IV. KINDS OF CHEESE AND CHEESE PRODUCTS

Discussed below is the manufacture of typical varieties of natural, process, and other cheeses by distinctive processing steps (Table 26). For more information on the manufacture of specific cheeses and cheese products, refer to Kosikowski and Mistry.

NATURAL CHEESES

Curd Particles Matted Together

■ Cheddar Cheese

Cheddar cheese makes up the largest share of American-type cheeses produced in the United States. The distinctive processing step is the matting or cheddaring of the curd particles into a cohesive state.

The manufacture of Cheddar cheese is illustrated in Figure 3. Raw milk is standardized to a casein-fat ratio of 0.7, pasteurized, and transferred to a cheese vat at 88°F. A small amount of harmless artificial coloring matter, such as annatto, may be added to the milk to standardize the cheese to a desired color. A 1% starter culture of lactic acid-producing bacteria (e.g., lactic acid streptococci) is then mixed with milk. When the milk has reached the proper acidity (0.05 to 0.1%), rennet (a coagulating enzyme) is added. Curd is formed in about 30 minutes, after which it is cut by special knives into .25- to .75-inch cubes. The cubes of curd are then cooked in the whey at a temperature of 98° to 102°F and generally stirred with mechanical agitators to allow effective removal of the whey. After the whey is removed, the warm curds mat together into a cohesive mass, which is then sliced into slabs. The slabs are turned regularly, stacked and restacked for about 2 hours, a technique called cheddaring. After cheddaring, the curd is milled to form small-sized cheese curds, salted, and pressed into blocks or barrels. The blocks are then packaged and ripened for about 3 months to a year. The longer the ripening period, the sharper the flavor. Retail portions of bulk, sliced, and shredded cheese are packaged in moisture-proof wrapping materials to protect against moisture loss and prevent or limit mold growth.

Curd Particles Kept Separate

■ Colby Cheese

The manufacture of Colby cheese is similar to that of Cheddar up to the point of draining off the whey. The curds of Colby cheese receive no cheddaring or milling. Instead, the curds are kept separate. After most of the whey has drained from the curd, cool water is added to reduce the curd temperature to 85°F. The curd is stirred for about 15 minutes to prevent it from matting. It is then drained, salted, weighed into forms called hoops, pressed, and ripened for 1 to 3 months. Colby cheese has a softer body (higher moisture content), lower salt content, and more open texture than Cheddar cheese but has a mild flavor resembling young Cheddar cheese.

Bacteria-Ripened Throughout Interior With Eye Formation

■ Swiss Cheese

Swiss cheese is characterized by the holes or eyes that develop during early stages of ripening. This cheese is one of the more difficult types of cheese to manufacture, involving several complicated procedures. Both rind and rindless Swiss cheeses are made; although today, most of the Swiss cheese made in the U.S. is rindless. The principles involved in making both types of Swiss cheese are essentially the same.

For either style of cheese, good quality milk is generally clarified to improve eye formation. The milk is ripened at 88° to 94°F by a starter culture consisting primarily of *Streptococcus thermophilus*, with small amounts of *Lactobacillus bulgaricus* and *Lactobacillus helveticus*. These heat-tolerant species of bacteria grow well at the relatively high temperature of 125° to 129°F used in cooking the curd. The addition of a culture of *Propionibacterium shermanii* is largely responsible for the characteristic eye formation and sweet flavor of Swiss cheese. When the desired acidity has been reached, a coagulating enzyme is added.

The curd is cut and recut until the particles are about 0.625 inch in diameter. The mixture of curd and whey is then cooked with constant stirring for about an hour at 125° to 129°F until the curd becomes firm. This is a stirred type of cheese with no matting. In the traditional method, after the curds are cooked, they are dipped out in one bag and transferred to a single round form.

Rindless Swiss cheese in blocks is an American innovation. The milk is set, and the curd cut and cooked as described above for traditional Swiss cheese. In rindless Swiss cheese, the curd and whey

are pumped into a forming tank, where the curd settles and pressure is applied with press plates before the whey is removed. After the whey is drained off, the curd is pressed overnight, then cut into blocks of the desired size (usually 80 to 100 pounds). The blocks of cheese are salted in brine similar to traditional wheels of Swiss cheese, usually from 1 to 3 days. The surface of the cheese is dried at 50° to 55°F for 5 to 10 days.

The cheese is then wrapped in plastic film and placed in a box under pressure in a cold room (50° to 55°F) for 6 to 10 days to prepare the cheese for eye formation. Thereafter, it is transferred to a warm room maintained at 70° to 76°F, the optimum growth temperature for *Propionibacterium shermanii*. During this principal ripening period, propionic acid fermentation occurs. *Proprionibacterium shermanii* and related organisms convert lactic acid and lactates to propionic and acetic acids and carbon dioxide. The propionic acid contributes to the characteristic sweet flavor and the carbon dioxide collects to form holes of eyes. The development of eyes is completed in 3 to 4 weeks. The cheese is then returned to a cold (35° to 40°F) curing room for 3 to 9 months or longer for slower ripening and more flavor development. Most of the Swiss cheese manufactured in the United States is marketed after ripening for 3 to 4 months.

■ Edam and Gouda Cheeses

The processing of Edam and Gouda cheeses, two cheeses with small shiny holes or eyes, is basically the same with minor exceptions. These cheeses differ from one another mainly in shape, size, and surface coloring. Gouda generally contains more fat and is softer in texture than Edam. The manufacture of these cheeses resembles that of Cheddar cheese. However, the curd develops little acidity, and it is neither cheddared nor generally salted at this point. After the curds are cooked and often washed, they may be matted under warm whey. Following drainage, the low acid curds are dipped into special pressing molds. Thereafter, the cheese is salted in a brine solution or dry-salted, shelf-cured for 2 months or longer at a warm temperature, and finally surface treated (colored, waxed, and rubbed).

Prolonged Curing Period

■ Parmesan Cheese

Parmesan (Parmigiano Reggiano) is the most widely known variety of grana (which means hard grating) cheese, the most important cooking cheese in northern Italy. This salty, sharp-flavored, grating cheese is also manufactured in the United States.

A mixture of whole and nonfat milk, usually pasteurized, is warmed to 95°F and a bacterial starter is added. After ripening for 5 to 10 minutes, a coagulating enzyme is added. The resulting curd particles are cut into pieces no larger than wheat kernels and cooked, with stirring, for about 45 minutes at a relatively high temperature of 115° to 125°F. The curd is allowed to settle and drain, and is placed in circular cloth-lined hoops and pressed. The pressed curd is removed, salted in brine for 14 to 15 days, and then dried 8 to 10 days. During cooling, which takes from 10 to 24 months in a cool (50°F), ventilated room, the cheese is frequently turned. The rind may be treated with a mixture of dark earth dye and olive or other vegetable oil.

■ Romano Cheese

Romano cheese, an Italian, sharply piquant, grating cheese resembling Parmesan and other grana cheeses, is manufactured in a similar manner to that described for Parmesan. Some Romano cheese is made in the United States from cow's milk but most of it is imported into this country. It is cured for 5 to 12 months or longer.

Pasta Filata (Stretched Curd)

■ Provolone Cheese

Provolone, an Italian cheese, is representative of the pasta filata or stretched curd cheeses. In these stringy-textured cheeses, the curd is cooked to a relatively high temperature and is pulled and molded while hot into various shapes. The name provolone is derived from the Neapolitan word "prova," meaning ball-shaped.

In the United States, provolone, except for the addition of special flavor-producing enzymes, is manufactured similarly to Cheddar up to the time of matting the curd. At this point, the curd for provolone is cut into slabs that are worked and stretched in hot (180°F) water or whey. The hot curd is kneaded and stretched either by hand or machine until it becomes shiny, smooth, and elastic. The curd is molded into various shapes, such as pear, melon, cylinder, sausage, or ball. The shaped curd is then chilled in cold (50°F) water to harden, and salted for several days in cool brine. After brining, the cheese is packaged, cured for a

few months, and usually smoked. Before selling, the cheese may be covered with wax or plastic film.

Mozzarella Cheese

Mozzarella cheese is a soft, pasta filata cheese made in a way resembling provolone. In the United States, milk (whole, lowfat, nonfat) is usually pasteurized, and set by warming to 95°F and adding lactic acid-producing bacterial starters and a coagulating enzyme. The curd is separated from the whey, and when a critical acidity has been reached, the mozzarella curd is immersed in hot water (170° to 180°F), or heated with steam, and kneaded and stretched until smooth. Thereafter, the cheese is molded into proper forms, immersed in cold water to harden, and sometimes salted in brine. The cheese has little or no curing and may be used immediately after processing. Available forms of mozzarella cheese include part-skim mozzarella, low-moisture mozzarella, and low-moisture, part-skim mozzarella. String cheese derived from mozzarella is also popular.

Mold-Ripened Throughout Interior

Blue Cheese

This cheese is characterized by visible blue-green veins of mold throughout the interior and by a sharp, piquant flavor. There are several blue-veined varieties of cheese known by various names. However, they differ appreciably only when the milk source varies. Cheeses in this family include Roquefort, which is made only in the Roquefort area of France from sheep's milk, and its cow's milk counterpart, known as bleu cheese in other areas of France, blue in the United States, Stilton in England, and Gorgonzola in Italy.

In the preparation of blue cheese, whole milk, usually homogenized, may be inoculated with mold spores of *Penicillium roqueforti* or a similar mold that will result in blue-green mottling of the cheese. Alternatively, the mold spores may be added to the fresh curd. The advantage of adding the mold to the milk is a more uniform distribution, although part of the mold is lost in the whey. Homogenization of the milk increases the surface area of the fat globules, thus accelerating the hydrolysis of the milk fat by mold enzymes during the ripening of the cheese. The mold *Penicillium roqueforti* produces a water-soluble enzyme that hydrolyzes the milk fat, liberating free fatty acids. The mold spores then convert the fatty acids to ketones, which are largely responsible for the flavor of the finished cheese.

A lactic acid starter culture initiates the ripening, after which coagulating enzymes are added to the heated (84° to 90°F) milk. The curd is cut as in Cheddar cheese (curd size is larger), drained, and placed in perforated metal hoops. Following an overnight drainage, the cheese is dusted with a calculated amount of salt at intervals over a 7-day period or salted in brine. The cheese is then punctured with slender needles to permit air to enter and carbon dioxide to escape, thus favoring the growth of the desired mold throughout the cheese. Curing takes place in a well-ventilated room maintained at a low temperature of 48° to 50°F and a high humidity (90 to 95%). The cheese may be scraped at intervals to remove surface growth of undesirable microorganisms. After satisfactory mold development (3 to 4 weeks), the cheese is again scraped, and wrapped in foil and stored at a temperature of 40°F or lower. If a pronounced flavor is desired, the cheese is aged for 9 months or longer. However, the usual ripening period is 3 to 4 months.

Surface-Ripened Principally by Bacteria and Yeasts

Limburger Cheese

In the United States, Limburger cheese is made from whole milk, preferably pasteurized. The milk, held at 90°F, is coagulated with a starter culture and a coagulating enzyme to form a jelly-like curd. After being cut into cubes, the curd is stirred and slowly heated in whey at 94°F. When sufficiently firm (in about 45 minutes), the curd is dipped into rectangular forms, which are turned several times over 10 to 20 hours to allow drainage. The cheese is then cut into half-pound, one-pound, or two-pound bricks. These are dry-salted and transferred to a ripening room maintained at 66° to 70°F and a uniform, high relative humidity of 90 to 95%.

In the ripening room, a culture of aerobic salt-tolerant yeasts and a culture of *Bacterium linens* are exposed to the surface of the cheese. Within a few days, the yeasts establish conditions favorable for the growth of bacteria on the surface of the cheese. *Bacterium linens* produces a brownish-red surface growth and is essential for the development of Limburger's characteristic strong flavor and aroma

and soft, waxy body. After 2 to 3 weeks of ripening, the cheese is wrapped in parchment, waxed paper, and foil and stored at 50°F for 1 to 2 months. When fully ripe, Limburger cheese must be marketed immediately, as it becomes over-ripe rapidly, which results in a strong flavor.

Surface-Ripened Principally by Mold

Camembert Cheese

In the manufacture of Camembert, a mold surface-ripened cheese, whole pasteurized milk is warmed to 84° to 92°F and ripened with lactic acid starter. The high acidity of the milk assists in whey drainage and suppresses the growth of undesirable organisms. Enough coagulating enzyme is added to make a firm curd in 1 hour or longer. The resulting curd is carefully dipped almost immediately into small, perforated forms and allowed to drain, with frequent turning for 1 or 2 days. The cheese is then removed and salted, and may be inoculated with a culture of mold and bacteria.

The curing of Camembert cheese is difficult. Not only must there be a uniform and progressive development of certain ripening agents, but the curd must dry out gradually. Curing rooms must be maintained at about 55°F and a relative humidity of 90%. The creamy, semi-liquid interior consistency characteristic of Camembert is largely due to the activity of *Penicillium camemberti*. This mold may be mixed with the milk, sprinkled on the curd, or rubbed on the cheese along with the salt.

After 2 weeks, the primary surface of mold growth forms a thin, gray-white, felt-like rind but does not penetrate the cheese. However, enzymes produced by the mold diffuse into the interior and act upon the protein of the cheese, causing a gradual softening of the curd. At this stage, the chemical changes responsible for Camembert's flavor occur. The cheese is then wrapped in parchment and foil, and boxed. After 4 to 5 weeks, the cheese reaches its prime condition, at which point it should be consumed. A pronounced ammonia aroma indicates that Camembert is overripe.

Brie Cheese

Brie, a cheese surface-ripened by mold, bacteria, and probably yeasts, is similar to Camembert cheese. Differences exist, however, in the manufacturing details, the internal ripening, and the characteristic flavor and aroma.

The manufacture of Brie cheese is complicated and exacting. Milk is set by warming to 90°F and adding enough coagulating enzyme to initiate curd development in 2 to 3 hours. The curd is then dipped into small forms and hoops and allowed to drain for about 24 hours. The hoops are removed, and the cheese is turned and dry-salted. Initial ripening for about 8 days occurs in a well-ventilated drying room maintained at 55° to 60°F. During this time, the curd softens rapidly and becomes slightly yellow and translucent, and a felt-like layer of white mold appears on the surface. The cheese is then moved to a dark, moist room or cellar maintained at 52°F and a relative humidity of 85% for 2 to 4 weeks. The initial white mold layer is eventually covered by a secondary growth of yellow mold that subsequently is overgrown with red bacteria. The cheese becomes less acidic and the curd is yellow and creamy. The surface growth of the white *Penicillium camemberti* and the reddish *Brevibacterium linens* during ripening is responsible for the characteristic flavor of Brie. Like Camembert, Brie ripens rapidly, is perishable, and must be consumed soon after ripening.

Curd Coagulated Primarily by Acid

Cottage Cheese

Cottage cheese dry curd is a lactic acid-precipitated type of cheese not subjected to prolonged ripening. Fresh pasteurized nonfat milk, concentrated nonfat milk, or reconstituted nonfat dry milk may be used. Coagulation is initiated by lactic acid, formed by active lactic acid starters. However, if properly labeled, cottage cheese may also be made by a direct acidification method in which food-grade acids are used.

The milk may be coagulated in about 5 hours at 90°F, the "short-set" method, or in about 15 hours at 70°F, the "long-set" method, depending on the amount of starter used. When the curd is firm enough, it is cut into about 0.25-inch cubes for small-curd cheese or 0.75-inch cubes for large-curd cottage cheese. In small-curd cottage cheese, acid coagulation alone is generally used. In large-curd cottage cheese, a small amount of coagulating enzyme is added to the milk in addition to the lactic acid starter. The amount of coagulating enzyme used changes the texture of the curd, increases the ability of each curd cube to remain intact (prevent matting of the curd during the

cooking process), enhances whey expulsion during heating, and permits a curd of less acidity to be cut, thus providing a sweeter curd. For small- or large-curd cottage cheese, the curd is cooked with gentle stirring in whey for 60 to 90 minutes at about 125°F, conditions favorable for proper firmness and acidity development. The whey is removed and the curd is washed with cold water to firm the curd and remove any remaining acid whey, thus producing a mild-flavored cheese. When the curd is firm and dry it may be salted.

For cottage cheese, a homogenized creaming mixture, such as cream and milk, is added to cottage cheese dry curd to yield a cheese of not less than 4% milk fat. Flavorings such as various fruit and vegetable products (e.g., chives, pimento, pineapple) may be added to cottage cheese. This soft, unripened cheese is packaged in moisture-proof containers. Because of its high moisture content and open texture, cottage cheese is highly perishable and must be kept under refrigeration.

Cream Cheese

Cream cheese, a soft, unripened lactic acid-coagulated type of cheese, is made in a manner similar to that described for cottage cheese. A mixture of cream and milk is pasteurized and may be homogenized. The mixture is set with a lactic acid starter for 12 to 16 hours or until the desired acidity and coagulation have been obtained. The coagulated mass is warmed at 130°F, stirred, and drained by centrifugal procedures. The curd may be pressed, chilled, worked, and seasoned with salt. The moisture content may be adjusted with cheese whey, concentrated cheese whey, dried cheese whey, or reconstituted cheese whey prepared by the addition of water to concentrated cheese whey or dried cheese whey. Cream cheese may also be flavored with condiments such as chives, scallions, vegetables, pimentos, relish, olives, cherries, pineapple, or nuts.

Cooking/No-melt Cheese

No-melt cooking cheese is a new category of natural cheeses developed at California Polytechnic State University, San Luis Obispo, Calif. (see Resources in the Appendix). This cheese does not have a U.S. Standard of Identity but rather is manufactured using a patented technology. Because this cheese has not been extended, blended, or modified with additives or extenders to change its properties, it is a natural cheese made with typical ingredients. No-melt cheese has a very mild flavor, lends itself to the addition of other flavors and seasonings, exhibits a range of textures (soft and moist to firm and chewy), and can be shredded or diced.

The patented cheese-making process uses temperature and natural organic acids to induce milk proteins to interact with calcium in a manner that prevents the cheese from melting. This process can be modified to offer a range of controlled melt conditions. No-melt cheese should be stored in the refrigerator or can be frozen in tightly sealed vacuum bags.

PROCESS CHEESE AND RELATED TYPES

Pasteurized Process Cheese

Pasteurized process cheese is the food made by grinding and blending, with the aid of heat (not less than 150°F for at least 30 seconds) and an emulsifying agent (e.g., sodium salts of phosphoric acid), one or more natural cheeses of the same or two or more varieties into a homogeneous mass. Allowable optional ingredients such as fruits, vegetables, or meats may be added. This cheese is generally packaged as presliced. The advantages of processed cheese products include uniform flavor and texture, specific melting characteristics, improved keeping quality, and effective merchandising. Pasteurized process cheese manufacturers can provide products with a wide range of melting characteristics from high-temperature products to slow-melt and extra-melt varieties. Also, physical and organoleptic properties of these cheeses can be tailored to meet flavor and texture requirements.

A pasteurized blended cheese is similar to the food described above with the exception that an emulsifying agent is not used. Because pasteurization halts the action of the bacteria and enzymes responsible for curing cheese, the keeping quality of the product is stabilized and no further change after processing occurs in the flavor.

Pasteurized process cheese that is made from a single variety of cheese is identified according to the cheese type (e.g., pasteurized process Swiss cheese). A product that contains Cheddar cheese and cheeses of similar characteristics such as washed curd, Colby, or granular cheese or any mixture of these cheeses is called pasteurized process American cheese and is labeled as such. When a mixture of two or more varieties of cheese

is used, the various components are included in the name in order of their quantitative contribution to the composition of the product. Federal definitions and standards of identity specify that the following cheeses may not be used in the manufacture of pasteurized process cheese: cream cheese, Neufchatel cheese, cottage cheese, cooking cheese, hard-grating cheese, semisoft part-skim cheese, part-skim spiced cheese, and skim milk cheese for manufacturing.

■ Pasteurized Process Cheese Food

This product is similar to pasteurized process cheese except for the addition of one or more of the following optional dairy ingredients: cream, milk, nonfat milk, buttermilk, cheese whey, anhydrous milk fat, dehydrated cream, or skim milk cheese for manufacturing. At least 51% of the weight of cheese foods must consist of the cheese ingredient. Other optional ingredients include emulsifying agents, acidifying agents, water, salt, artificial coloring, and spices and flavorings. Pasteurized process cheese food is higher in moisture and lower in fat content than pasteurized process cheese. Fruits, vegetables, or meats may be added according to federal definitions and standards of identity.

■ Pasteurized Process Cheese Spread

This product is similar to pasteurized process cheese food except that no emulsifying agent is used. Added moisture is permitted in pasteurized process cheese spreads to give a spreading quality to the product at room temperature (70°F). The addition of moisture may require the use of water-retaining ingredients such as gums, gelatin, and algin in an amount not to exceed 0.8% of the weight of the finished product. Other optional ingredients specified for pasteurized process cheese food, as well as sweetening agents such as sugar, dextrose, maltose, and corn syrup, may also be added. The cheeses used must contribute at least 51% of the weight of the finished product. A pasteurized process cheese spread is lower in fat and higher in moisture content than a pasteurized process cheese food. Federal standards of identity define pasteurized process cheese spreads with fruits, vegetables, meats, or mixtures of these additions.

■ Cold-pack Cheese

Cold-pack or club cheese is made by grinding and mixing one or more ripened cheeses of the same or two or more varieties into a homogeneous mass. Unlike process cheese, cold-pack cheese is not heat-treated or cooked at the time of packaging. The product may be smoked and optional ingredients such as acidifying agents, water, salt, coloring, spices and flavorings, and mold-inhibiting ingredients may be added before packaging in jars or in moisture-proof material in retail-size portions. Because the product is not heat-treated, the cheese selected must be made from pasteurized milk or have been held for at least 60 days at not less than 35°F.

■ Cold-pack Cheese Food

This product is similar to cold-pack cheese except for the addition of one or more of the following dairy ingredients: cream, milk, nonfat milk, buttermilk, cheese whey, anhydrous milk fat, dehydrated cream, or skim (nonfat) milk cheese for manufacturing. Other approved optional ingredients include the following: acidifying agents, water, salt, artificial coloring, spices or flavorings, sweetening agents, mold-inhibiting ingredients, or stabilizers. Fruits, vegetables, or meats, as specified by federal definitions, may be added.

■ Grated Cheeses

Grated cheeses are foods prepared by grinding, grating, shredding, or otherwise blending cheese of one variety or a mixture of two or more varieties. The cheeses used are those for which definitions and standards of identity have been established, unless otherwise indicated. Optional ingredients may include mold-inhibiting ingredients, anticaking agents, spices, or safe and suitable flavoring ingredients. Each cheese ingredient used may be present at a level not less than 2% by weight of the finished food. Moisture may be removed in the manufacture of the finished food, but no moisture is added. Consequently, the grated cheese may be partially dehydrated, powdered, or granular in texture.

OTHER CHEESES

■ Reduced-Fat Cheeses

In recent years, many reduced-fat cheeses have entered the marketplace. The basic principles used to make reduced-fat cheese are similar to those of its traditional counterpart, with subtle changes depending on the degree of fat reduction. However, the lower the fat content of cheese, the more challenging the cheese-making process.

Standardization of milk to the appropriate fat content is necessary to achieve the desired fat level

in cheese. To achieve a one-third reduction in fat in Cheddar cheese, milk must be standardized to 1.6 to 1.8% fat. To achieve a 50% reduction in fat, milk of 0.9 to 1% fat is required. Lower fat or nonfat milks are needed to produce cheeses with a greater fat reduction. The milk may be fortified with fat-soluble vitamins A and D to compensate for their reduction due to fat removal. The casein-to-fat ratio of milk used in producing reduced-fat cheeses is often regulated by the removal of fat or the addition of casein. Also, the lactose content of the milk may be reduced in the production of lowfat cheeses with high moisture content. Fat reduction in cheese is accompanied by an increase in cheese moisture of 45 to 49% for one-third reduced-fat Cheddar cheese to more than 50% for a 50% reduced-fat Cheddar cheese.

Adjustments in the moisture-to-protein ratio, the extent of acidity developments during manufacturing, the characteristics of the lactic acid starter cultures, and the control of secondary bacteria are of particular importance if off-flavors, bitterness, and a rubbery texture are to be minimized. In addition, cooking temperatures typically are lower in the manufacture of lowfat cheeses. In general, the composition and processing controls must be more precise during the manufacture of lowfat cheeses than for traditional cheeses. Because of the high moisture content of lowfat cheeses, extended aging may not be possible. These cheeses therefore are often available in only mild forms. To complement their mild flavor, many lowfat cheeses contain herbs, seasonings, and other flavoring ingredients. Reduced-fat cheeses generally have a shorter shelf life than full-fat cheeses.

As a result of the 1990 Nutrition Labeling and Education Act, cheeses with reduced fat content are now distinctly defined (see Table 9). Under these definitions, if a cheese is to qualify as low fat, it must contain no more than 3 grams of fat per serving. To be called reduced fat, the cheese must contain at least 25% less fat than its traditional counterpart. Fat-free cheese must contain less than 0.5 grams of fat per reference amount and per labeled serving size.

Whey Cheese

Whey cheeses are obtained by concentrating whey (the watery liquid remaining after the curd is formed in cheese-making) and by coagulating the whey protein with heat and acid, with or without the addition of milk and milk fat. Ricotta cheese is a well-known type of whey cheese, although it is now frequently manufactured from whole or lowfat milk. A high temperature (176° to 212°F) and a lactic acid starter or added acetic acid are used to coagulate the protein. The resulting curd is transferred to hoops for straining. Fresh ricotta cheese resembles cottage cheese. The curd may be pressed and dried for grating. The fat and moisture content of ricotta cheese vary widely according to the manner of manufacturing and the initial ingredients used.

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TABLE 26

Classification of Cheeses by Manufacturing Process

Distinctive Process	Characteristics	Example Cheeses
Curd particles matted together	Close texture, firm body	Cheddar
Curd particles kept separate	Slightly open texture	Colby, Monterey Jack
Bacteria-ripened throughout interior	Gas holes or eyes with eye formation throughout cheese	Swiss (large eyes), Edam or Gouda (small eyes)
Prolonged curing period	Granular texture; brittle body	Parmesan, Romano
Pasta filata	Plastic curd; stringy texture	Mozzarella, Provolone
Mold-ripened throughout interior	Visible veins of mold (blue-green or white); piquant, spicy flavor	Blue, Gorgonzola, Roquefort
Surface-ripened mainly by bacteria and yeasts	Surface growth; soft, smooth, waxy body; mild to robust flavor	Brick, Limburger
Surface-ripened mainly by mold	Edible crust; soft, creamy interior; pungent flavor	Brie, Camembert
Curd coagulated mainly by acid	Delicate soft curd	Cottage, Cream, Neufchatel

Source: National Dairy Council®