

Cooking with Dairy

Use *Culinary Techniques for Healthy School Meals: Preparing Dairy Products* Packet to answer the following questions.

On page 3, find the word *Mise en Place* and explain what it means in your own terms (do not just copy).

Page 4: What are 5 facts about Natural Cheese:

- 1.
- 2.
- 3.
- 4.
- 5.

What are 3 facts about process cheese:

- 1.
- 2.
- 3.

What are 3 facts about Cheese Food:

- 1.
- 2.
- 3.

What are the groups of foods that are meat alternatives? (page 5)

Page 6: Substituting Cheeses:

What can happen if you substitute a different cheese in a recipe than the one it said to use?



How do lowfat cheeses react differently than natural whole milk cheeses?

What are 2 characteristics that make process cheese and cheese foods not equal substitutes in cooking?

**Using Chapter 17 Dairy Products: Answer the following:**

Define Pasteurization:



Define UHT (ultra-high temperature processing)

Define Homogenization

Whole milk contains at least \_\_\_\_\_% milkfat.

Define Milk Solids

Define Lactose Intolerance



Describe the differences between heavy whipping cream, light whipping cream and half and half.



Define Yogurt

Define buttermilk

Define evaporated milk

Define sweetened condensed milk

Define scum formation



Define curdling

Define scorching

Define white sauce

Define roux

Define slurry



Define chowder

Define bisque



## Important Terms

### **Culinary**

Relating to the kitchen or cooking. An example of use is to describe food preparation skills as culinary skills.

### **Culinary Technique**

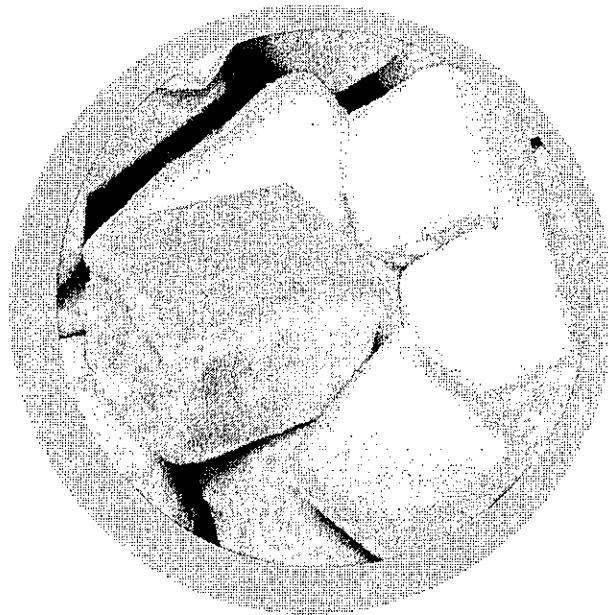
A step-by-step preparation method. The culinary techniques discussed in this lesson include cooking cheese.

### **Just-In-Time Preparation**

This term is used throughout the lessons to mean preparing a menu item in small enough quantities that it will be at its peak of quality when placed on the serving line. This preparation schedule avoids holding any food for a long time. Other terms that mean the same thing are *batch cooking* and *cooking to the line*.

### **Mise en Place (meez-un-plahss)**

A French term used by chefs and other food professionals to describe all the different things that have to be done to get ready up to the point of cooking. Translated, it means *put in place*. It includes all the *get ready steps* in food preparation such as using the recipe to assemble the equipment needed and getting ingredients ready to combine.



## Mise en place

### Natural Cheese

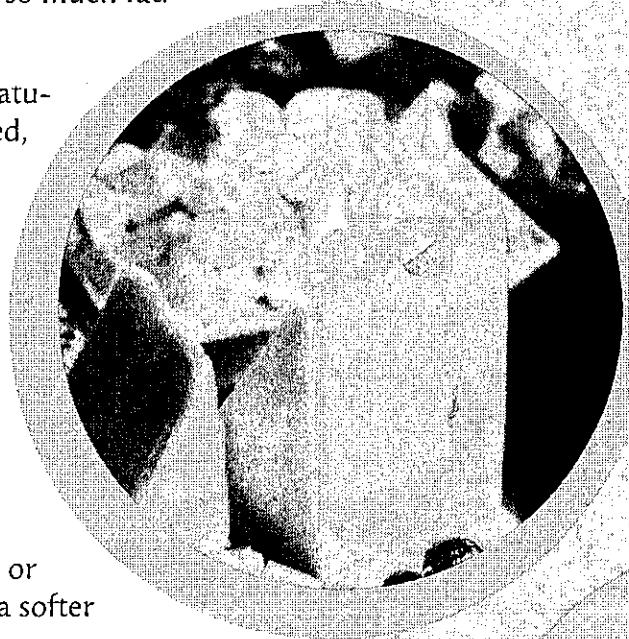
- Natural cheese is a very concentrated food. One pound of natural cheese may contain the protein and fat of 1 gallon of milk.
- Natural cheeses are made by a traditional process and are considered *living*. This means that a natural cheese, like aged cheddar, will age or ripen with an improvement in flavor.
- A natural cheese will eventually spoil or over ripen.
- Cheeses made from lowfat or skim milk are lower in fat content than cheeses made from whole milk.
- Because natural cheeses have a more intense flavor than process cheeses, a smaller amount of natural cheese can often be used to give a good flavor without adding so much fat.

### Process Cheese

- Process cheese is a blend of fresh and aged natural cheeses that have been melted, pasteurized, and then mixed together with an emulsifier.
- Its flavor depends on the flavor of the various cheeses used to make it.
- Lowfat pasteurized process cheese products are available.

### Cheese Food

- Pasteurized, process cheese foods have other ingredients added, such as milk, whey, or flavorings.
- Cheese food has a milder flavor than natural or process cheese, melts more quickly, and has a softer texture.
- Process cheese and cheese foods do not ripen or age, though over time they will eventually lose quality and become inedible.



## Dairy Products and Healthy School Meals

Meat alternates is a term used in child nutrition programs to mean main dish foods that provide alternate sources of protein for school lunch and breakfast menus. The groups of foods included as meat alternates are cheese, eggs, cooked dry beans and peas, peanut butter and other nut or seed butters, and yogurt. Guidance information from the U.S. Department of Agriculture explains how to use these foods in school menus. Cheese is part of the milk, yogurt, and cheese food group. Some of the most popular menu items served in schools come from this important group.

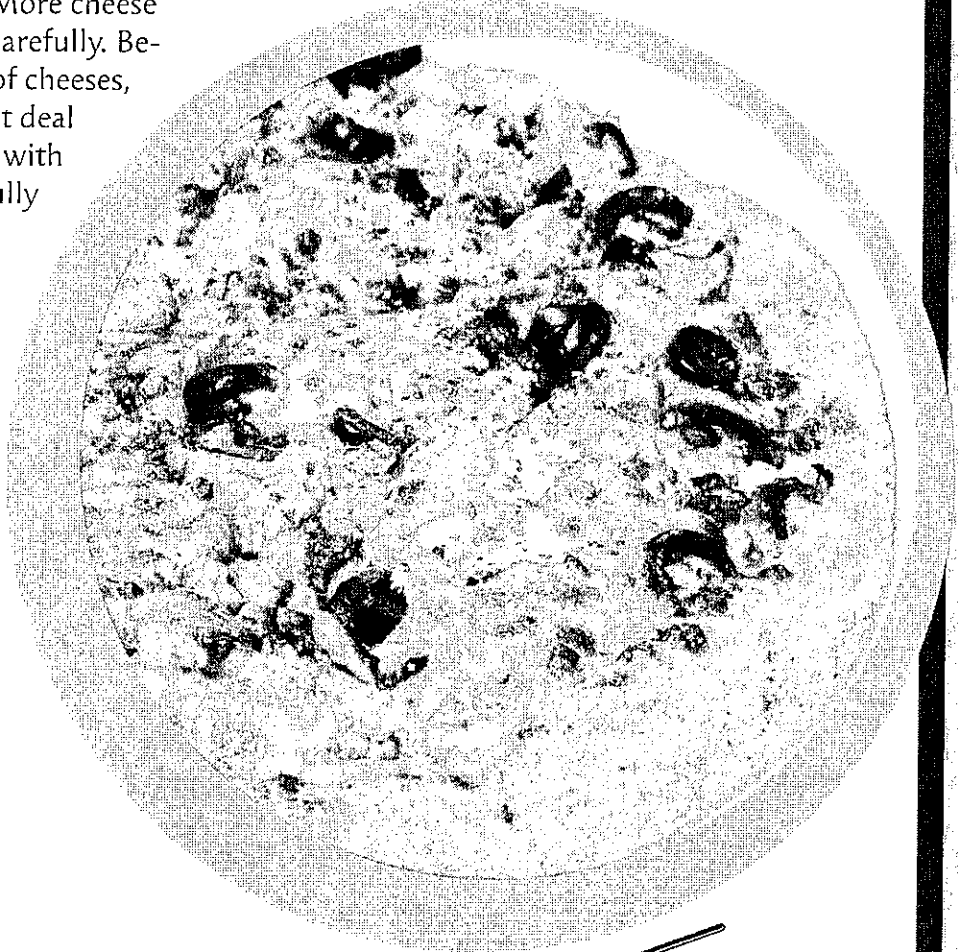
Cheese is counted as a meat alternate for school meals, even though it is from the milk group. Cheese is typically high in fat. To keep school meals moderate in fat, it is important to follow recipes and use only the amount of cheese called for in the recipe. More cheese means more fat, so measure it carefully. Because of the wonderful variety of cheeses, including lowfat cheeses, a great deal of flavor can be added to a dish with a small amount of cheese carefully selected to complement other flavors in the dish.

### Menu-Planning Practices for Healthy School Meals

- Use lowfat cheeses and other dairy products.
- Offer lowfat sour cream or lowfat or fat-free yogurt for a topping in place of sour cream.
- Cheese is a meat alternate for lacto-vegetarians.

### Purchasing Practices for Healthy School Meals

- Purchase lowfat or fat-free yogurt fortified with vitamins A and D.
- Purchase lowfat cheeses such as part-skim mozzarella, and other lowfat or fat-free dairy products.
- Offer lowfat sour cream or lowfat or fat-free yogurt for a topping in place of sour cream.



# Culinary Principles

## Cooking with Cheese

### Substituting Cheeses

Making changes in a recipe should be done only with the approval of the manager. Substituting a lower fat cheese is one way to reduce the fat in a recipe. However, the substitution should only be made if the flavor of the two cheeses is very similar. For example, mozzarella cheese has about half the amount of fat as cheddar cheese, but a much milder flavor. Mozzarella could be substituted for cheddar in a recipe that has other lively flavors but not in a recipe that is bland. Mozzarella in a macaroni and cheese recipe would result in a very bland dish. Lowfat cheese, like lowfat mozzarella can be blended with American cheese or cheddar cheese to lower the fat of the recipe and maintain good flavor.

When cooked, lowfat cheeses will react differently than natural whole-milk cheeses. In general, lowfat cheese will melt better when it is grated and then added to a cooked recipe. Lowfat cheddar cheese can be substituted in most recipes that call for natural cheddar. When making any ingredient substitution, the manager and the cook should discuss how the substitution will be made. Then the recipe should be made in a 25 portion amount and taste tested with feedback from students.

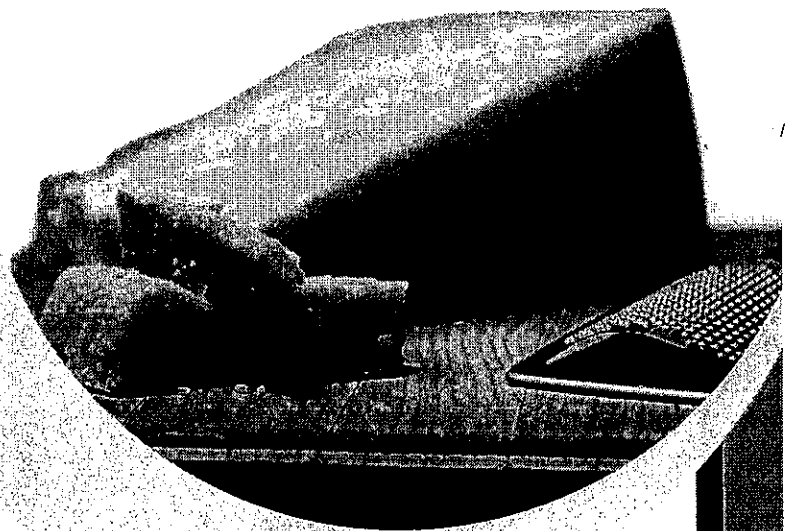
Process cheese and cheese foods are not equal substitutes for natural cheese because they do not have the characteristic flavor of natural cheese. Some cheese foods will not melt and are not appropriate for cooking.

### Overcooking Cheeses

Hard cheeses, like cheddar or parmesan, get soft when heated, and then they melt. When heating is continued, the fat in the cheese separates and then a tough, rubbery curd forms in long strings. This rubbery curd is the cheese protein that is overcooked. As the cheese cools, it becomes hard. To prevent this from happening, several things can be done.

- Do not overcook the cheese. When cheese melts, it is done. Rubbery, tough cheese is overcooked.
- Grate or grind the cheese before it is added to other ingredients. This helps the cheese to melt before it is overheated.
- Use process cheese or aged natural cheese for blending in mixtures rather than mild natural cheese.

Cheese melts in an oven between 300 °F and 335 °F so dishes containing cheese should be cooked at 350 °F or lower. When cheese is added as a topping to a product that must be cooked for a long time, it should be added during the last 10 minutes.





## Chapter 17

# Dairy Products

*W. J. Lea*

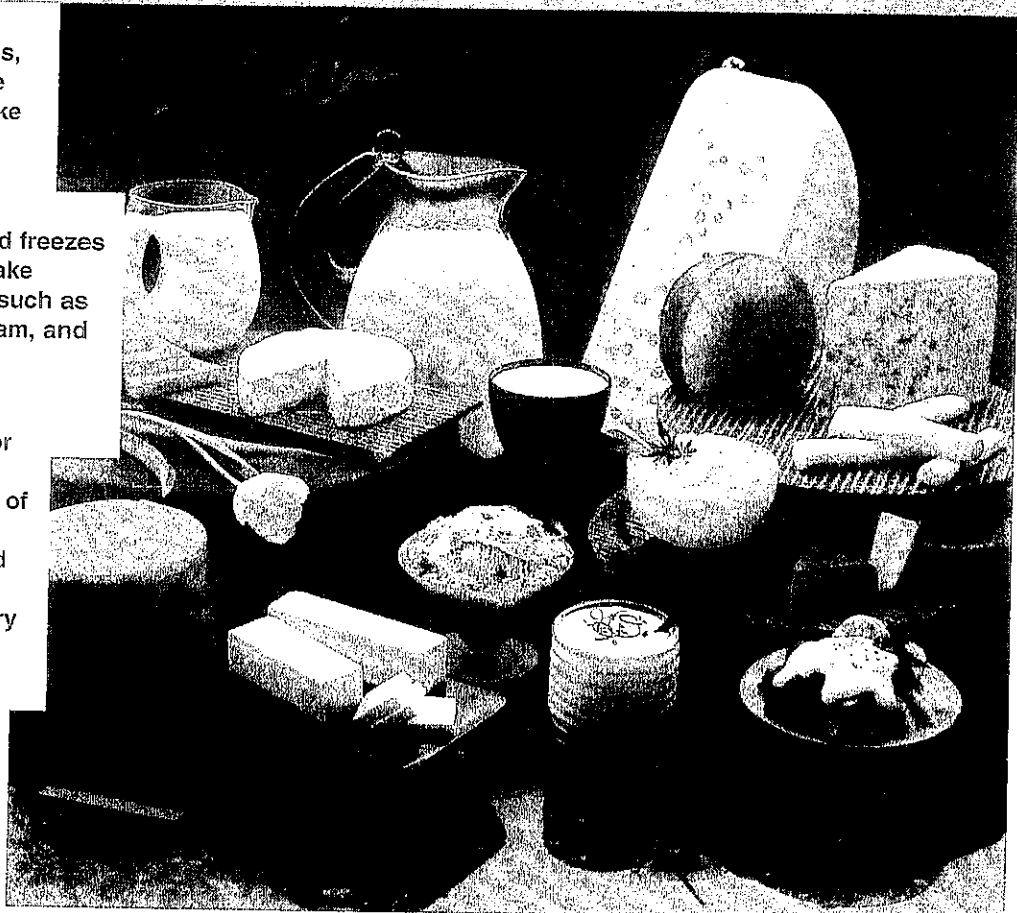
### Cheese Blender

Prepares charts of quantities, grades, and types of cheese required for blending to make cheese products.

### Ice Cream Chef

Mixes, cooks, and freezes ingredients to make frozen desserts, such as sherbets, ice cream, and custards.

Dairy Farm Supervisor Supervises and coordinates activities of workers engaged in milking, breeding, and caring for cows, and performs lay-veterinary duties on dairy farm.



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## Terms to Know

pasteurization	scum
ultra-high temperature (UHT) processing	scorching
homogenization	curdling
milkfat	white sauce
milk solids	roux
curd	slurry
whey	bisque
unripened cheese	chowder
ripened cheese	gelatin
triglyceride cheese	gelatin cream
	hydrate

## Objectives

After studying this chapter, you will be able to

- list factors affecting the selection of dairy products.
- describe guidelines for preventing adverse reactions when cooking with dairy products.
- prepare a variety of dishes using milk, cream, cheese, and other dairy products.

Dairy products make up the milk, yogurt, and cheese group of the Food Guide Pyramid. These dairy foods are essential for good health.

Teens and older adults should include three servings in their diets each day. People in other age groups should consume two servings daily. Dairy foods are your major source of calcium. They also contain high-quality protein, phosphorus, riboflavin, and vitamins A and D.

Cream, sour cream, ice cream, sherbet, and butter are also dairy products. However, calorie for calorie, they are higher in fat and lower in other nutrients than milk, yogurt, and cheese.

You can enjoy dairy products fresh or use them as ingredients in cooking and baking. Chocolate pudding, pizza, and scalloped potatoes are just a few of the many popular foods that contain dairy ingredients. In addition to contributing important nutrients, dairy products contribute flavor, texture, and richness to many foods. Milk products also help baked goods brown.

## Selecting and Storing Dairy Products

You can choose from among a variety of dairy products to meet your drinking and cooking needs. Most dairy products are highly perishable. They require careful storage to maintain their flavors and nutrient qualities.

### Milk

Milk, both plain and flavored, is a popular beverage. Milk is also an important ingredient in many foods.

### Milk Processing

Milk may go through several processes between the dairy farm and the retail store. Milk and milk products sold in the United States are

pasteurized. During **pasteurization**, milk is heated to destroy harmful bacteria. Pasteurization improves the keeping quality of the milk.

It does not change the nutritional value or the flavor.

Some milk is treated with **ultra-high temperature (UHT) processing**. This preservation method uses higher temperatures than regular pasteurization to increase the shelf life of foods like milk. After heating, UHT processed milk is sealed in presterilized boxes. You can store unopened UHT milk products without refrigeration, 17-1.

Fresh whole milk is usually homogenized. **Homogenization** is a

mechanical process that prevents cream from rising to the surface of milk. This process breaks globules of milkfat into tiny particles and spreads them throughout the milk. Homogenized milk has a richer body and flavor than nonhomogenized milk.

Whole milk is often fortified with vitamin D. Fat free milk may contain added vitamins A and D. Milk fortified with calcium is available for people who are concerned about getting enough calcium in their diets.

### Types of Milk

Each type of milk must meet specific standards for its composition. **Whole milk** must contain at least 3.25 percent milkfat and 8.25 percent milk solids. **Milkfat** is the fat portion of milk. **Milk solids** contain most of the vitamins, minerals, protein, and sugar found in milk.

All types of milk begin as pasteurized whole milk. **Reduced fat milk** has some of the fat removed. **Fat free milk** has nearly all of the fat removed. The less fat the milk has, the fewer calories it provides per serving. Milk with added flavoring becomes flavored milk, such as chocolate milk.

Many people experience gas, cramps, bloating, and diarrhea after drinking and eating regular milk products. They have a condition called **lactose intolerance**, which means their bodies cannot produce enough lactase. Lactase

## Healthy Living

Getting enough calcium in your diet during the teen years is important. You need calcium to support the rapid bone growth that occurs at this stage in your life. A calcium-rich diet during the teen years can also help reduce your risk of osteoporosis (excessive bone tissue loss) later in life.

While all dairy products provide calcium, they do not all provide it in the same amounts. Cottage cheese and ice cream provide about half as much calcium as equal portions of milk or yogurt. Choose three servings of calcium-rich foods and be physically active daily to build strong, healthy bones.

is the enzyme needed to digest lactose—the natural sugar in milk. People with lactose intolerance may choose to buy *lactose-reduced milk*, which has been treated with lactase to break down milk sugar.

## Cream

Types of cream are defined according to the amount of milkfat they contain. *Heavy whipping cream* has the most fat, followed by *light whipping cream*. Both hold air when whipped, and they are often used in desserts. *Light cream*, or *coffee cream*, has less fat than light whipping cream. You can use it as a table cream and in cooking. *Half-and-half* is made from half milk and half cream. It has the least amount of fat, so it is the lowest in calories.

## Yogurt and Other Cultured Dairy Products

A number of dairy products are made from milk to which helpful bacteria have been added. These bacteria are *cultured*, or specially grown

for this purpose. Therefore, dairy products to which they are added are called *cultured dairy products*. The bacteria produce lactic acid, which gives these products a thick texture and tangy flavor.

*Yogurt* is a cultured dairy product. It may contain added nonfat milk solids and flavorings or fruits. An 8-ounce (227 g) serving of yogurt provides a bit more calcium and protein than a cup (250 mL) of milk. The amount of fat in yogurt depends on whether it was made from whole, reduced fat, or fat free milk. Although yogurt is a nutritious food, fruit-flavored yogurt often contains about 8 teaspoons of added sugar per serving. To limit your sugar intake, try stirring fresh fruit and a drizzle of honey into some plain nonfat yogurt. See 17-2.

Other cultured dairy products include butter-milk and sour cream. People use *cultured buttermilk* for cooking and baking as well as drinking. Regular *sour cream* is made from light cream. *Light* and *reduced fat sour cream* have fewer calories than regular sour cream because they have less fat. These sour cream products can all be used interchangeably in most recipes.

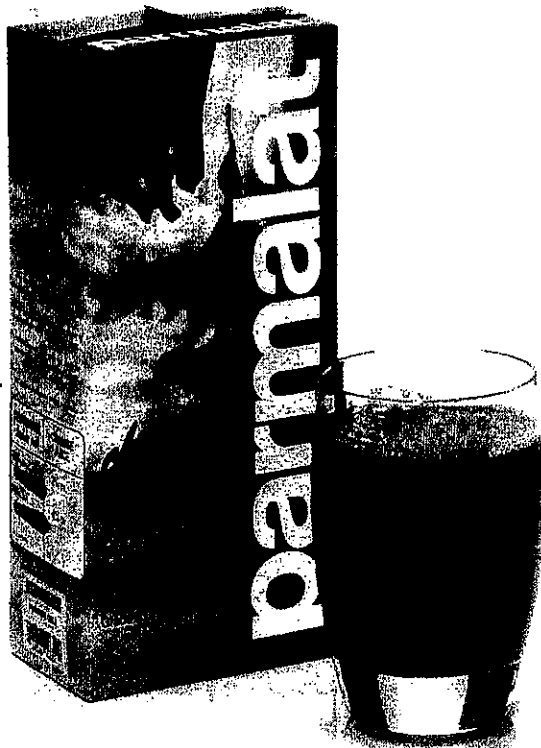
## Concentrated Milk Products

Removing water from fluid milk produces concentrated milk products. These products can be canned or dried.

*Evaporated milk* is sterilized, homogenized whole, reduced fat, or fat free milk that has had some of the water removed. When diluted with an equal amount of water, it matches fresh milk in nutritional value. You can then use it in place of fluid fresh milk for drinking and in recipes. Evaporated milk costs more than fluid whole milk.

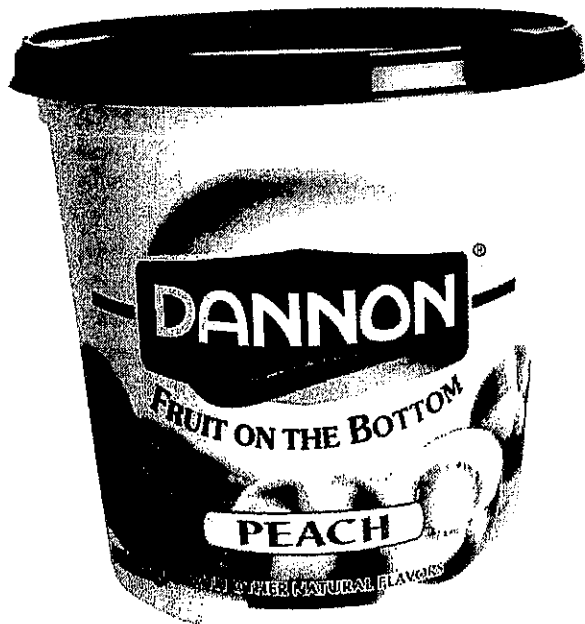
*Sweetened condensed milk* is whole or fat free milk with some of the water removed and a sweetener added. It is used most often in cooking and baking. Sugar affects the flavor and texture of cooked and baked products. Therefore, you should use condensed milk only in recipes that call for it. Sweetened condensed milk cannot be used interchangeably with evaporated milk. You cannot dilute it for use in place of fluid fresh milk, either.

Removing most of the water and fat from whole milk produces nonfat dry milk. You can use nonfat dry milk to add calcium and protein to many foods. You can also reconstitute it and use it like fluid milk. When you add water, it costs one-half to two-thirds less than fluid milk.



Parmalat

17-1 UHT processed milk is found in presterilized boxes on the grocer's shelf—not in the dairy case.



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*17-2 Yogurt, like other cultured dairy products, is made by adding cultures of special helpful bacteria to milk. These bacteria cause the milk to thicken and develop a tangy flavor.*

## Frozen Dairy Desserts

Ice cream, frozen yogurt, and sherbet are all frozen dairy desserts. The names of these products used on labels indicate fat content. *Reduced fat products* must show at least a 25 percent reduction in fat over regular products. *Lowfat products* must not contain more than 3 grams of fat per serving. *Nonfat products* must contain less than 0.5 grams of fat per serving. See 17-3.

## Butter

Churning pasteurized and specially cultured sweet or sour cream produces butter. The churned product is usually salted and artificially colored.

*Sweet butter* is butter made without salt. Salt acts as a preservative, so sweet butter is more perishable than salted butter. *Whipped butter* is butter that has air whipped into it. It is also more perishable than regular butter.

## Nondairy Products

A few products that look and perform like dairy products contain no dairy ingredients. *Nondairy products* include coffee whiteners,

*whipped toppings*, and *imitation sour cream*. These products do not contain real cream. They get the body and appearance of dairy products from substances such as soy protein, emulsifiers, and vegetable fats and gums.

Margarine is another nondairy product. Many people use margarine in place of butter. It contains vegetable oil, animal fat, or some of each rather than milkfat like butter.

## Cost of Dairy Products

National brand dairy products tend to cost more than local brands. In addition, milk products differ in cost depending on fat content, form, size of container, and place of purchase. Whole milk usually costs more than fat free milk. Fluid fat free milk usually costs more than nonfat dry milk. Ounce for ounce (milliliter for milliliter), milk sold in small containers usually costs more than milk sold in large containers. Home-delivered milk costs more than milk you buy at a store.

The cost of frozen desserts depends on the amount of fat. The kind and amount of extra ingredients, flavorings, and container size also affect cost. Rich ice cream in small containers with many added ingredients costs the most. See 17-4.

The cost of butter depends on form. Sweet butter and whipped butter may cost more than regular butter. Margarine costs less than butter, but prices vary depending on packaging and kind of oil used.

Type of Ice Cream	Typical Percent Milkfat	Fat per 1/2 Cup (125 mL) Serving
Regular ice cream	10.0% or more	6-8 g
Reduced fat ice cream	7.0%	4-5 g
Lowfat ice cream	3.0%	3 g or less
Nonfat ice cream	0.5%	0 g

*17-3 Reading labels can help you determine the fat content of ice cream products.*

**Q: Isn't margarine lower in fat and calories than butter?**

**A:** No. Full margarine contains the same amount of fat and calories as butter. Most margarine is lower in cholesterol and saturated fat than butter. However, most stick margarine provides trans-fats. These fats are created when liquid vegetable oils are hydrogenated to make solid margarine. Tub margarines have little or no trans-fat.

## Storing Dairy Products

All dairy products are highly perishable. Cover and store them in the coldest part of the refrigerator. Pour out just the amount of milk and cream you intend to use and return the rest to the refrigerator. Keep containers tightly closed to prevent contamination and off flavors.

You can store sealed UHT milk products unrefrigerated for up to six months. Once opened, you should refrigerate them and use them like other milk products.

Cover ice cream and other frozen desserts tightly and store them in the coldest part of the freezer. If frozen desserts become soft, large ice crystals will form when they are refrozen. This damages their textures. For best quality, use these products within a month.

Store dried and canned milk products in a cool, dry place. Reseal opened packages of dried milk carefully. Store reconstituted dry milk like fresh milk. Cover the unused portions of canned milk products and store them in the refrigerator. Use them within a few days.

Refrigerate all butter and margarine. Do not let either product stand at room temperature longer than necessary. Freezing will extend the life of both butter and margarine.

## Cheese

Few foods are as versatile as cheese. Its many flavors, textures, and nutrients make it suitable for any meal or snack. See 17-5.

Cheese is a concentrated form of milk, so it is an excellent source of complete protein.

A 1-pound (450 g) package of cheese contains the protein and fat of about 1 gallon (4 L) of whole milk. Cheeses are important sources of calcium and phosphorus. They are fair sources of thiamin and niacin. Whole milk cheeses are excellent sources of vitamin A.

## Kinds of Cheese

All cheese is made from milk. The milk used can be from cows, goats, or other animals. In simple terms, the milk is coagulated, and the **curd** (solid part) is separated from the **whey** (liquid part). Cheeses made in this way are sometimes called *natural cheeses*.

Using different kinds of milk and changing the basic steps of production can produce hundreds of different cheeses. All these cheeses may be classified in two main groups: unripened and ripened. **Unripened cheeses** are ready for marketing as soon as the whey has been removed. They are not allowed to ripen or age. Cottage cheese, cream cheese, farmer's cheese, and ricotta cheese are examples of unripened cheeses. They are mild in flavor.

Controlled amounts of bacteria, mold, yeast, or enzymes are used to make **ripened cheeses**. During ripening, the cheese is stored at a



Dairy Management Association

*17-4 Premium ice cream with added ingredients costs more than store brands to which you add your own toppings.*

specific temperature to develop texture and flavor. Some cheeses become softer and more tender. Others become hard or crumbly. Over 400 varieties of ripened cheeses are produced. Each has a distinctive flavor, ranging from mild to strong. See 17-6.

Some ripened cheeses require further storage to develop flavor. This process is called aging. Cheese is aged anywhere from two weeks to two years, depending on the kind.

### Process Cheese

Natural cheeses can be made into other products called *process cheeses*. Several kinds of process cheese products are available in supermarkets and specialty food shops.

*Pasteurized process cheese* is made from a blend of unripened and ripened cheeses. The

cheeses are heated and an emulsifier is added. The finished product is smooth and creamy. *Pasteurized process cheese food* is similar to pasteurized process cheese, but it contains

more moisture and less fat. *Pasteurized process cheese spread* has a stabilizer added. It contains less milkfat and more moisture than cheese food.

*Coldpack cheese* (club cheese) is made from a mixture of unripened and aged ripened cheeses blended without heat. *Coldpack cheese food* is similar to coldpack cheese. It contains

additional dairy products like cream, milk, fat free milk, or nonfat dry milk.

*Imitation cheese* has a large portion of the milkfat replaced by vegetable oils. Imitation cheese may differ in texture and melting

## Be a Clever Consumer

Be sure to check the date stamped on dairy product containers when choosing items at the store. Look for products stamped with the latest date. Keep in mind the date on dairy products is a pull date. This is the last day a store should sell the product. If stored properly, dairy products remain wholesome and can be consumed for a few days past the pull date.



## Cheese Guide

Kind	Color	Texture	Flavor	Use
Brie	White marbled with a blue green mold	Semisoft	Sharp, tangy	Appetizers, snacks, salads, desserts
Blue cheese	Visible veins of blue green mold	Semisoft to crumbly	Spicy, tangy	Appetizers, snacks, salads, desserts
Gorgonzola	Tan surface with creamy interior marbled with blue green mold	Less moist than blue cheese	Tangy, spicy	Snacks, salads, desserts
Cheddar	Light yellow to orange	Hard, smooth	Mild to very sharp	Desserts, snacks, sandwiches, cooking
Colby	Orange	Hard with numerous small holes	Mild	Snacks, sandwiches, cooking
Monterey Jack	Creamy white	Semisoft, smooth	Mild	Snacks, sandwiches
Queso Pasa	Creamy yellow, may have waxy red coating	Hard, open, mealy	Nutlike	Desserts, snacks
Queso Cam	Creamy yellow	Hard, open, mealy	Nutlike	Desserts, snacks
Queso Romano	Yellowish white interior, greenish black surface	Hard, granular	Sharp, tangy	Cooking, seasoning
Queso Mesan	Light yellow with brown or black coating	Granular, brittle	Sharp, spicy	Cooking, seasoning
Mozzarella	Creamy white	Semisoft, plastic	Mild, delicate	Pizza, sandwiches, cooking
Provolone	Yellowish white	Hard	Mild to sharp or smoky	Salads, cooking
Swiss	Yellow, tan, or white surface with creamy white interior	Semisoft, smooth	Mild to mellow	Sandwiches, snacks
Colby	Light yellow to orange	Semisoft, smooth	Mild	Snacks, sandwiches
Chèvre	Light yellow	Hard with tiny holes	Sweet, nutlike	Snacks, desserts, cooking
Swiss	Light yellow	Hard with large holes	Sweet, nutlike	Sandwiches, snacks, desserts, cooking
Cream cheese	Creamy white	Soft, smooth	Mild	Desserts, snacks, dips
Cottage cheese	White	Soft large or small curds	Delicate	Salads, dips, cooking

17-6 With a broad range of textures and flavors, cheese is a versatile food.

characteristics from real cheese. These differences may affect the outcome of cooked foods made with imitation cheese.

### Cost of Cheese

You may be able to save money by buying cheese in large pieces rather than sliced,

cubed, shredded, or grated. Fully-ripened cheeses often cost more than unripened cheeses or those that ripen for only a short time. Pasteurized process cheese costs less than ripened cheese. Plain cheese costs less than cheese with added ingredients like nuts and herbs.



**Q: Isn't cottage cheese a good source of calcium?**

**A:** Actually, cottage cheese has less than half the calcium of an equal portion of milk. An ounce of Cheddar, Swiss, and part skim mozzarella cheeses each provide more calcium than a cup of cottage cheese.

**Storing Cheese**

You should cover or tightly wrap all cheese and refrigerate it. This will prevent the cheese from becoming dry. It will also prevent the spread of odors and flavors. Strong-flavored cheeses can flavor other foods. Mild-flavored cheeses can pick up flavors from other foods.

Cheese can become moldy if you store it improperly or keep it too long. A small amount of mold on hard cheese is not harmful. Just cut off the moldy section about one-half inch (1.25 cm) into the cheese. Eat the rest of the cheese within a short time. Dispose of hard cheese with large amounts of mold and all moldy soft cheese.




**Making the Lowfat Choice**

Dairy products contribute a significant amount of fat to the diets of most people in the United States. To meet the Dietary Guideline for a diet moderate in total fat, choose reduced fat or fat free milk products. They can greatly reduce the amount of fat in your diet when used instead of whole milk or cream products. Remember that lower fat means lower calories, too. For every gram of fat you cut from your diet, you save 9 calories.

As an example, you can use plain, nonfat yogurt in place of sour cream in many recipes. Making this simple switch can save 3 grams of fat per tablespoon (15 mL). This may seem like a small difference, but it can really add up. In a recipe calling for a cup (250 mL) of sour cream, you would save 48 grams of fat and 380 calories. (Larger amounts of carbohydrate and protein in yogurt take up some of the calories

saved from fat.) Table 17-7 lists some other dairy substitutions that can help reduce fat and calories in your diet.



**Cooking with Milk and Cream**

White sauce, cream soups, puddings, and frozen desserts are popular milk-based foods. Some of these foods may use cream in place of or in addition to milk.

Fresh milk, sour milk, evaporated milk, dried milk, and condensed milk are used in cooking and baking. Evaporated and dried milks may be used in place of fluid, fresh milk when you mix them with water. You cannot substitute condensed milk for other milk products.

**Food Science Principles of Cooking with Milk**

When you use milk as an ingredient, you often heat it. Heat affects proteins, and milk is a protein food. Understanding principles for cooking milk will help you avoid undesirable reactions.

The same cooking principles that apply to milk also apply to cream. Because cream is richer than milk (it contains more milkfat), heat and acids affect it more quickly than milk. Therefore, you should take extra care when cooking with cream.

**Scum Formation**

**Scum** is a solid layer that often forms on the surface of milk during heating. The scum is made up of milk solids and some fat. Because the scum is rubbery and tough, you should remove it. If you stir the scum into the milk, it will float in small particles throughout the milk.

Scum formation is difficult to prevent. After you remove the scum, another layer will form if heating continues. Stirring the milk during heating or covering the pan will help prevent scum formation. Beating the milk with a whisk or rotary beater to form a foam layer will also help prevent scum from forming.

**Boiling Over**

Scum formation is the usual cause of milk boiling over. Pressure builds up beneath the layer of scum. The scum prevents the pressure



Lowfat Dairy Substitutions			
Portion	Whole Milk/ Cream Product	Lowfat/Nonfat Product	Grams of Fat Saved
1 cup (250 mL)	whole milk	fat free milk	8
½ cup (125 mL)	regular ice cream	nonfat ice cream	6 or more
1 tablespoon (15 mL)	sour cream	plain, nonfat yogurt	3
1 ounce (28 g)	Cheddar cheese	mozzarella, part skim	4

17-7 Lowfat or nonfat dairy products can reduce fat in a health-conscious diet.

from being released as steam. The pressure continues to build until the milk finally boils over. You can prevent milk from boiling over by using low heat and one of the methods suggested for preventing a scum layer.

### Curdling

High temperatures, acids, tannins, enzymes, and salts can cause milk proteins to coagulate and form clumps. This is called **curdling**, and the clumps are called *curds*. Foods like oranges and tomatoes contain acids. Many fruits and vegetables contain tannins and enzymes. Brown sugar also contains tannins. Cured ham and other meats contain salts. These substances may cause curdling in cream of tomato soup, creamed green beans, scalloped potatoes and ham, and other milk-based foods.

You can prevent curdling by using low temperatures and fresh milk. When you add acid foods to milk, you should thicken either the milk or the acid first. For example, tomato soup made from thickened milk (or tomato juice) is less likely to curdle than tomato soup made from unthickened milk and juice. See 17-8.

### Scorching

**Scorching** is burning that results in a color change. Scorched milk is brown in color and has an off taste.

Milk can scorch because it contains lactose, which is a type of sugar. Like any sugar, lactose can *caramelize*, or change to a brown, bitter substance called *caramel* when it is heated. When you heat milk, the milk proteins coagulate and settle onto the sides and bottom of the

### Q: Shouldn't I avoid high-fat dairy products if I'm trying to watch my weight?

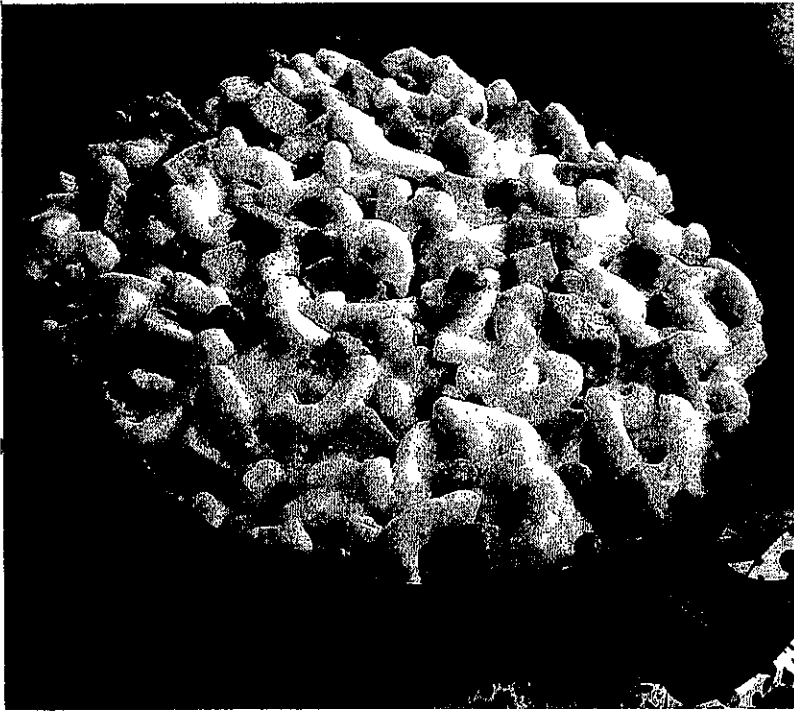
A: Limiting your intake of foods that are high in fat and calories will help you prevent unhealthful weight gain. However, you do not have to completely avoid any food to achieve or maintain a healthy weight. Moreover, many dairy products are low in fat. They serve as excellent sources of protein and calcium that you should include in your diet every day.

pan. If you overheat the milk, the lactose in the coagulated solids caramelizes, thus scorching the milk.

You can prevent scorching by using low heat. Heating milk in the top of a double boiler will also help you avoid scorching.

### Microwaving Milk Products

Use lower settings when microwaving milk and milk products. Higher settings can cause milk to curdle. You should also watch milk carefully, as it can boil over quickly in the microwave oven. Filling containers no more than two-thirds full when microwaving milk products will help avoid this problem. Stirring during the cooking period to prevent scum formation will also help reduce the risk of boiling over.



courtesy of National Pork Board

**17-8** *Thickening the milk before adding the ham to the creamy sauce in this dish will help prevent curdling.*

## Whipping Properties of Cream

The amount of milkfat affects the volume and stability of whipped cream. Cream must contain at least 25 percent milkfat to whip successfully. However, at least 30 percent milkfat is needed to produce a stable product. More milkfat (up to 40 percent) will produce a product that is still more stable.

When you whip cream, two changes take place. The first is that air bubbles are incorporated in the cream and a foam forms. The second change is that fat particles in the cream clump together. The clumping of the fat particles produces the stiffness in whipped cream. It also is the first step in the churning of butter. For this reason, you must control the amount of beating carefully. When the cream is overbeaten, too much air is incorporated into the cream. The emulsion around the fat particles breaks, the foam collapses, and the cream turns into butter.

Sugar decreases both the volume and stiffness of whipped cream. It also increases beating time if you add it before the cream has begun to stiffen. If you are sweetening the cream, you should add the sugar after the cream has become fairly thick.

## Preparing Whipped Cream

For best results when whipping cream, you should thoroughly chill the bowl, beaters, and cream. The bowl to be used for whipping should be large enough to hold the cream after whipping. (Cream doubles or triples in volume during whipping.)

To whip cream, pour the cream into a chilled bowl. Beat it at medium speed until thickening begins. If you are sweetening the cream, gradually start adding sugar at this point. As you add the sugar, increase the beating speed. Continue whipping the cream until it is stiff. Do not overbeat. Serve whipped cream immediately. (If you must hold whipped cream for a short time, refrigerate it promptly.) See 17-9.



## Preparing Common Milk-Based Foods

The creamy texture and richness of milk-based foods have made them favorites for generations. Studying basic preparation technique will allow you to include these popular foods in your menu planning.

### White Sauce

A **white sauce** is a starch-thickened milk product. It is used as a base for other sauces and as a component in many recipes.

The proportion of starch to milk determines the thickness of white sauce. Use *thin sauce* as the base of cream soups. Use *medium sauce* for cream vegetables and meats and *thick sauce* for soufflés. *Very thick sauce* binds the ingredients in croquettes.

### Preparing White Sauce

Classic white sauce is thickened with a **roux**, which is a cooked paste of fat and flour. You melt the fat over low heat. Then you stir in flour and seasonings to form a paste. Stir milk into the roux. Stir constantly as you cook the mixture over medium heat until it thickens into smooth sauce.

You can use a **slurry** as the thickening agent in a fat free white sauce. A slurry is a liquid mixture of milk and flour blended together until smooth. Combine fat free milk, flour, and seasonings in a blender container or a small, covered jar. Blend or shake until thoroughly mixed. Cook the slurry in a heavy saucepan



*17-9 Whipped cream has the best texture and greatest volume if served right after whipping.*

over medium heat, stirring gently, until it reaches a boil. Cook the slurry for one minute longer until the sauce is smooth and thickened. (This cooking will also prevent a raw starch flavor.)

When preparing a white sauce, take care to prevent scorching and lumping. Using moderate heat will prevent scorching. Using cold milk and thorough blending will separate the starch granules in the flour. This, along with gentle stirring during cooking, will prevent lumping and produce a smooth-textured sauce.

The principles of preparing white sauce are also used when preparing gravy. Juices from meat or poultry are used in place of some or all the milk to give gravy flavor. Skim the fat from pan juices remaining after cooking meat or poultry. Stir a slurry into the juices. Cook and stir over medium heat until thickened. To thin or extend gravy, add milk as needed. Season to taste with salt and pepper.

## Cream Soups

Milk-based soups, often called cream soups, are popular luncheon and supper dishes.

The three basic types of cream soups are thickened cream soups, bisques, and chowders. Use a thin white sauce to make thickened cream soups. They contain vegetables, meat, poultry, or fish that is pureed or cut into small pieces. Cream of mushroom and cream of tomato soups are popular thickened cream soups. See 17-10.

**Bisques** are rich, thickened cream soups. Light cream often replaces all or part of the milk in a bisque. Bisques usually contain shellfish that is shredded or cut into small pieces. You may have seen lobster bisque listed on a restaurant menu.

**Chowders** are made from unthickened milk. Chowders can contain vegetables, meat, poultry, or fish. (Most chowders contain potatoes, which help add thickness.) A few chowders use tomatoes and water instead of milk. Tomatoes form the base for Manhattan clam chowder, whereas milk forms the base for New England clam chowder.

## Preparing Thickened Cream Soups

The first step in preparing thickened cream soups and bisques is to cook the added ingredients. You must cook the vegetables, meat, poultry, or fish using only a small amount of liquid. This will help preserve as many of the water-soluble nutrients as possible. You may use the cooking liquid later as part of the liquid in the white sauce.

Many cream soup recipes require you to puree the vegetables, meat, poultry, or fish. Use a blender or sieve to make the puree as smooth as possible. You should cut foods that do not require pureeing into small pieces.

The second step in making a cream soup is to add the prepared ingredients to a thin white sauce. Season the soup to taste. You may serve the soup immediately, or refrigerate it and reheat it later. Be sure to use low heat when reheating a cream soup to prevent scorching.

## Preparing Unthickened Cream Soups

The cooking method used to prepare chowders differs somewhat from the method used to prepare thickened cream soups. Usually the pieces of vegetables, meat, fish, or poultry are fairly large, and they are cooked in a stock. When they are tender, add the milk to the stock and stir gently until blended. You should add the milk slowly and heat the soup at a low temperature to prevent curdling.



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*17-10 Creamy cheese soup gets its rich texture from dairy ingredients.*

## Puddings

Puddings are thickened milk products usually served as desserts. You probably are familiar with cornstarch, tapioca, rice, and bread puddings. You may also have tried Indian pudding. All these puddings contain milk and a thickening agent—cornstarch, tapioca, rice, bread, or cornmeal, respectively. In several types of puddings, eggs contribute additional thickening as well as protein.

### Food Science Principles of Cooking Puddings

All puddings require the use of moderate cooking temperatures to prevent scorching and overcoagulation of the egg and milk proteins. You

must separate the starch grains before cooking to prevent lumping. You will usually place rice, bread, and Indian puddings in a dish of hot water during baking. This provides further protection against the overcoagulation of proteins.

Some old-fashioned pudding recipes call for *scalded* milk. Scalding means heating to just below the boiling point. In the past, this step was necessary to kill bacteria in unpasteurized milk. Because all milk is now pasteurized, you can skip this step whenever you see it in a recipe.

When you use eggs in pudding, you should first add a small amount of the hot pudding to the beaten eggs. You can then add the diluted egg mixture to the rest of the hot pudding. (Eggs added directly to a hot mixture can coagulate into lumps.) You should cook the pudding a few minutes longer after adding the eggs to completely cook the egg proteins.

### Preparing Cornstarch Pudding

Of all the puddings, cornstarch pudding is the most versatile. You can serve it alone or use it to make fillings for other desserts, 17-11.

To prepare a basic cornstarch pudding, combine the sugar, salt, and cornstarch in a heavy saucepan and mix well. Add a small amount of the cold milk and stir to make a smooth paste. (These first steps help separate the starch granules.) Add the remaining milk, stirring constantly.

Cook the pudding over moderate heat, and continue stirring until the pudding boils. Cook for one minute longer to thoroughly cook the starch. Add the flavoring, and pour the pudding into dessert dishes. Chill before serving. A piece of waxed paper placed on the surface of the warm pudding will prevent the formation of a skin.

## Gelatin Creams

**Gelatin** is a gummy substance made from the bones and some connective tissues of animals. In its pure state, it is colorless and tasteless. You will use two types of gelatin in cooking—flavored gelatin and unflavored gelatin. Both types of gelatin are dissolved in a hot liquid. During cooling, the gelatin sets into a jellylike mass.

**Gelatin creams** are milk-based desserts thickened with unflavored gelatin. They are similar to puddings. Both desserts contain milk products and a thickening agent. However, you

thicken puddings with starch instead of gelatin. Three main types of gelatin creams are chiffons, Bavarian creams, and charlottes.

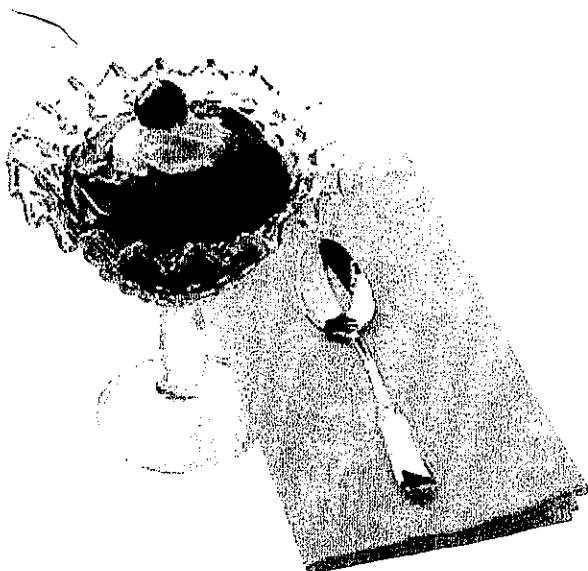
You prepare *chiffons* by adding unflavored gelatin to a stirred custard while the custard is still warm. Chill the mixture until it is almost set. Then fold in cooked, beaten egg whites. Pour the chiffon into a mold and chill until firm.

You prepare *Bavarian creams* by folding whipped cream into a chilled soft custard that has been thickened with gelatin. You may wish to add flavorings to the custard. Chill the mixture in a mold until firm and then unmold it for serving.

You prepare *charlottes* by folding whipped cream into a gelatin-thickened custard. Pour the mixture into a mold lined with ladyfingers and chill until set. See 17-12.

### Food Science Principles of Preparing Gelatin Creams

When preparing all three types of gelatin creams, you must soak the gelatin in a cold liquid, usually water. This initial soaking *hydrates* the gelatin granules, causing them to



17-11 Creamy chocolate pudding is a nutritious dessert.

used by permission of Dean Foods

## Good Manners Are Good Business

You can add small oyster crackers to a bowl of soup served at a business meal. However, do not break larger crackers into your soup. Above all else when eating soup, remember to eat it quietly. Slurping soup is one of the quickest ways to make a bad impression at a business meal.

absorb water. This allows the gelatin to dissolve more easily when you stir it into hot liquid.

Pour a prepared gelatin cream into a mold and chill it until firm. To unmold a gelatin cream, dip the mold quickly in warm water. Run the tip of a paring knife around the edge of the mold. Place the serving dish

upside down on top of the mold. Then turn the mold and the dish right side up. Shake the mold gently. The gelatin cream should slip out. If it does not loosen, repeat the previous steps. The gelatin in the mixture helps the dessert hold its shape when you unmold it.

## Ice Cream and Sherbet

Ice creams and sherbets are frozen dairy desserts you can make at home. They contain milk, cream, or a combination of both.

*Ice cream* contains milk, cream, sugar, and flavoring. You can make homemade ice cream that is lower in fat. However, it will be less creamy than regular ice cream. Simply substitute fat free milk for the whole milk and whole milk for the cream found in ice cream recipes.

*Sherbet* contains fruit juices, sugar, and milk. You may add cooked beaten egg whites, whipped cream, or gelatin to improve the texture of sherbets. The increased sugar in sherbet makes it less creamy than ice cream.



17-12 A charlotte is a molded gelatin cream surrounded by a ring of ladyfingers.

California Apricot Advisory Board

## Food Science Principles of Preparing Frozen Desserts

You must stir ice cream products and sherbet during freezing to achieve a smooth texture. This is because ice crystals form during freezing. Stirring keeps these ice crystals small. Frozen desserts that have small ice crystals taste creamy. Frozen desserts that have large ice crystals taste grainy. See 17-13.

You can prepare ice cream products and sherbet in an ice cream freezer or in the freezing compartment of the refrigerator. In an ice cream freezer, stirring is continuous, so ice crystals remain small. In the refrigerator freezing compartment, stirring is not continuous. You may add cooked beaten egg whites, whipped cream, whipped evaporated milk, or whipped gelatin to recipes prepared in the refrigerator freezing compartment. These ingredients inhibit the formation of ice crystals.

### Preparing Frozen Desserts

Whether prepared in an ice cream freezer or in the freezing compartment of the refrigerator, frozen desserts are frozen by the withdrawal of heat. In an ice cream freezer, ice and salt surround the dessert mixture and withdraw heat. In the refrigerator freezing compartment, cold air surrounds the dessert mixture and withdraws heat from it.

To prepare a frozen dessert in the refrigerator freezing compartment, turn the temperature control to its lowest setting. Pour the dessert mixture into a shallow metal baking pan. Cover it with foil and freeze until mushy. Quickly turn the mixture into a chilled bowl and beat with a whisk or rotary beater. Fold in whipped cream, cooked beaten egg whites, or other ingredients as your recipe instructs. Pour the mixture back into the metal pan. Cover and freeze until firm.

To prepare a frozen dessert in an ice cream freezer, prepare the dessert mixture and chill. Chilling will result in faster freezing.

Rinse the freezer canister first with very hot water and then with cold water. Pour the chilled dessert mixture into the canister, filling it no more than two-thirds full. (The mixture will expand during freezing.) Place the dasher into the canister. Cover the canister and attach the crank handle.

Surround the canister with alternate layers of salt and ice, beginning with ice. Use one part salt to eight parts ice, by weight, for ice cream. Use one part salt to four parts ice for sherbet.

Let the mixture stand four or five minutes and then begin cranking slowly. When the mixture begins to freeze, crank more rapidly. Continue cranking until turning the handle is difficult. (When using an electric ice cream freezer, the motor will stop at this point.)

When cranking is complete, carefully remove the water and salt from the tub. Wipe the top of the canister with a damp cloth. Remove the handle and crank. Then wipe the top again. Remove the lid and push the dessert mixture down with a rubber spatula. Cover the canister tightly. Repack the tub with four parts ice to one part salt. Cover the tub with newspapers, and let the frozen dessert ripen for four hours to develop flavors. Frozen desserts will have more flavor if you allow them to soften slightly before serving.

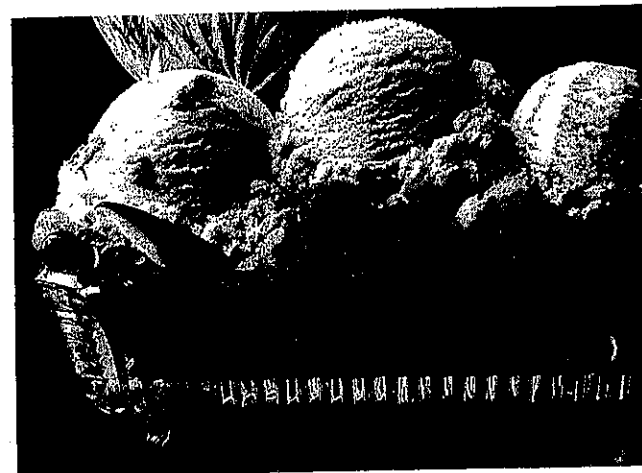


## Cooking with Cheese

You can eat cheeses alone or use them as ingredients in appetizers, sandwiches, casseroles, sauces, salads, and many other dishes. See 17-14. When used as an ingredient, cheese contributes proteins, vitamins, minerals, and flavor to other foods.

### Food Science Principles of Cooking with Cheese

Cheese is a concentrated form of milk. Therefore, it is a high-protein food. Like all



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17-13 Keeping the ice crystals small is the key to creamy texture in ice cream.



high-protein foods, heat can adversely affect cheese. If you cook cheese at too high a temperature or for too long a time, its proteins overcoagulate. As a result, the cheese becomes tough and rubbery and the fat in the cheese may separate.

## Preparing Cheese Dishes

You combine cheese with liquids in sauces and soups. When combined with liquid, the temperature must be hot enough to melt the fat so the cheese will blend smoothly. However, it must be low enough to prevent toughening of the proteins.

Cheeses that are well ripened blend more easily than less well-ripened cheeses. Well-ripened cheeses also tolerate higher temperatures.

Cheese that is grated, shredded, or cut into small pieces will blend more quickly than cheese cut into large chunks. As a result, you can use a shorter cooking time.



17-14 Pizza is a favorite among cheese lovers.

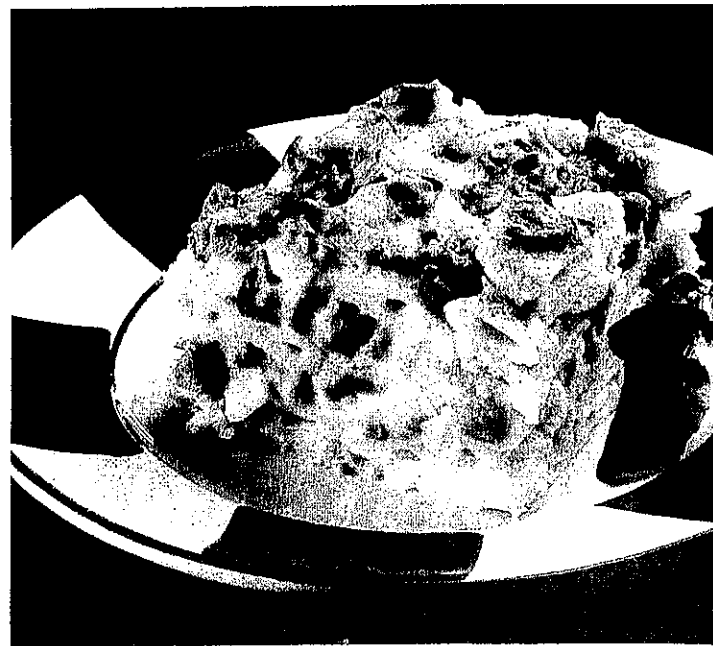
Process cheese blends more easily than natural cheese because of the emulsifiers it contains. A cheese sauce made with process cheese is smooth and less likely to curdle. In comparison, a cheese sauce made with Cheddar cheese has a grainier texture, although the cheese flavor is more pronounced.

When preparing appetizers or cheese sandwiches under the broiler, place the food four to five inches (10 to 12 cm) from the heat. Watch food carefully while broiling. Remove the appetizers or sandwiches when the cheese has melted.

Cheese dishes prepared in the oven, like macaroni and cheese, should bake just until done, 17-15. Cheese dishes cooked on a surface unit should cook over low heat or in the top of a double boiler.

## Microwaving Cheese

Cheese requires careful timing and the use of low settings when it is being cooked in a microwave oven. Cooking for too long or at too high a power level can cause cheese to separate and become rubbery. All cheeses microwave well, but some cheeses have better melting qualities than others.



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17-15 Baked dishes containing cheese should stay in the oven just long enough to thoroughly heat the ingredients and melt the cheese.

# Chapter 17 Review

## Dairy Products

### Summary

Dairy products include a wide range of popular foods, such as milk, cream, yogurt, ice cream, butter, and cheese. Many dairy foods are good sources of protein and calcium as well as a number of vitamins and other minerals. The cost of dairy products varies depending on fat content, container size, brand, and place of purchase. All fresh and frozen dairy products are perishable and require storage in the coldest part of the refrigerator or freezer. Store canned products like fresh products once you have opened them. Store dried products like fresh products after you reconstitute them.

Cream and whole milk dairy products are high in fat. Choosing reduced fat and fat free milk versions of dairy products can help you reduce fat and calories in your diet.

Milk can form a scum layer, boil over, scorch, and curdle during cooking. You can take steps to help prevent these negative reactions.

Many recipes call for dairy products as ingredients. White sauces, cream soups, puddings, gelatin creams, and frozen desserts are just a few of the foods that contain milk. When preparing these foods, you need to remember to use moderate temperatures to prevent scorching and overcoagulating the proteins. You also need to use moderate temperatures when cooking with cheese. This will help keep the cheese from becoming tough and rubbery and prevent the fat from separating.

### Review What You Have Read

Write your answers on a separate sheet of paper.

1. The process of heating milk to destroy harmful bacteria is called \_\_\_\_\_.

2. Which of the following types of cream has the most milkfat?
  - A. Coffee cream.
  - B. Half-and-half.
  - C. Heavy whipping cream.
  - D. Light whipping cream.
3. Name three types of cultured dairy products.
4. True or false. Evaporated milk and sweetened condensed milk can be used interchangeably in recipes.
5. True or false. Margarine is a dairy product.
6. Name a cheese that would be suitable for each of the following uses: appetizer, snack, dessert, sandwich, and salad.
7. Describe the difference between ripened and unripened cheeses.
8. True or false. A small amount of mold on hard cheese is not harmful.
9. How can you prevent milk from curdling during cooking?
10. If whipped cream is to be sweetened, when should the sugar be added?
11. List four food products that are made with a white sauce.
12. In what type of cream soup might cream be used in place of milk?
13. How should eggs be added when preparing a cornstarch pudding?
14. Why is it important to stir sherbets and ice creams during freezing?
15. What are two factors that affect how easily cheese blends with other ingredients during cooking?