

Lesson 6: Dairy Products

Along with beef, pork, lamb, and poultry, dairy products are a major agricultural food commodity in the United States. Raw milk is inspected and processed into fluid milk and other dairy products, such as yogurt, ice cream, and various types of cheeses.

Milk Grades and Products

Raw milk can be one of two grades: grade A milk or manufacturing-grade milk. Grade A milk is for drinking and is called fluid milk. Other dairy foods may be made from grade A milk. Grade A milk comes from grade A dairies that are required to meet more strict sanitation standards than manufacturing grade dairies. All milk is tested periodically for bacteria count, somatic cell count, and antibiotics. Somatic cells are mostly white blood cells that the cow produces to fight infections. When the somatic cell count of milk is elevated, the cow is experiencing health problems in one or more of the four mammary glands. Grade A milk commands a higher price paid to producers than does manufacturing grade milk.

Manufacturing grade milk may be used only for manufactured dairy products, such as butter, dry milk products, cheeses (except cottage in some markets), and frozen desserts (in most markets).

Milk Processing

Fluid milk is collected from the farm in a large insulated stainless steel “bulk” tank on a truck and is taken directly to a processing plant. At the processing plant, the milk is pasteurized and homogenized. Vitamin D must be added to all fluid milk, while vitamin A must be added to milk containing less than 3.25% milk fat, the legal minimum for any product that is labeled “milk.” Below this limit, descriptors must be placed in front of the word milk. For example, milk containing 2% milk fat is called “reduced fat milk.” Milk that provides less than 3 grams of fat per 8-ounce serving is known as “lowfat milk,” and when 8 ounces contain less than 0.5 grams of fat, it is called “nonfat milk” or “skim milk.”

Pasteurization involves heating milk above 161°F for over 15 seconds to kill bacteria and other disease-causing microorganisms.

Homogenization prevents the milk from separating into cream and skim milk during storage. The hot milk is pumped through a fine orifice (opening) under high pressure. This breaks down the milk fat globules, so they will be too small to separate from the skim milk.

Milk Defects Resulting in Off Flavors

Milk is naturally a slightly sweet, rather bland-tasting liquid; however, various factors sometimes create off flavors in milk. Off flavors resulting from milk defects are a major consumer concern. These off flavors, if not detected before reaching the consumer, lower the consumer appeal for milk and milk products. Some milk defects that result in off flavors of milk can make the milk unsaleable. Off flavors can be associated with the following.

Bitter - Bitterness usually results from the spoilage of milk by bacteria that grow at refrigerator temperatures. These psychrotrophic bacteria degrade milk proteins causing bitterness. A bitter taste makes the milk unsaleable.

Feed - One of the most common milk defects occurs when the feed flavor passes through the cow's bloodstream to the mammary glands, producing an off flavor in milk. Offending feeds and plants include silage, ryegrass, ragweed, and wild onions. These will cause the milk to taste similar to the smell of the feed the cow has consumed. Off flavor caused by feed does not affect the milk's saleability, but it reduces the flavor appeal.

Flat/watery - A flat or watery taste results when milk is diluted with water or when milk is very low in fat content. It does not affect the milk's saleability, but it reduces the flavor appeal and it is illegal to add water to milk.

Foreign - A foreign taste is present in milk that has come in contact with cleaners or sanitizers in inadequately drained equipment. This makes the milk unsaleable.

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Malty - A malty taste results from milk that has been spoiled by an unusual type of bacteria. Infrequently, bromegrass pastures produce malty flavored milk. A malty taste will probably result in the milk being unsaleable depending on the cause of the malty flavor.

Oxidized - This “wet cardboard” or “metallic” taste results from milk being exposed to sunlight, copper, or iron. Milk that has been oxidized is usually not saleable.

Rancid - Rancid is also known as lipolyzed. A rancid flavor results from milk that has been allowed to become too warm and was not properly stored and/or cooled. Churning milk fat removes the protective fat globule membrane, allowing milk’s natural lipase to split the fatty acids from the glycerol “backbone” of the milk fat. Rancid milk has a foul odor and taste resembling the smell of sweaty socks or blue cheese. Rancid milk is not saleable.

Salty - Salty milk originates from cows with mastitis, which is an infection in the mammary system. With today’s production practices, there are very few incidences of mastitis. Salty milk is saleable because the pasteurization process kills the bacteria that are present in the mastitis. However, the flavor may not be desired among consumers.

Sour - This acidic flavor is caused by the production of lactic acid by bacterial fermentation of milk’s sugar, lactose. Sour milk is almost always caused by leaving the milk out at too high a temperature. Sour milk is not saleable.

Cheese Identification

Approximately 400 varieties of cheese are available for consumption. Cheeses differ in appearance, color, flavor, and texture. Most are made from cow’s milk. When a cheese is typically made from milk of another species, it is noted in the discussion.

Blue - Blue cheese is a semisoft, mold-ripened cheese. It has a white interior with strips of blue *Penicillium* mold running through the cheese. Blue cheese exhibits a peppery taste and a pungent aroma. In France this general class of cheeses is known as *Fromage Bleu*.

Many countries have their own name(s) for blue cheeses, for example *Gorgonzola* in Italy and *Stilton* in Great Britain. *Roquefort* cheese looks like blue cheese but is made from ewe’s milk in a specific region of France.

Brick - Brick cheese is semisoft, mild to medium-strong in flavor, smooth and waxy in texture, yellow in color, and has small openings throughout. Traditionally, Brick cheese is surface-ripened, but some markets require a delicate flavor that is achieved without the surface microflora.

Brie/Camembert - Brie/Camembert cheese is a very soft cheese variety with a thin crust that contains microorganisms that aid in ripening the cheese. It has a mild to pungent flavor.

Cheddar - Cheddar cheese is the most popular cheese in the United States. The intensity of the yellow color depends on how much coloring is added. Mild Cheddar is aged for a shorter period of time than medium and sharp Cheddar. Cheddar cheese has a nut-like flavor and has a firm but smooth texture. Openings that may exist in it are irregular in shape, unless undesirable bacteria produce gas that forms round holes or until undesirable yeasts form slits.

Colby - Colby is a yellow cheese that is softer than Cheddar and has many small irregular openings. Because it is aged only 1 to 3 months, it has a mild and slightly sour flavor.

Cottage - Unripened curd is made from skim milk. Cream, salt, and stabilizer are added to make the creamed form of this soft product, which contains 4% milk fat and 20% total solids. It is also made in reduced fat, lowfat, and nonfat varieties. The curds are cut into cubes that range in size from 0.2 to 0.5 inches.

Cream - Soft, white, buttery, smooth, spreadable cheese made by concentrating acidified cream. It is served fresh without ripening. The flavor is nut-like and slightly sour.

Gouda/Edam - Gouda and Edam cheeses originated in Holland. They are similar to Cheddar in taste. Gouda and Edam are less sour because they are made with a

high concentration of the coagulating enzyme, rennin or chymosin. These cheeses are traditionally covered with wax coatings and are formed in ball or wheel shapes. Gouda and Edam contain round openings throughout, which are caused by gas from friendly ripening bacteria that produce a nutty flavor.

Monterey Jack - This white to light yellow (no color added) cheese has many small holes. It is similar to Colby but softer.

Mozzarella - This white, very stringy, or plastic, cheese is used primarily on pizzas. After curd is produced similar to Cheddar cheese, the pressed curd is submerged in hot water and stretched. This removes much of the acid and causes the proteins to form polymers that provide the stretchy consistency of the melted cheese. This also makes the flavor somewhat bland. Salt is added by soaking the formed loaves of curd in cold salt brine.

Munster (Muenster) - This semi-soft, yellow to white cheese originated in Germany. It is similar to brick cheese but has less of a surface layer of microorganisms and undergoes less ripening. It contains numerous small irregularly shaped openings and has a mild to mellow butternut flavor.

Pasteurized Process American - This is a yellow to white group of cheeses that can be made from several varieties of natural cheese including Cheddar, Colby, stirred curd, and washed curd. Both fresh, or green, curds and ripened cheeses are shredded and ground together and melted in a cooker. To this mixture emulsifier salts are added and mixed. The hot molten cheese is pressed onto cooling belts to make slices or into wrappers to make loaves. The process adds some cooked flavor; the emulsifier salts provide saltiness, and the cheeses provide characteristic flavors blended to maintain consistency from batch to batch. The cheese is usually free of holes provided air bubbles are eliminated, and it stores exceptionally well because enzymes and bacteria are inactivated by the process.

Provolone - This yellow to white colored, hard Italian cheese typically is highly aromatic, has a spicy flavor, and may have a smokey and/or salty taste. Being of the Pasta Filata (plastic curd) family, it has been stretched

under hot water and has a stringy consistency similar to mozzarella cheese when warmed. Typically, provolone cheeses are formed into pear shapes and encased with twine or rope.

Swiss - Swiss cheese is hard, yellow to white in color, and filled with large openings (gas holes) produced by the ripening bacteria that impart the sweet, nut-like flavor.

Summary

Milk is graded differently from other raw animal products. Whereas, each egg, broiler, pig, and steer is examined for quality and safety, milk is graded based on inspections of farms and processing facilities and by periodic testing of milk. All fluid milk comes from grade A dairies. Milk is pasteurized and homogenized, and vitamins are added at the dairy plant. Dairy producers and processors must be careful not to contaminate milk with foreign material or to allow off flavors to develop. Various cheeses can be identified by using taste, sight, and smell.

Credits

Martin, Phillip. *Food Science and Technology*. University of Missouri-Columbia: Instructional Materials

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