesterol.
- Compare calcium content. Many people consume dairy products for the calcium. Not all non-dairy options have been fortified.
- Compare vitamin D content if possible. Vitamin D is used by our bodies to help store calcium. Most, but not all, dairy and non-dairy beverages are fortified to provide at least 25 percent of the daily value needed by the average American.
- Try different flavors of milk from the same company.
- Consider “light” options. You’ll save calories without sacrificing nutrition.
- Consider the price.
- Look at the package size. Choose the size of product you will use without wasting. Or, if you wish to buy a larger package, consider if the contents can be safely frozen for later use.
- Milk should be stored in the coldest part of the refrigerator — in the back on the lowest shelf. This practice will help extend the shelf life. Milk should not be stored in the door of the refrigerator where it is warmer.(26)
- Dairy milk may be frozen. However, once thawed, you may want to use it only for cooking as its texture may change slightly. Shaking or stirring will help to restore it to its more natural texture. It is best to freeze milk in the portions you think you will ultimately use. Divide it into freezer safe containers; leave room for expansion; label and date; and place in the freezer. For small portions you can pour milk into ice cube trays, freeze it, then pop out the cubes and store the cubes in a freezer safe bag or container. Plan to use the frozen milk within a month for best quality.(27) Most non-dairy beverage manufacturers do not recommend freezing their products. Freezing does not affect the nutrition or safety of the product but it will change the texture.(28,29)

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